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Bicycles and Tricycles of the Year:

BEING

A CHRONICLE OF THE NEW INVENTIONS AND IMPROVEMENTS INTRODUCED EACH SEASON, AND FORMING A PERMANENT RECORD OF THE PROGRESS IN THE MANUFACTURE OF BICYCLES AND TRICYCLES.

DESIGNED ALSO TO ASSIST INTENDING PURCHASERS IN THE CHOICE OF A MACHINE.

1879-80.

WRITTEN FROM PERSONAL EXAMINATION

By HARRY HEWITT GRIFFIN

(*London Athletic Club, Wanderers' Bicycle Club, &c.*).

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Bicycles of the Year

1879-80.

INTRODUCTION.

To enable us to write these notes on the "Bicycles of the Year" from *personal* observation we have visited every bicycle-making town in the kingdom, and our readers may therefore place entire reliance upon the accuracy of our descriptions.

The miserable weather, combined with the dullness of trade, which prevailed for the greater portion of 1879 had a great effect on the bicycle business. Nearly all the makers complained of the absence of that progressive movement which had hitherto characterised each succeeding season, and placed it in advance of its predecessors in point of demand for new and improved machines of the best class. There was also a large falling off in low priced ones. This was attributed to the fact that the rich are the only people who can afford to speculate in mounts, and that those who were not blest with a superabundance of the world's good felt the hard times severely, and could not therefore afford the outlay that even a cheap machine entails. On the other hand, riders, in consequence of the long-continued wet, put off getting another "steed" until there was some prospect of a change for the better in the weather. We therefore anticipate that 1880, if only the weather be propitious, will prove most successful in the annals of bicycle making.

DESCRIPTIVE PARTICULARS OF MAKES.

1. *The 'Xtraordinary Challenge* (Singer and Co., Challenge Works, Alma-street, Coventry).—Ever since the modern bicycle grew in height, and its danger increased, there has been an increasing demand for a "safe" machine, not only amongst timid riders, but from many men more advanced in years, who, seeing the terrific falls their younger companions received, naturally declined to run similar risks, which for them would probably have very serious consequences. To meet the wishes of

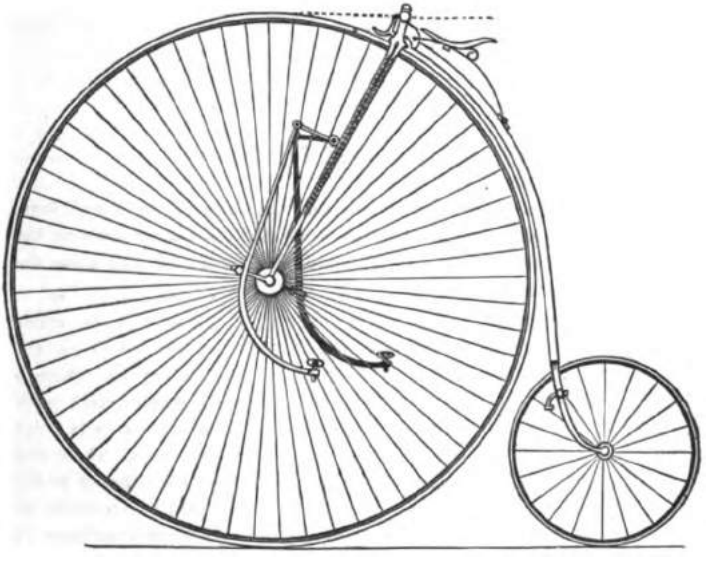

FIG. 1. THE 'XTRAORDINARY CHALLENGE.

this class of riders Singer and Co. produced the Safety, which, although it promised well at first, proved a failure in the end, chiefly on account of the clumsy appearance, awkwardness, and the "wagging" of the large (back) wheel. After this came the 'Xtraordinary (Fig. 1), which, as usual with all new or remarkable inventions, met with a vast amount of ridicule and opposition from riders who judged by looks only. The true centre of gravity is an important point to be considered in the build of a machine, as the nearer the rider's weight is to the centre of the wheel, the greater

the liability to "go a cropper" on meeting with the slightest obstacle, and therefore as the "rake" is increased the safety of the rider is more secured; but a "rake" brings serious drawbacks, as the rider, on being put further back, is of course more removed from his work, and power has to be applied in a slanting line, and thus not nearly so large a machine can be ridden, and steering is much more difficult. But in the 'Xtraordinary these difficulties have been completely overcome. The great and leading feature of this machine is the 9in. or 10in. of rake; but in order to make the steering gear workable a most ingenious plan has been adopted. Of course if the centres were in a line with the fork, as usual, the machine could be hardly made to answer the helm, therefore the Stanley head is upright; the portion of the fork next to it is bent forwards, so that it can be welded to the fork proper. A Stanley head is adopted; the handles, screwing in at either side, are 22in. long, giving great power at uphill work, and are 5in. above the tyre, the measurement being taken from directly beneath them, but as a 56in. machine has in this case at least 9in. rake, the height is reduced to about 4in.; of course the handles can be made lower if wanted and the saddle can be put far back. Because of being so far removed from over the centre extra lever arms have to be provided, and these take the simplest form possible. About 17in. from the axle a bolt passes through the (hollow) forks, held by another bolt inside, and on the outside there is a hardened steel ball head, over which fits the end of the short supporting rods, these merely serve the purpose of holding up the long arms of the levers, which are made of tubular steel, the fulcrum being an ordinary pedal pin, made stronger than usual, a cone slipping over it, on which the arm works. The pin sticks out and might be shortened, or if ball or roller (adjustable) bearings were substituted here, it would still further add to the easy running of the whole machine, as there is considerable strain at this part. The levers proper are solid, and curve downwards and turn upwards, branching out into a prong, between the ends of which the pedals are fixed. They can only turn about three-quarter way round, not being required to revolve. There is considerable difficulty in mounting ordinary machines owing to the small rear wheel and great distance from the step to the centre of the saddle. Thus, on a 56in., with a step 21in. from the ground, it is about 43in. to the centre of the saddle, while with the 'Xtraordinary it is but 36in. The spring has a slide termination; a solid round piece of metal about 3in. is secured to the hollow steel backbone, over which a clip works freely; it is in turn bolted to the tail end of the spring. The wheels of the Royal Challange were employed on the one we tried, and we should strongly recommend this pattern in preference to the ordinary type. They

have U steel rims, sixty direct action spokes, screwing into large gun metal hubs (which might be recessed to let in the bearings) 5¾in. wide and 4in. deep. The bearings adopted are the cycle, and they answer splendidly. We have before described them in *The Bazaar*, and a brief outline for those readers who do not know them will be sufficient. The interior arrangements consist of two guide rings, with a series of notches, in which a corresponding number of small steel rollers lie. The axle works on them, and friction is reduced to a very low minimum, and but little lubricant is required. They are bolted by a hinge or knuckle joint, which acts as a brake on the twist of the forks, and prevents to a considerable degree the impingement common to the bearings of most machines. The cranks are detachable, and the slot adjustable from 4in. to 6in. The steel backbone is necessarily short, being only 43in. from the opening in the head to the spring of the back fork, while the usual length would be 53in. As much greater weight is thrown on the trailing wheel, it is larger than usual—22in. being the best height. It has twenty-four direct spokes and Bown's adjustable ball bearings. The sizes of rubbers are generally ⅛in. and ¼in., but if it is required for extra rough work they may be full inch and ¼in. respectively. This gives a description of the machine so far as words can. We now come to the principles and advantages of the 'Xtraordinary. It is a well-known fact that in order to exert his full power with the legs a man should have his work almost directly under him, and, further, the feet should be close together; it is in these very things that the 'Xtraordinary is not only equal but superior to any bicycle made. Take any machine—first class or otherwise—and measure the breadth of the tread, *i.e.*, from centre to centre of the pedals, and very few will be found under 14in., the generality 15in., and some even 17in. to 18in. The extreme breadth (*i.e.*, from outside of pedal pin to ditto on opposite side) is about 5in. to 6in. more. These measurements should be calculated with a 6in. hub; some racers are built only 13in., but out of the countless number of makes we have examined, only in one solitary instance have we found it under 12in., and that was a very exceptional case. A wide tread is not only very ugly but positively dangerous to the system, as the legs are stretched out of their natural position. To give a common example, let anyone try to walk fast with the feet 18in. apart! This is a fact nineteen out of every twenty makers are either ignorant of or wilfully careless about. In the "new-fangled notion" this objection is overcome, and the feet are barely 12in. apart. To any fairly active man it is the safest machine made, for there is absolutely no fear of going over the handle. As a roadster it is particularly good, and, contrary to the general expectation, it takes hills with ease. The brake, although only of the

ordinary front wheel lever spoon pattern, is the most powerful we have ever seen on any bicycle (save that on the old Safety). When the 'Xtraordinary is mounted for the first time, the action and steering feel rather difficult, but this very soon passes away, and, although the motion of the pedals is apparently slightly different, scarcely any change is felt by the rider. The steering answers immediately, only it requires more attention, as the feet are not of much use for guiding. The driving wheel has in every case U steel rims, and *sixty to eighty direct action* spokes, large gun-metal hubs, and the Æolus bearing is used if required. These have knuckle joints in place of being bolted to the fork, a considerable improvement. Since the first notice appeared in the *Bazaar*, several other items have also received attention, and the whole machine presents a more graceful appearance. An extensive demand has sprung up for this machine, and it has taken an important place amongst "bicycles of the year." In weight a 56in. scales 57lb., out of this the levers, &c., contribute 11lb., but this weight may be still further reduced. The size of the wheel is not restricted to the height of the rider, as the lever can be bent to any extent, enabling a 6ft. man to ride a 48in., or a 5ft. 6in. man a 60in. It will doubtless be good news to those who use this steed to know that the Right Honourable Robert Lowe, M.P., Ex-Chancellor of the Exchequer, now rides an 'Xtraordinary, and the fact ought to encourage many who fancy they are too old for our noble sport.

2. *The Autocrat* (Messrs. Harrington and Co., Desideratum Works, Stewart-street, Wolverhampton).—One of the leading peculiarities of the Autocrat lies in the method adopted in affixing the spokes. The gun metal hubs have a series of slots, corresponding to the number of spokes, cut on the inner sides; the heads of the spokes are slipped into these and screwed into very neat nipples, which pass through the rim, and, having six sides, are easily turned by a wrench, if the spokes should require tightening; or in case a spoke has to be renewed, it is easily accomplished by unscrewing the nipple and slipping the spoke through the slot; by the reverse method a new one can be put in, which plan is not only simple, but the rubber tyre has not to be moved or loosened. It was thought by outsiders that the spokes had not sufficient hold on the gun metal, and were apt to drag through, but we put them to a very severe test, which fully proved that they are as strong as other usual styles of fastening. The spokes are made of fine gauge steel wire, about sixty to a 54in. wheel, and burnished by a patent process, which prevents rusting even if exposed to wet. The felloes are of the steel crescent shape, and the tyres, red rubbers of ¼in. to the driving wheel, and ⅜in. for the back wheel, are adopted; they are firmly cemented and baked in. Rudge's bearings are applied to three parts, the two wheels and

pedals. These bearings are like Bown's, balls running on cones, co-eccentrically adjustable. The rear wheel balls are somewhat similar, and make a wonderful difference in the running; when the wheel is "spun" it seems as if it would glide smoothly round for ever, so freely does it revolve. The bearings are not of so much consequence to the pedals, but are a comfortable auxiliary, and there is not the slightest danger of them locking, as sometimes happens with cones. The pedals are adjustable from 4in. to 6in., and the cranks are detachable, being held by a thin screw nut over the end of the nipple, a much neater plan than the usual bolt. The forks are solid, but neatly tapered, and the Stanley head, backbone, &c., the same as in the Desideratum, are used. The spring has improved "shackle" arrangement in front to ease jolting. It is better understood by referring to Fig. 2. The front part is split,

FIG. 2. SHACKLE SPRING.

to go on either side of the neck, and is bolted to a "joint" or "shackle," which has a slight play, giving a downward motion in a forward direction. The spring is also elastic, and the tail-end is fixed to the backbone. One of Lamplough and Brown's suspension saddles is fitted to every machine. The backbone, forks, and rims are handsomely japanned; while the Stanley head, handle bar, and spring are nickel plated. In weight a 54in., all complete, scales 41lb. Price, 50in., £15.

3. *The Dreadnought.*—For a strong roadster the Dreadnought will be fit to carry a rider safely in rough places. It is very much like the Desideratum, only stronger and stouter in all parts, and about seventy spokes are put in the driving wheel, and 1¼in. rubbers. It is about 4lb. to 5lb. heavier. Price, 50in., £10 10s.

4. *The Desideratum.*—This make is one of the best known of any cheap make, but it must be placed in a rather higher rank than its cost implies. We described it fully last year, and a brief repetition will now be sufficient. The step can be adjusted 5in., from 19in. to 24in., which is of the greatest importance. Two bars are bolted to the backbone, immediately above the fork; attached to this by a sliding bracket is the

ring step, with a saw edge to prevent slipping. By unscrewing the nut at the point of the arrow in Fig. 3 it can be placed in any position, and held fast on tightening up. The Stanley head possesses the peculiar property of being self-adjusting; it automatically takes up any wear, and prevents the disagreeable looseness or shaking often experienced in ordinary machines. In place of the awkward lock nut and high screw

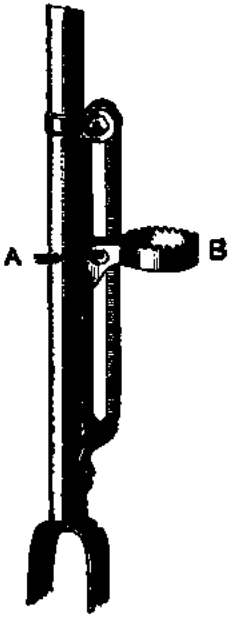

FIG. 3. THE DESIDERATUM (PATENT) ADJUSTABLE STEP.

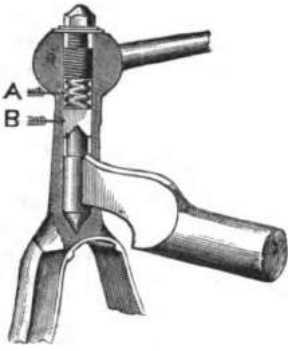

FIG. 4. THE DESIDERATUM (PATENT) SELF-ADJUSTING STANLEY HEAD.

sticking up over the handles, they are finished off with a neat ball, much smaller than was formerly used. The top nut screws into the interior of the head, and forces down the spiral spring A (see Fig. 4), which in turn keeps the steel cup B tightly down on the top centre. Should the slightest looseness be felt, the nut is screwed down; but there is no fear of its shaking loose continually. The bearings consist of a single row of balls held in a grooved collar which slips over the axle—a great advantage over those which work directly on the axle, as it is subject to no wear, and all working parts can be thoroughly hardened. An exceedingly neat case, with corresponding grooves, fits over, and is bolted by a

hinge joint to the fork end. They are adjusted by screws at the sides. The steel cranks are easily detached, and the pedals are rubber clothed. Solid taper forks, hollow steel backbone, spring as described, and the wheels are also like the Autocrat. The alarums only sound when pressed by the thumb; they then yield loud clear notes. Rear wheel runs on adjustable cones, and front wheel lever brakes are fitted. The spring, handle, head, &c., are polished; the remainder painted. A 50in. weighs exactly 41lb. Price, 50in., £10.

5. *The Eureka.*—This is an auxiliary machine, introduced at a lower price than the well-known Desideratum. The backbone and forks are ornamented with a curious device, technically called the "key pattern," which is japanned on them; this process being used instead of painting. The Patent Desideratum ball head is adopted. Fifty lock-nutted spokes, gun metal hubs, roller bearings, crescent rims, red or grey tyres, form the wheels, while handy detachable cranks are fitted. Handles of a good length screw into either side of the head, and the spring slides by a clip-tail on the steel backbone. A 52in. weighs 43lb. Price £7 5s. to £8.

6. *The Manchester Bicycle* (Messrs. Cunliffe and Croom, Broughton Ironworks, Edward-street, Broughton-lane, Manchester).—This machine, which is as yet almost unknown in the London market, being chiefly built for use on the rough Lancashire roads, has an air of strength and solidity in its construction. The wheels have U steel rims, and strong spokes of iron charcoal wire, in the proportion of one for every inch of the driving wheel, are lock-nutted into a flat-sided iron hub, which is made solid with the axle. The bearings, which are parallel, are extra long, and bolt to fork ends. The Stanley head is of the type known as "open." A well arched and pliable spring, terminating with a large hinge clip, slides freely on the hollow steel backbone. Although the handles are only 5in. above the rubber, the centres are 4in. long, giving greater rigidity and firmness to the steering arrangement. The handle bar is shorter than the general rule—17½in. in length—and is carried in front of the head. Starley's patent detachable cranks are fitted; they are held by a simple screw. The same inventor supplies the brake, which is about the best kind, acting on the rear wheel, and has the merit of being safe, which is a considerable advantage. It consists of two short arms attached to part of the rear fork, so that it is out of the centre, and on putting on it has to be pulled up so that it catches the rubber. Should the cord snap, instead of the machine running away, it is soon brought to a stand, as the brake, falling by its own weight, is carried round as far as it will go, when it jams the small wheel. The latter is fitted with the usual cones. All the bearings have brass lubricators. The step—an ordinary oval iron one—is tilted slightly forwards, which

materially assists in mounting. In order to meet the wishes of riders, front wheel brakes are substituted for Starley's, if desired. The pedals are coned, and measure from centre to centre 16in., the hub being 5¼in.; rubber tyres of 1in. and ¾in. are used, nice horn handles, leg guard, neat neck, well shaped backbone, complete the remaining features of this machine. The machines are by no means light, a 50in. weighing about 46lb.; but it must be remembered that they are built for strength and use, not show. Price, 50in., £14.

7. *The Dart Roadster* (Smith, Sons, and Co., Bow Works, West-street, Sheffield).—The bearings of this machine are a leading feature—being neither rollers or balls, but a combination of both—being as broad as long, ¾in. either way. They are cut true from the best steel and extra case hardened. They fit into a groove cut in the axle, and also in a corresponding slit in the case, which tightens at the sides; twelve are put in each. They form a very easy going, strong, and steady bearing. Hollow steel forks are now adopted, surmounted by a neat low Stanley head. The handles, carried in front, are 21in. long, and only 4½in. above the rubber tyres; the latter is smaller than usual for roadsters, ¾in. for the front and ¾in. for the rear wheel. They are cemented in crescent steel rims, and the wheel is further made up with sixty fine steel wire spokes, screwed direct into straight gun-metal hubs. The hub averages 5½in. in width; fixed cranks are employed with adjustable slot. The head is a genuine Stanley. The spring slides by a hinge clip on a backbone 1¾in. in diameter. The saddle is kept very close, and is fitted to a steel plate. A 54in., all complete, weighs only 37½lb. The step is placed 24in. from the ground on that size, and adjustable cones form the running parts of the trailing wheel, which is 17in. in height. A capital front wheel brake is employed, and the whole machine is neat and graceful in outline, made of good materials, and well built. The makers have wisely stamped the name on the head of the machine. Price, 50in., £14 17s.

8. *The Dart Racer.*—Much the same in main details as the one just described, except a reduction of weight and increase of spokes; ball bearings are used for both the front and back wheels. A 52in. weighs within a few ounces of 30lb. Price, 50in., £15.

9. *The Dart* No. 2.—A good strong machine, more plainly finished, but made of good stuff, rather heavier and stronger; plain bearings, &c. Price, 50in., £11 12s.

10. *The Dart* No. 3.—Suitable for a first season machine; the parts are good, fewer spokes, plain bearings, solid forks, common rubber, and with brake. Price, 50in., £9 12s.

11. *The Special Express* (J. Devey, Tower Works, Piper's-row, Wolver-

hampton).—The Express has become very well known, and is in extensive demand. It has plain roller bearings bolted to solid forged iron forks, neatly tapered, and of oval form. They are surmounted by a Stanley head, with hardened centres. The spring slides either by a slot or bolted clip on the tubular steel backbone. About a spoke per inch is put in the driving wheel; these spokes are of steel wire, and screw direct into gunmetal hubs, 5½in. wide. The size of rubbers depends upon circumstances, and if needed for rough work, full inch and ½in. are used; if for good roads, ½in. and ¾in. respectively are found sufficient; cement is the only means used to secure them into the U steel rims. Adjustable cones form the bearing of the rear wheel. A 50in. represents 41lb. weight, and forms a strong serviceable machine. Price, 50in., £7 5s.

12. *The Semi-Racer.*—A lighter type, a 54in. only scaling 36½lb., suitable for ordinary road work. The back wheel is a trifle smaller, 16in., and has dust-proof cone bearings. The rubbers are only ½in. and ¾in., while the number of the spokes is increased to sixty for the front and twenty for the trailing wheel. They screw direct into gun metal hubs. The Stanley head is short and neat, the handle bar being kept low down, 3½in. above the rubber, and put slightly in front of the head. The other details are as already described, save and except that for the front wheel bearings Bown's adjustable balls are used. Price, 54in., £9.

13. *The Racing Express.*—Intended for the path, it is made generally lighter throughout, hollow steel front forks, and Bown's bearings to both wheels. About eighty light spokes are put into the driving wheel, and the whole machine is well finished. All parts are reduced in weight, but it retains considerable strength. The tyres are made ¾in. and ½in. for good paths; indeed for light weights it makes a fine roadster, being neat, light, and graceful. A 54in. weighs 30lb. to 32lb. Price, 54in., £10.

14. *The Express* No. 1.—This differs but little from the Special, as it has roller bearings, or plain if preferred, some forty-two or forty-four direct action spokes and U rims. Full inch tyres for the "driver," with a ½in. for the lesser wheel, of red rubbers, are put in absence of special orders. Detachable cranks are even fitted, and the description given of the Special applies to this one also. Weight of a 48in., all complete for the road, 41½lb., price £6 10s.

15. *The Express No.* 2.—A step lower in price, and the brake absent. Cone bearings to both wheels, but rollers are put to the front, without extra charge; about thirty eight or forty strong lock-nutted iron charcoal wire spokes, straight iron hubs, V rims, grey or red rubbers, iron backbone, cliptail spring; rubber pedals or rat trap are fitted to all varieties. They run on cones, and are adjustable. Weight of a 54in. about 49lb. Price £6 5s.

16. *The Special Tubular Defiance* (Simpson and Co,. Mansfield).—This firm was first established in 1875, but was not very well known till 1877. Now, however, their machines are to be seen all over the country, some 1220 having been made during the last year and a half. In building the present machine the firm seemed determined to construct a bicycle that would defy the worst roads, great strength being the object, it has been sought for in one direction by making deeply fluted hollow forks—they are so much hollowed out as to almost resemble D.H.F. forks. They are neatly tapered, and are very strong and rigid. It is a well-known fact that the shorter the centres are made the weaker they become, causing the whole framework to be ricketsy and to be more springy. In the S.T.D. the opposite is the case, and the longest centres of the day are found, and although 5¼in. long the handles are only 4½in. above the rubber. This effect is secured by novel means—in fact, the centres are outside the head, the lower portion being the usual Stanley head. The bottom centre works in a steel cup, and the pin projects outwards at a right angle and runs up behind the head, the top centre being brought over it again in the same manner; a loose cone screws down on the head, and is held by a lock nut; it is dust proof and although not so attractive as the Stanley head proper, the great strength and rigidity it imparts is a valuable gain. Another advantage is secured, as the handle bar is adjustable for some two inches, and can be made high or low by means of a set screw. The backbone, which is of weldless steel tube, is almost flat, the corners are rounded off, and the upper and lower sides dented inwards. Toward the rear wheel it is nicely tapered and spreads out into a hollow back fork, a much better system in every way than solid. Eighty direct action spokes are put into the front wheel; these screw into gun-metal hubs, which are 5½in. broad. Red rubber tyres, ¾in. and ⅝in., are cemented into steel U rims. For the large wheel Bown's bearings are employed, and cones for the small. The latter are far superior to those ordinarily employed, and, being constructed to keep the grit out of the working parts, they run very freely. The arrangement of the spring is very good. Attached to the long outer centre there is a small box or case containing a rubber buffer, which supports the fore end, while the other extremity slides in a box brazed on the backbone. This forms a most comfortable resting-place for the saddle, which, being a Lamplough and Co.'s, makes the seat delightfully easy and pliable. The brake is another novelty, as it works directly under the head, by a series of small levers; it is effective and direct in application. The pedals are combined nat-trap and rubber. All working parts are case-hardened, and brass lubricators fitted throughout. The whole machine is made with great care, and good workmanship will be found in every part; for a strong

useful roadster, where the rider has to depend thoroughly on his steed without fear of breakdowns, it is most valuable. A 54in. weighs 48lb., and costs, painted, £18 10s.

17. *The Clarke* (Robert Clarke, New Moston, Failsworth, Manchester).—In building this machine the Humber is taken as a model. The wheels have sixty direct action steel wire spokes, gun metal hubs 5¼in. wide, steel crescent rims into which red or grey tyres, according to order, are cemented. The old and excellent Sheffield plain bearing is used generally; they are adjustable, and being made thoroughly hard, not only last a long time, but run very freely. The forks are forged from solid Low-moor iron, neatly tapered to the edges, and decreasing in size from the Stanley head to the bearings. The head is of the same pattern as that adopted by Carver of "hollow spoke" fame. The bottom centre is a female cone, a male cone being inserted in the head; by the adoption of this shape dirt and dust cannot work its way into the centres, so preserving it from wear to some extent The top centre is a "male," and the adjusting screw fits down over instead of into it. Handles are 20in. long, and screw into either side of the head; the front wheel lever brake is attached to them; it has a mud guard to prevent the rider being splashed, as is often the case if the brake is put on when travelling fast on a wet day. Brass lubricators are attached to all parts which require "oiling up." Adjustable cranks are not fitted, the usual fixed ones with an adjustable slot taking their place. The spring works with a hinged clip on a hollow steel backbone. The other details do not present any remarkable features. The Clarke will be found a good strong roadster of medium weight, a 52in. scaling 41lb. It is well made and looks capable of standing the work for which it is designed.

18. *The Hallamshire* (R. and A. Hill, Sylvester Gardens, Arundel-street, Sheffield).—The Hallamshire (Fig. 5) has for some years been known as a very light type of the Stanley, or we may say "Sheffield style," as all made in the "home of steel" are constructed on very similar lines. The number of spokes put in the Hallamshire wheel is about one per inch, or generally sixty in large wheels, or in accordance with the wishes of customers, this is increased to eighty. They are of fine steel wire, and screw direct into large gun metal hubs, well recessed, in order to allow the bearings to go closer together. The hubs average 5⅛in. to 5¼in. diameter. The upper portion of each spoke where it screws into the nave (or hub) is left for ¼in. free from any thread, so that there is a certain amount of "play," a system that has been found to answer successfully in lessening the liability to snap off short at that point where the chief strain is brought to bear. The bearings are rather remarkable, and seem specially adapted for rough work, as they possess solidity and strength

combined with easy running. The portions that mitigate the friction are neither balls nor rollers, though more of the latter than the former, as they measure ⅛in. broad by ⅛in. deep, that being the running surface. They are placed in double rows, and kept apart by a steel cage, twelve being placed on each side. The method of adjustment is also known as the Sheffield, and consists of the two halves of the usual kind of case, being tightened with bolts; all parts are well hardened and made dust proof. Solid forks were still used at the time we inspected the machine, but we believe they have since been replaced by hollow. The Stanley head is short, and the handles screw in at either side. The end of the

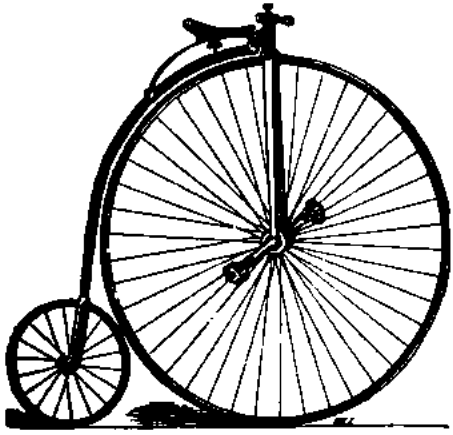

FIG. 5. THE HALLAMSHIRE.

backbone (hollow steel) is brought close up to the head by means of a short but deep neck, to which the front portion of the spring is bolted, the tail end sliding on the backbone by a clip tail. The usual size of the rear wheel is 17in. It has extra long cone bearings, the length making them run more smoothly and wear equally. Rubber tyres are generally ⅜in. and ½in. respectively. Front wheel lever brake and the usual steerers. A 50in. machine as described weighs exactly 37½lb. The racers are, of course, very much lighter. Price, 50in., £10.

19. *The Comet* (Toledo Steel Company, Eden Engineering Works, Eden-street, Hampstead-road, N.W.)—The Comet bears a close resemblance to the Volante. It has oval hollow steel forks, the lower ends of which are brazed on to the upper half of the bearing case; the latter is an improved roller bearing, fashioned after the form of the "cycle," but heavier and

stronger; ten hardened steel rollers are kept apart by a cage, and, the axle working on them, friction is reduced to a minimum. They are capable of easy adjustment, run very freely, and are subject to little or no wear. The cranks are fixed, and have the usual adjustable slot for the pedal. The handles screw in at either side, and the ends pass into the centre of the head, and are "tapped" so that the long centre screw acts against them like a lock nut preventing them from slipping, while, if bent, the screw has only to be withdrawn and the handle twisted round till it comes off. They are 20in. to 21in. long, and 5in. above the tyre. The objectionable nut at the end—a frequent source of blisters in most makes—is entirely done away with, and the handles are quite smooth at the extremities, being very pleasant for the hands. A very deep narrow head, of handsome appearance, brings the backbone close up to the Stanley head, and also increases the strength of the centres, the lower of which is a "female," possessing the advantage of not allowing the dust and grit to wear away the cup, as is the case when a "male" cone is used. At a small extra charge a capital dust cover is fitted over the opening in the head, which not only keeps the dust out, but the oil from oozing out in an objectionable way. The saddle is supported on a steel plate, the front portion of which has two cross clips, which fit over the spring; these hold it securely. At the back part there is a curled piece of steel, which is affixed to the framework of the saddle; it has a slot on the lower end, which works on a small bolt and nut, by which means it can be adjusted as required, a system infinitely preferable to the old thumb screws, which are entirely banished. This is the best plan we have yet seen, as it does away with the saddle block; it brings the rider close down to his work, and permits of a larger size being ridden. The end of the spring works between two gunmetal guards, and is pliable. Sixty steel wire spokes is the number put in almost every sized wheel. They screw direct into gunmetal hubs, 5¼in. diameter, steel crescent rims and rubber of ⅜in. and ½in. The trailing wheel is generally 17in. high, has twenty spokes, and runs on excellent cones. The backbone is weldless tubular steel; a ring step is attached some 21in. from the ground. Every portion where there is any friction is case-hardened; and the machine is carefully constructed, so that it will be found a thoroughly good one, either for road work or the path. A 50in. weighs exactly 35½lb. Price, 50in., £11 11s.

20. *The Vade Mecum* (W. Clarke, 34, Broadwall, Stamford-street, Blackfriars-road, London, S.E.)—In this machine the rule of "spoke per inch" is carried out, but V rims are used with grey tyres, unless U felloes and red rubbers are specially ordered. An even number of spokes is, however, maintained, so as to bring one opposite the other, and screw direct into gunmetal hubs (lock-nutted if desired). The forks

are of good width and well forged. The spring works by a slot on the steel backbone, which tapers to the rear wheel. A neat handle bar of graduated thickness screws into a small ball which surmounts the Stanley head. The bearings consist of twelve steel rollers, held in a case-hardened box, which is bolted to the fork ends; a brass oil reservoir assists lubrication. All other details are "as per ordinary;" foot rests and the usual auxiliaries are given without extra charge.

21. *The Northern* (North of England Bicycle Company, Meadow-street, Sheffield).—This is a genuine Sheffield machine, light and elegant, having those points of beauty so characteristic of all machines hailing from the "Town o' Blades." The wheels have light crescent steel rims, with red rubber tyres, ⅛in. and ¼in., held by cement alone, the spokes are of fine steel wire, and number from three to five score, according to the size of the wheel, and screw into large gunmetal hubs. These are from 5¼in. to 6in. across, and they are recessed on the outside, so that the bearings may be brought nearer each other. These consist of two rows of very short rollers, as broad as long, kept apart by a cage, and adjusted in the usual manner. They run very easily, and are steady on the road. Forks of a neat bayonet shape support the Stanley head. The handle bar is 20½in. long, and is directly above the centres, 5½in. high. The "knobs" are generally of lignum vitæ or ebony. The spring is bolted to the neck, and has a small tail end which passes between two leather guards, the lower of which is held on a piece of metal secured by nuts to the hollow steel backbone; the latter is 1⅝in. in diameter near the head, and it follows the curve of the wheel very nicely. Improved cones are fitted to the back wheel; its average height is 17in. Fixed cranks are employed, but they have the usual adjustable slot for altering the throw of the pedal. The brake is a double lever, and acts on the front wheel. There are no other features of note. It is a first-class machine. A 54in. weighs about 38lb. Price, 54in., £15 5s.

22. *The Northern Racer.*—Much the same, only lighter, hollow front forks, ball bearings to both wheels, ⅛in. and ¼in. tyres, finer gauge spokes, rattrap pedals, &c. Price, 54in., £15 10s.

23. *The Northern No.* 2.—A cheaper machine, although of the same good materials, only not so much time is spent in putting on the finishing touches, and fewer spokes are used; ordinary rollers take the place of the special bearings. Price, 54in., £12 2s. 6d.

24. *The Northern No.* 3.—Plain bearings, iron charcoal wire spokes, about fifty to fifty-six, solid forks, foot rests, &c., but no brake. Price, 54in., £9 10s.

25. *The Special Commercial* (A. Robinson, Albert-place, Wolverhampton).—This machine is made by one of the partners of the late firm of

A. and J. Robinson; it has 100 fine direct action spokes, large gunmetal hubs, firmly secured on a steel axle, crescent rims, red rubber tyres. Rudge's famous bearings are fitted to both wheels; hollow steel forks and backbone. The spring works on balls, making a very easy action. A capital front wheel lever brake acts in the usual style from the handle bar, which is of medium length and placed slightly forwards on the top of the head, or next the rider, as may be wished. A mud guard protects him below, while Lamplough and Brown's saddle adds considerably to the comfort. The whole machine, except rims, is electro plated, and is very cheap. Price, 50in., £12 15s.

26. *The Commercial Roadster.*—A lower priced machine, and more fit for rough work. Its ruling characteristics are steel "half-moon" felloes, from fifty to sixty direct action spokes, gun metal hubs, steel spindle or axle. Lubricators are fitted to facilitate oiling, the front wheel having adjustable roller bearings, and the other cones. The forks are solid but of a neat shape, and crowned by a Stanley head; steering rod and buffalo horn handles go over the centre; usual front brake; rubber pedals are given unless rat-trap are preferred; valise, wrench, new alarum bell, &c., are given gratis with every machine. Price, 50in., £7.

27. *The Commercial No.* 2.—A still lower-priced one, much the same as above, but all painted, and details not so well finished; roller or plain bearings. Price £6 5s.

28. *The Eagle* (Messrs. Bowers and Cook, 25, Bilston-road, Wolverhampton).—This is a light machine for either racing or moderate road riding. It has on an average sixty spokes, direct action, gun-metal hubs, full 6in. in width, steel crescent rims, ⅜in. and ½in. rubbers respectively, solid front forks, Rudge's patent adjustable ball bearings, Stanley head, short and neat clip tail spring, hollow steel backbone, and when the machine is to be employed as a roadster a lever front wheel brake is affixed. It is neat and light. Price, 52in., £12 10s.

29. *The Dart.*—The "stable companion" of the Eagle. It has lock-nutted spokes, in the proportion of one to the inch in the height of the driving wheel, U rims, gunmetal hubs, 6½in. wide. The steering bar sets slightly forward in front of the Stanley head, and has horn handles, to which the front lever brake is attached. The spring is bolted to the neck in front, and its tail end has a sliding clip, which works on the iron backbone. A saddle pouch, containing oilcan and spanner, is given with each machine; leg rests are fitted if desired. Roller bearings are put to the driving wheels of all machines, and adjustable cones to the small wheel. The step is of a good shape, oval, roughed and tilted slightly forwards. The Dart is a strong machine for rough work. A 52in. weighs 46lb.; price £8 10s. It is a pity the makers could not have chosen more

original titles; both the Dart and Eagle are already in use—the latter title being a very old one.

30. *The Interchangeable* (Thos. Palmer and Co., Victoria-road, Aston Park, Birmingham.)—The bearings of this machine are of the Sheffield type, plain, parallel, thoroughly hardened, and with the usual double side adjustment. The cranks are fixed and have an adjustable slot; the rubber pedals are left close, not much room being wasted; the hubs are of gunmetal, 6in. wide, the "tread" is kept down to 14½in.; about sixty direct action spokes are put to a 50in., U steel rims, and grey rubbers complete the wheels; solid forks, Stanley head, steel backbone, &c., make up the framework. The rear wheel runs on cones. The machine will be found a good strong roadster, of moderate weight, a 52in. averaging about 43½lbs. Price, 52in., £10 10s.

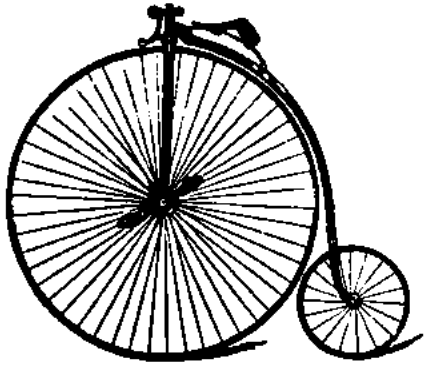

FIG. 6. THE INTERCHANGEABLE ROADSTER.

31. *The Interchangeable Racer.*—This is a lighter and better machine than the roadster, and possesses some special features. The spokes are of a fine gauge 14 steel wire, and are eighty in number. They have the appearance of direct action, but an excellent plan is adopted. A very fine nipple, without head, is screwed into the hole in the hub until it is flush with the edge. The spoke is then tapped and screwed into the nipple, the upper eighth of an inch being left free for play. Thus, should any breakage occur, the nipple is easily removed, bringing the stump of the spoke with it, which prevents the difficult and troublesome job of drilling out the broken end, and this desirable point is gained without sacrificing appearance. Another capital idea is the Universal joint to the bearings; they are either balls or plain, as preferred. A steel collar fits over the case, which has a rounded surface, the

combination forming a ball and socket joint, which gives free play to a slight extent, but sufficient to prevent the bearings crossing. The rear wheel runs on a plain pin, with dust proof caps, which effectually keep out the grit; it is of one size, 16in. The forks are hollow steel; the Stanley head is short and neat, the handles kept well down, while the spring is short and light. The whole machine is built very close to allow a large size to be ridden. The tyres are ⅜in. and ½in., cemented on U steel rims. This elegant racer is an excellent mount when speed on the path is required. A 54½in., that being the size we placed on the scales, weighed only 33lb. Balls are now also placed on both wheels. Price, all sizes, £12 12s.

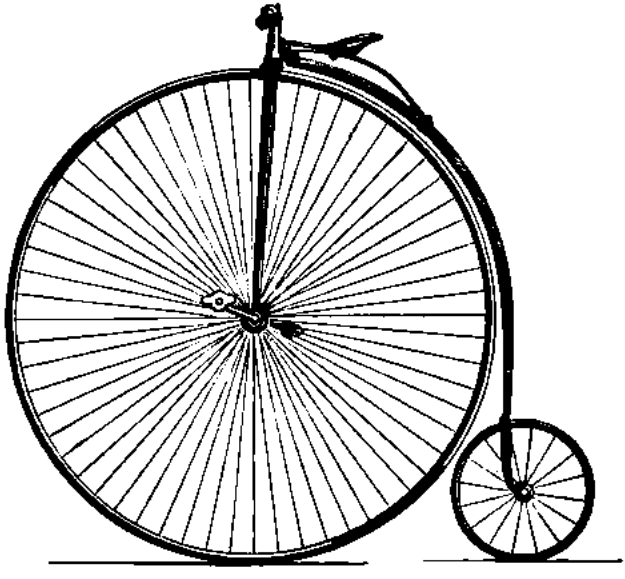

FIG. 7. THE LONDON BICYCLE.

32. *The Improved London* (Moir, Hickling, and Co., Show-rooms, 30, Queen Victoria-street, London, E.C.).—The original London proving a success, a new edition (Fig. 7) has been issued, which brings it up to date. It now has bearings fashioned after the Humber model—*i. e.*, a double row of balls, kept apart by a washer, with double side adjustment; the top of the case slips up into the lower end of the hollow steel forks, into which they are neatly brazed. The upper portion or

shoulder of the forks spreads out, giving greater strength. An elegant form of Stanley head is employed, of the Pyramid pattern; it is made all bright, and has an advantage in the manner the opening is cut, as it is broader in the lower part, which enables a shorter turn to be made without the disagreeable locking that often causes an upset when endeavouring to get round in a circumscribed space. Attention has been paid to the centres, and a male cone is screwed into the head, the lower centre being a female, it fits over, and prevents grit getting into the working part. The top screw is kept well down, and the handles are 5in. from the tyre, and are 20in. or 21in. long, being fixed, as a front wheel lever brake is employed. The spring terminates with a leather lined slot, which is held by a single bolt, allowing it to slide freely on the steel spine. Sixty direct action spokes screw into nice-looking gun-metal hubs. The cranks are fixed and the pedal pins coned. The tyres are both wired and cemented into U rims, and are of ⅞in. and ¾in. for light machines. The small wheel is generally 17in., and runs on cones, which are rather larger than usual, but act in the ordinary manner. The machines are finished half bright, and a 52in. weighs 37lb. to 40lb. It will be found a really excellent roadster, fit for all work. Price, 52in., £16.

33. *The London Racer.*—The above description applies for the greater part; the brake and leg guard are left out, while it is finished all bright, the rubbers reduced to ⅛in. and ¼in. The rims are of light U steel, and ball bearings are fitted to the rear wheel as well. The weight of a 54in. ranges from 31lb. to 34lb. Price, 54in., £19 10s.

34. *The London No.* 1.—This is a strong plain machine, V rims and forty-six stout iron charcoal wire spokes, lock nutted into iron hubs, roller bearings are fitted without extra charge, and they are firmly bolted to the solid iron forks, which are surmounted by an ordinary Stanley head. The tyres are ⅞in. and ¾in., held by the combined action of wire and cement. An extra wide hub is employed, which imparts great strength. The spring is similar to the others, working by a slot on the backbone. Dust caps are fitted to the cone bearings of the rear wheel, which has brass hubs. A double thumb brake is provided. A 52in. weighs 42lb. Price, 52in., £14 10s.

35. *The London No.* 2.—A common variety of No. 1, which it resembles in most particulars, it has the same parts, with the exception of the driving wheel, which has cone bearings. A 54in. weighs 46lb. to 47lb. Price, 54in., £12.

36. *The Timberlake Light Roadster.* — Formerly this machine was known as the Eagle, and under that title it was described in *The Bazaar* in 1875; since then, however, it gradually came to be called after its

original maker, the brake (Fig. 8) having, in no little measure, assisted its popularity. This was one of the earliest improved front wheel brakes, and it differs from any other in use. The handles are free to revolve, and in the centre a ratchet is fixed. This acts on an upright bar similarly notched, which is held by a guard coming out from beneath the head; the lower extremity is fitted with a brass roller shaped to fit the rubber. On turning the handles the bar is depressed, which brings the roller firmly on the tyre. The advantage of the ratchet is that it takes all strain off the hands when applying it, as it remains on, and the pressure can be regulated to a nicety; a brass guard prevents the mud from flying, and a rubber band keeps it off the tyre when not wanted. It has many advantages, among others, it

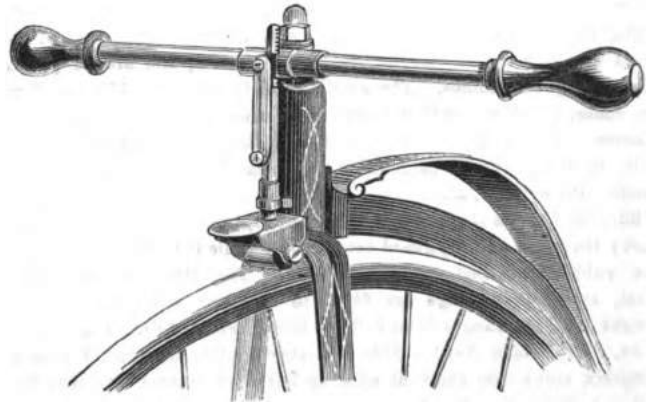

FIG. 8. THE TIMBERLAKE BRAKE.

does not yield on a rough road, but imparts an even equal pressure without the constant strain on the hands that is felt when descending a long hill with the ordinary levers. The Stanley head is a neat pyramid, the neck small and heavy but strong, and a good shape. Ball bearings are employed, and they are bolted to hollow steel forks. A rather short slot is made in the cranks, which are fixed. Only forty-six spokes are put to a 52in. They screw direct into a gun-metal hub. The rubbers, ⅛in. and ¼in., are securely wired into the U rims. A pliable spring works in a sort of slot formed by a projection from the backbone. The latter follows the wheel very closely, and presents an elegant outline, but it brings the wheels into very close proximity, an undesirable result. The trailer runs on

cones, and is nearly always 17in. in diameter; step, leg-guard, and the usual etceteras are fitted. A 52in. weighs 37lb. to 40lb. They are well known as sterling good roadsters. Price, 52in., £14 16s.

37. *The Timberlake Ordinary Roadster.*—This is of stouter build than the foregoing, and is slightly different in some details. Iron V rims are used, and forty-eight wire spokes to a 52in., direct action into gun-metal hubs, which have flat edges. They are keyed and "sweated" on a steel axle, the wearing parts of which are hardened. Roller bearings take the place of balls, and are bolted to the solid iron (Lowmoor) forks. The spring is unusually long, but any disadvantage that is incurred is compensated for by the easy and pliable support it affords to the suspension saddle; it slides freely on the steel tubular "bone." The step can be adjusted, and as it is of a fair size, it affords a good foothold in mounting. The cranks are fixed, and the Stanley head is made open, or closed if preferred. The handles are set slightly forwards, and in other points it agrees with its stable companion, being a thoroughly strong and trustworthy machine. Either a lever or the patent brake (Fig. 8) is fitted. It averages about 4lb. or 5lb. heavier than the other in weight. Price, 52in., from £13 11s.

38. *The Birmingham Imperial* (Brown and Ashton, Kensington Works, Kensington-street, Summer-lane, and 30, York-street, Birmingham).—There is evidently some great attraction about the name Imperial, as the market is flooded with various machines bearing that title, the last that has come to light being the one under notice. It is a pity makers do not exert themselves to find some *original* cognomen for their productions. *This* Imperial has eighty lock-nutted spokes, U steel rims, iron hubs, of 6¼in. in width, detachable cranks, rubber pedals, pyramid Stanley head, short handle bar 18in. by 5½in. above tyre, front lever brake. The front wheel bearings bolted to solid forks, the back wheel have the ordinary adjustment. The spring works on two small rollers, which run on a plate screwed to the hollow steel bone; it gives freely to the weight and is firm in action. The machine is neat, strong, and very light, a 50in. being only 37lb. Price, 50in., £12 10s.

39. *The Hollow Fork Empire* (Howard and Co., Ivy-lane, Newgate-street, London, E.C.)—That portion of its frame whence this machine borrows its title is made of a very strong steel tube well rounded at the edges; the shoulders are spread out, and have a fine broad arch, which imparts great additional strength. They taper as they fall to the bearings, to which they are bolted by a knuckle joint. The bearings of the driving wheel are Bown's noted balls, but it is the trailer that offers the chief difference. It consists of what is called a "quadruple cone." The steel axle pin has one fixed double cone. The other is loose, that is to

say it has a hole, which permits it to slide on the pin for the purposes of adjustment, but prevents it from turning round. The hubs are of gun-metal and considerably recessed, to allow the caps or cases to run well in. These are really the duplicate portion of the cones on which they take their bearing. They have a milled edge to facilitate screwing them home into the hub with which they revolve, in order to place another check on that ever penetrating compound—dust. The case is recessed, and thin washers fit in; outside this again comes the nuts which "lock" the adjustment made by the case. Then comes the fork end, and the outer lock nuts. In order to allow room to tighten up, a space is left for that purpose. All wearing parts are hardened and capitally fitted, and great care and attention have been taken in perfecting the bearing; it is steady, strong, lasting, free running, and about as dust proof as can be made. The driving wheel has sixty fine spokes, direct action into gun metal hubs, which are full 6in. in width; they (the spokes) are screwed ¾in. into the hubs, and have ¼in. of a "clearing hole" at either end, the lower being to allow for tightening the spokes; the upper is to give the necessary "play" to prevent it snapping off. Crescent steel rims are employed, and the red rubbers are cemented in; they are of the ordinary size, ⅝in. and ¾in. The back wheel is generally 16in. in height, and has twenty spokes. A shackle spring bolted to the neck in front is used. Detachable cranks are also added, and the Stanley head has the handles carried slightly in front by a gun-metal journal, and average 20in. in length. The centres are both "males," and 3½in. long, while the top saddle is kept well down. A front lever brake is used, and a suspension screw is completes the whole, which will be found an excellent machine in every way. A 52in. weighs 38lb. to 41lb. Price, 50in., £16.

40. *The Empire*, No. 1.—This machine has a Ball-Stanley head, solid forks bolted to the roller bearings, with brass lubricators, fixed cranks, and ordinary pedals. The spokes are stouter, less in number (50), and there is no "play" left where they screw direct into iron hubs. A hinge clip tail spring works on the tubular steel backbone; the rear wheel is 16in. in diameter, has eighteen spokes and adjustable cone bearings; a front lever brake is fitted. It forms a strong roadster of good quality. A 52in. weighs about 43lb. Price, 52in., £12 10s.

41. *The Empire No.* 2.—Being built for those patrons of the firm whose pockets are shallow, not much is expected. An iron backbone, forty lock-nutted spokes, iron hubs, Ball-Stanley head, cone bearings to both wheels, slot springs, lever cranks, rubber pedals, iron V rims, no brake, but the usual etceteras. A 50in. weighed 45½lb. Price, from £9 10s. to £10.

42. *The Boys' Empire.*—For the use of sons, nephews, and younger brothers of riders. Price, from 30in. to 40in., £7.

43. *The Amateur* (Evans and Dodd, 36, Steelhouse-lane, Birmingham).—The most striking peculiarity in this machine is the new head, which is an improved Stanley. One of the chief objections against that most popular form of steering gear is that the constant and great strain on the centres loosens and injures them by the play of the backbone. In order to obviate this there is a division or projection in the centre of the slot, cut in the head, and therefore the centres are made in two divisions, and in place of being made with cones are larger than usual, with flat ends both top and bottom. A small steel pin passes right through from the bottom upwards, being held by a small nut at the top, which draws up the centres should they require to be tightened. This is a capital arrangement, as no accident could happen from the centres getting loose, and it makes the whole machine steadier and firmer, while the appearance is not affected. Hollow forks are now used entirely; they are bolted to Bown's ball bearings. A very wide and neat hub is employed; it is 6½in. in width, and some fifty-six to sixty direct action spokes radiate from them to the light U steel rims, into which are cemented the red rubber tyres, generally ⅜in. and ½in. in size. The handles are carried slightly in front, and are only 16in. long by 5½in. high. They screw in at either side. A change has been made in the spring, which works by means of a shackle at the top end on the neck, whence it takes a sudden downward curve, thereby bringing the seat nearer the backbone, but at the same time the elasticity is additionally preserved by the tail clip. Dust-proof cones generally form the bearing for the hind wheel. Rattrap pedals are fitted to the fixed tempered steel cranks. The "tread" is about 17in.—rather wide for modern tastes. The whole machine is very neat in appearance and extremely light, only 35lb. for a 55in. Price, 52in., £11.

44. *The Exact.*—Intended as a stable companion to the above, but at a lower rate; it has very good ball bearings to the driving wheel, a groove is cut in the axle, and a corresponding one in the case, which is adjusted by a hinge at one side and a screw bolt at the other, not placed opposite, but in a slanting direction. Between the grooves are nine balls; they run very easily indeed, as the grooves are partly coned. It has solid iron front fork, Stanley head, and fixed handle bar, to which the front lever brake is attached. Only about forty lock-nutted spokes are put to a 50in., iron hubs, but crescent rims. The spring slides in a slot on the iron backbone, and is bolted to the neck as usual. Seventeen inches is the height of the rear wheel, dust proof cone bearings. A 50in. weighs 42½lb. A strong, plain machine, fit for ordinary work. Price, 50in., £7.

45. *The Captain* (A. D. Butler, St. James's-street, Wolverhampton).—Considerable improvement has been made, both in appearance and construction, since last season. Large handsome gun metal hubs, which measure 6½in. in width, and are 4½in. in depth. Threescore spokes, of light steel wire, are screwed from the U steel rims. A novelty is added in the shape of the spring, which, sliding on a clip, is brought close to the steel tubular backbone, and then curled up suddenly behind to afford a purchase to the saddle. Large "dumb-bells" are employed for bearings. They are only four in number, and measure ⅛in. in thickness or depth. They run very easily, and are bolted to the hollow steel forks. A "ball" pattern Stanley head is used, and the handles are brought next the rider. An extra small wheel, only 16in., forms the "trailer;" it runs on adjustable cones. A front wheel lever brake, suspension saddle, &c., complete a nice-looking, very fair and low-priced machine.

46. *The Lieutenant or Sub-Captain.*—In main lines like the foregoing, but not so well finished. It has solid forks, Stanley head, iron backbone, direct or lock-nutted spokes, roller bearings, and no special features. It is considerably less in price than the former.

47. *The Club* (Coventry Machinists Company, 28, 29, and 30, Holborn, London, W.C.)—The spring which marred the first days of the "Club," has been cut down until it has entirely disappeared, and it has been made neater than we thought possible; indeed, there is but little difference observable at the first glance from the ordinary spring of every-day use; but when once in the pigskin a material difference is felt—that miserable jar and vibration from the backbone are in a great measure absent, and the rider feels "suspended." These desirable ends are gained by making the spring in two parts; the joint which joins them being of rubber. This is arranged by the backbone being strengthened by a piece of metal affixed to it, on which the tail end or lower part of the spring is firmly bolted, leather washers intervening to assist in checking vibration. This portion of the spring is only about 6in. to 7in. long, and it partly laps over the end of the upper portion; a handsome plate (with name of machine and makers) assists in covering the junction; under this there is a strong bit of rubber, in length equal to the breadth of the spring; this has two holes bored through lengthwise, which carry the pins supporting each part of the spring; they thus do not touch each other, and all the weight at the back rests on this block. A somewhat similar plan is carried out in front, where a support curls upward and backward from the joint where the solid portion of the neck enters the backbone; it also supports a rubber buffer; a shackle is bolted to the same part of the bone, and joins the front of the spring by the bolt, which passes through the buffer and prevents too much

"play;" by this means the whole weight of the rider rests on "suspended" rubber, and with the suspension saddle we need hardly say riding is a genuine pleasure. The saddle is attached by a neat arrangement formed by a sliding wedge and side screw, and the framework of the saddle is grooved to fit the spring, so that there is no fear of slipping. Among its new leading attractions is the Universal joint, which has been successfully adopted to counteract the cross strain and looking action that roller bearings are subject to when turning corners or forcing the machine up hill, a process which not only wears them, but makes it much harder work to the rider. This end is gained by making the outer case of the bearings with a half rounded surface; over this fits a second ring or case, grooved to fit the back of the outer case. The combination forms a ball and socket joint; a small projection from the outer passes into a hole in the inner case, to prevent it turning round, but allows considerable side play when on the machine, though its action is almost imperceptible, and adds considerably to the free and regular running of the machine. As to the bearings themselves, they are rollers, beautifully made and fitted, and by the action of the Universal joint they are always parallel with the axle. Furthermore, not only the bearings but all working parts of this machine are hardened in a manner that is second to none in the trade—some American process, we believe; but, whatever it is, the working surface of the metal, rollers, cases, centres, pins, &c., is the hardest we have ever tested, and seems impervious to wear. The Stanley head is straight, and has milled rings, of no use except to relieve the appearance. The internal arrangements are much as usual, only all parts are double extra hard and fit most accurately; the centres are at top female and lower male cone, but a neat dust guard, which covers the entire aperture, makes the head much neater, and at the same time keeps out the grit, which is most destructive to the centres, and it also keeps the lubricant from running down the forks. A novel form of brake is attached; it is a direct action piston, a steel rod, having for its termination a roller; it is held in position by a guard, which acts as the fulcrum. The upper part of the rod is flattened, and is acted on by a small projection jutting out from the centre of the handle bar. On turning the handle bar the latter pushes out the lever, and the roller is brought to bear on the rubber with a firm and easily regulated pressure. Should a fixed handle be preferred, it can be almost instantly made so by pressing in a small bolt, which makes the brake non-acting. When not in use it is held off the tyre by means of a spring. The steering rod itself is generally 20¾in. long by 5¾in. high. Oval backbones have risen into considerable popularity of late, and the Club is noted for this speciality. It is of greater diameter (or depth) than

the round, and less in thickness — *i.e.*, sideways — but is round where it joins the neck, also for some distance before it reaches the small wheel; the back forks are solid. So far as it seems possible, both grit and dust are excluded from the back wheel bearings by an apparently intricate but actually simple arrangement of steep cups and washers. In the first place, the actual bearing itself is a long cone, with considerable bearing surface, adjustable, as usual. The hub is recessed to the depth of 1in.; the cones are placed right inside the hub, and over each a thick felt washer; then a lock nut, which fills up the space, and over all a cap, which screws over a projection and into the hub. The centre portion of the pin carries enough oil for a tour. Hollow felloes are also a feature of the Club. They are formed from steel tubes rolled when at a high temperature into a hollow or double section of the rim; this not only saves in weight, but adds immensely to the strength. The spokes are of steel wire, with larger heads, and are shrunk on the steel spindle; about sixty spokes are used. The cranks are fluted on the inner side, which renders them both strong and light. The pedals are a mild rat-trap, the bars being roughed in place of a saw edge, and are anti-slipping. This machine has made its mark in the foremost rank of thoroughly genuine, reliable, high-class, roadsters. A 55in. weighs 46lb. Price, 55in. or 56in., £18.

48. *The Bedford* (G. Wooton, Gwyn-street, Bedford). — These machines do not possess any striking features, and are chiefly made for the local market. The best quality have crescent steel rims, fifty-six direct steel wire spokes to a 56in. machine, screwed into rather small gun-metal hubs, which are deeply recessed. For roadsters, ⅞in. and ¾in. tyres are employed. Unless a back brake is used, the handles are fixed; if made to turn, they have adjusting collars to prevent side shake. Flat slotted fixed cranks, Æolus bearings, steel backbone, extra long cone bearings to rear wheel, and a spring with hinged clip working on the steel backbone, complete the chief points. A 50in. weighs 44lb., and is a strong reliable machine.

49. *The Bedford Racer.* — The same, only without brake; lighter throughout, ball bearings to both wheels, ⅞in. and ¾in. rubber; sixty spokes, &c. A 50in. weighs 35lb.

50. *The No. 2 Bedford.*—Strong open head for steering, second quality rubber, steel backbone, plain clip spring, some forty lock-nutted spokes to a 50in.; cone bearings rear and adjustable rollers to the front wheel, solid forks, no brake, rubber pedals, and other general features. A 50in. weighs 46lb.

51. *The Otto Bicycle Company* (4, Newgate-street, E.C.).—A glance at Fig. 9 shows the design of this machine to be very singular, the wheels

being side by side without any back or front support, the whole framework being balanced between them, the rod coming down the centre and projecting, being to prevent tipping over backwards. Taking the framework first, the centre rod or main support to keep the wheels apart is a steel tube, 1¼in. in diameter by 24in. long, and placed 5¼in. behind and below the centre of the wheels; the ends just escape the large driving hubs; midway the "tail" is joined to it; this consists of a steel taper backbone gracefully curved backwards and downwards, having at its extremity a small roller in order to prevent back somersaults should the rider lean too far back; the tail is also of great assistance in other

FIG. 9. THE OTTO BICYCLE.

ways. In mounting, when seated in the saddle, the machine tilts backwards, and the guard rests on the ground, so that the cyclist can "fix" himself or herself (it being quite adapted to the fair sex), before the start, by putting the feet through the stirrups on the pedals, &c. Then, by pressing down with the uppermost pedal (should neither be in position they can be spun round so as to obtain the best position of the feet for the downstroke by slackening the cords as hereafter described), and, leaning gently forwards, the tail is raised and the rider starts off. In the street, descending or going up a steep hill, stopping for any cause suddenly, &c., by simply leaning back, the balance is, so to speak, lost and thrown rearward, which brings the guard to the ground, and,

combined with the brake, makes a dead halt at once, without fear of being pitched out forwards. The hollow crossbar also supports the seat. This is a marvel of comfort; it consists of a thin steel plate hollowed out, and covered by a soft and handsome cushion, shaped so as to yield to the motion of legs and allow full play to the limbs. It rests on what may be described as a couple of "turnover" springs, steadied by two rods in front, but resting on coil springs. The main springs are held by lock nuts on two bars, tapped for the screw. The ends of the springs are horizontal, and have three or four holes, which admits of its being moved in a forward or backward direction about three inches, so that the same machine can be readily adjusted to persons of almost any height, as the seat can also be raised or lowered to the extent of some 5in. Even the "cant" of the saddle can be changed and the front may be made high, in relation to the general level of the seat. The driving power is communicated by two endless cords, made from the finest Italian hemp, and tested up to a breaking strain of two tons (4480lb.). They are covered entirely by a coating of indiarubber, in order to keep it dry, otherwise the rope would be affected by any changes of the temperature. They are ¼in. thick, and pass round two deeply grooved wheels, the upper of which form the inner hubs of the driving wheels. They are 12in. in diameter, the groove being ¼in. in depth, and coned between a U and V shape, so that the cord obtains a full grip. The inner spokes screw direct into the outer side of the large hubs, and being thus considerably shortened, they make the wheel firmer and more rigid. The lower "drums" or wheels are only 9½in. in diameter. It is in the framework which joins the pedals to the machine and the accompanying parts that the beauty and originality of design are chiefly manifest. The pedals are attached to a cranked steel axle, hexagon in shape, and bent so that the treadles have a 5½in. throw, and are 9½in. apart from centre to centre. Over each pedal there is fixed a leather strap guard to prevent the feet slipping off, and to keep them in position. These straps do not hold the feet as might be expected, but naturally release them by the very action of falling forwards, so that the rider only comes down on his feet. The axle is from end to end 27in. long, having (as already described) the smaller wheels at the ends. The main connection is two rods on each side. The outer ones (i.e., next the wheels) are the chief support. The lower end is left free, and works through a slot attached to the collar, which goes round the axle and contains the bearings; these are of a peculiar pattern, and may be described as double parallel with variations. Coil springs are wound round the larger rods, top and bottom; the lower being much stronger, it forces the treadle downwards, thus keeping the cords always in tension.

When in action the cords are drawn still tighter, and the pedals and axle are entirely supported by them, the rods acting more as guides; the slides through which they pass are made rather oval at each side, so that the rods cannot jam, as would be the case were they cut true, owing to the angle of the rods varying according to position. The smaller rods are for the brakes, steering and slackening either or both cords, the operation of guiding being performed on quite different principles from those carried out in other machines. The handles answer a variety of ends, and the brake may be applied single, double, or treble power—first, in ordinary cases, by a quarter turn of the handles, the brake, which consists of a large wooden tooth or clip, attached to a bracket sliding on the larger bar, fits the groove of the hub on each side, and so stops its revolving. When not in action a couple of small coil springs keep it off the hub. The first turn of the handle shortens these springs and forces up the tooth into the groove, and checks either or both wheels as may be wished. In turning, say, to the left, this is done, and the handle additionally pushed forwards; this puts on the brake harder, and also pulls up the small rod, drawing with it the left lower axle wheel; this slackens the left cord, so that the wheel stands still while the right runs round it. By this means a very sudden turn can be taken, and a square corner negotiated with ease, as no sweeping curve is required. By pressing out both handles all strain is taken off the cords, and the pedals can be turned without affecting the progressive action. The actual brakes are small levers under the handles, by which extra force is exerted. These are also valuable to pull against when ascending steep hills, or any time extra leverage is required. "Back pedalling" can be resorted to as in the ordinary two-wheeler, and should a hill be too great to be conquered in one effort, the rider can lean back and take a rest before proceeding with his task. Plain bearings are used for the large wheels, and the "Otto" ditto for the axle. The wheels have crescent steel rims, ¼in. rubbers, and direct spokes, screwing into iron hubs on the outer side. These are recessed, so that the nut which holds the wheels on their axle does not protrude in the ugly manner common to many tricycles. Should the cords require adjustment, not because they stretch, but on account of any special road, it being advisable to have them tighter in a hilly country than is necessary on the flat, all that is required is to slacken the lock nuts on the shorter bars, which, being provided with a right and left screw, can be turned, and the distance between the grooved wheels increased accordingly. As to learning to ride, cyclists are as much at sea as outsiders, and when on for the first time there seems a strong inclination to pitch forward on applying pressure to the treadles, but this is overcome with practice,

and riders discover that they have a "joint" in their bodies capable of bending to the action of the vehicle; after this passes away the motion is delightful, there being an entire absence of the back wheel vibration, while it is very hard to upset sideways, and the rider can readily jump out forwards should a dismount be compulsory. The machine, with 54in. wheels, the general size, weighs about 70lb. Price, £21.

53. *The Lion No.* 1 (Lion Bicycle Company, Leicester-street, Coventry).—This machine has large gun metal hubs, is 6½in. broad, while the flanges are 4½in. deep. They are screwed, and otherwise secured on to the steel axle, which is grooved to afford a channel for the ten hardened steel balls, which form the bearings; each ball, which is ¾ of an inch in diameter, is kept apart by a light perforated collar, and held in a case, with side adjustment, joined to the hollow forks by a hinge joint. About seventy-two direct action spokes are used, V steel rims, red rubber tyres, ¾in. and ⅞in. in size. The handles are of ebony or horn, and the bar, which is of medium length, is placed slightly before the Stanley head. Brake power is applied by a front wheel lever spoon. The spring is rather long but elastic, having a shackle at the lower end, where it is joined to the tubular steel backbone. The "trailer" has some twenty spokes, cone bearings, &c. All the usual accessories are added. The price runs from £15 for a 50in., to £17 for a 60in. The weight we cannot give, as we could only inspect a machine in parts.

53. *The Lion No.* 2.—Main details like the No. 1, but with solid forks and lower spring, and the price only £1 less than the above.

54. *The Lion No.* 3.—This also has the double ball bearings, the case for which is, however, welded on to the solid forks; Stanley head; handles in front, bar 20in. long by 6in. high; lever brake, arched spring, as in No. 1, with shackle joint; gun-metal hubs; fifty to sixty spokes, leg guard, fixed cranks, &c.; cones to rear wheel. A 54in. scales 47lb. Price, £11 5s.

55. *The Lion No.* 4.—Altogether lower in price, iron supplanting steel to a great extent, in backbone, hubs, &c.; roller bearings, low spring, V rims, a less number of spokes. Weight heavier than No. 3. Price, £8.

56. *The Special Ten Guinea* (William Grainger, 38, Vyse-street, Birmingham).—Some considerable improvements have been made since last year. In place of lock nuts only very small nipples secure the spokes —three-score in number—to the gun metal hubs, which are "canted" slightly inwards. The effect is that the spokes run straight into them in an unbroken line in place of where a straight hub is used, being at a different angle; light U steel rims hold the tyres. A boss on the hub and head of the crank is so grooved that dust is inclined to fall over

rather than penetrate into the bearings; these are either very large rollers —eight only being used—or balls. The spring is fitted with a shackle which works on the steel "bone." A front brake is fitted before the Stanley head. Wilde's patent lock nuts are adjusted to the pedals, which run on cones, as does the rear wheel. Taken all in all, it is a good strong serviceable machine.

57. *The Special Advance* (James Beach, Gladstone Works, Stafford-street, Wolverhampton).—Roller bearings are used, but they are kept apart by means of a guide, somewhat after the cycle principle. The outer case is of gun-metal, and screwed on to the solid forks. Spoke per inch is the rule followed, and lock nuts generally employed; but should the order specially denote that direct action is preferred, that plan is followed. V rims and inch rubbers to the driver, with ⅞in. the back wheel. A ball Stanley head, horn handles, steel backbone, saw step, clip spring, &c., complete the machine, which has a double lever brake, worked by both hands. The weight is 44lb. for a 52in. Price, £13.

58. *The Advance No.* 2.—By using white horn handles it has the appearance of ivory at a tithe of cost; the handle bar screws into each side of the ball on the top of the Stanley head. The neck is extremely short, the end of the backbone being brought close up to the head; the spring is arched considerably behind and slides on the tubular backbone. The hub is extra wide, 6⅝in., and of gun metal; fifty spokes are usually put in, which are locknutted as in No. 1. A single row of balls forms the front and cones the back bearing; lubricators are put on all parts that require oiling; 17in. is the average size of the smaller wheel. Other details the same, except weight, which goes up, a 50in. scaling 48lb. Price, £7 10s.; alarum gratis.

59. *The Advance No.* 3.—Constructed for those whose financial resources are limited. It has iron hubs, lock-nutted iron wire spokes, about forty in number, iron V rims, grey tyres of a commoner quality, cone bearings throughout, and pedals, while the almost forgotten and ancient socket supplants the Stanley head; iron backbone, ordinary roller spring. A strong rough machine. A 50in. weighs 52lb. Price, £6 2s. 6d.

60. *The Meteor* (Starley and Sutton, Meteor Works, West Orchard, Coventry).—This machine has more than one feature to commend it to public approval, chief amongst which may be mentioned the roller-ball bearings, which are different from any others we have examined, being a combination of both principles. A large steel collar is slipped over the axle, in the centre of which a parallel groove is cut, into which seven small but thick (⅛in. by ⅜in.) ball-rollers fit; between these the actual rollers are placed. They are also seven in number, and are in the form

of dumb bells, having the centre portion partly cut away, so that the balls fit in, just sufficient room being allowed to keep them apart. This forms a remarkably steady, firm, and free-running bearing when in action. The "balls" turn in a contrary direction to the rollers. All parts are hardened, and the case is made dust-proof. The wheels, which are of novel design, have about a spoke to the inch. These are on the direct action principle, but, in place of screwing into the gun-metal, a number of steel studs are driven through the hub, being flush with it on both sides; each of these is drilled through and tapped to receive the end of the spoke, which is screwed into it; the hole in the hub through which it passes is ¼in. deep, is merely drilled, and affords ample "play." A small portion below the stud is also left to allow room for tightening. The object is that, should the spokes snap off short, the stud can be

FIG. 10. THE SAFETY METEOR HEAD.

driven through the hub, carrying away with it the stump of the spoke; the remaining portion is removed easily when it is replaced ready for a new spoke, without the troublesome process of re-boring the hub. Crescent steel felloes and ⅞in. rubber tyres are employed. Solid forks are still used, and an open head (Fig. 10). The centres are very long, the lower working in a steel cup in the "bridge," the upper being held by a screw, which passes through the centre of the handle bar; the latter is on the short side, 19in. and rather high, 6¼in. above the rubber. A boss or support is made on the neck or end of the steel backbone, to give increased solidity to the junction of the spring, which works on a shackle at the tail end. The back wheel runs on cones. A front wheel brake and detachable cranks are fitted to all machines, and a 50in., when com-

plete for the road, weighs 41¼lb. They are fine strong roadsters, well made, and of good material. Price, 50in., £16.

61. *The Safety Meteor.*—Many have aimed at the great desideratum of riders' "safety," and most in different directions; among the means employed must be numbered the "adjustable rake," which is here and in other cases followed. In this case an ingenious plan is resorted to, called

FIG. 11. THE METEOR BICYCLE.

a "reciprocating head." By moving the small handle shown at Fig. 10 the rake is altered to about 6in. by throwing back the top centre, thus making it very safe in descending hills, and almost excluding "croppers;" but it has its disadvantages also, as it puts the seat farther back from the pedals, which are therefore difficult to reach. The change is made from the saddle without dismounting. In other respects it is the same as the foregoing; both have leg guards, bone handles, &c., while £1 extra is charged for the Safety.

62. *The Racing Meteor.*—Lighter all over, Stanley head, hollow forks,

the patent bearings and other special details, but it generally depends on the special orders received, therefore the weight, style, and price vary. The last-named on the average corresponds with the Safety.

63. *The Special Perfection* (C. Gorton, Talbot Bicycle Works, Stewart-street, Wolverhampton).—A great improvement has been made in the whole construction of these machines. To the pyramid-shaped Stanley head are attached handles, carried in front. The front wheel lever brake and trouser guard are in gun-metal, though iron is substituted if desired. The steering rod is some 20in. to 21in. long and 5in. high—the "nobs" being of white bone or wood. Hollow forks are used. They are secured by two bolts to the case of Bown's noted ball bearings. Round detachable cranks with the usual adjustable slot find favour. About eighty strong spokes, of Birmingham wire, No. 11 gauge, coated with an anti-rust composition, screw direct from the crescent rims into extra large and handsome gun metal deeply recessed hubs. These are 5¼in. deep by 6in. broad, and of a dark copper hue. The "tread," *i.e.*, from centre to centre of pedals, is 15in. Large red rubber tyres, full inch to the front and ⅞in. to the small wheel, are employed. The spring works on what is known as a "sliding slot," and gives easily to the varying pressure of the rider's weight. The general size of small wheel, which runs on ball bearings, is 16in. or 17in. All machines over 50in. are provided with two steps, the upper of which is adjustable to any height. A 54in. weighs 48lb. Price, any size, £10.

64. *The Ordinary Special Perfection.*—In this the spokes, fourscore in number, are lock-nutted into gun metal hubs, which are a size smaller and not so much recessed. The hollow forks are made of thin steel rolled into shape, and brazed instead of being drawn from the tube. The U rims are kept up, and cycle replace Bown's bearings, while the trailing wheel runs on cones, and the cranks are fixed; other details similar, except the weight, which is very slightly increased. Price, any size, £8.

65. *The No. 1 Perfection.*—Ordinary rollers in front and cones behind, solid forks, much smaller gun metal hubs, spokes reduced twenty-five per cent. in number, and all lock nutted; a Stanley head of neat pattern, grey rubbers, 16in. tread, hubs being fully 6in. The wheels have either U or V rims. It is a low-priced machine, intended for either beginners or those whose purses are not deep. Price, any size, £6 10s.

66. *The Star* (J. Parr, Works: 58, Navigation-street, Leicester.)—The maker's original speciality of skeleton hubs is still retained. These are of iron, and a portion of the metal is cut away, mainly for lightness and appearance. They are 5¼in. broad, and the spokes, varying in number from fifty-six to eighty, are lock nutted into them; ⅛in. and ¼in. is the size of the rubbers, which are cemented into the crescent steel felloes.

The forks are hollow steel tubes bolted to Bown's bearings, or, if double balls are preferred, those like Humbers are substituted. Fixed cranks are fitted, the adjustable slots of which are rather short, An extra low Stanley head is used, the handles only 4¼in. above the tyre, and the ordinary lever brake worked from the handles, but the spoon is better shaped than many, as it fits the rubber smoothly. For the termination of the spring a clip is employed, it slides on a leather washer, and forms an easy and comfortable support to the saddle, which is either a suspension, or made with two hollows to make a comfortable seat. One of the most striking features in the shape is the sweep of the backbone which follows the curve of the front wheel lower down than any other, and then bends suddenly into the small wheel. It gives a very graceful appearance to the machine. Ball bearings are fitted to the trailing wheel, generally 18in. high. The machines are carefully built under the direct superintendence of the maker, who is well-known as a successful racer. The Star will be found a reliable mount and good roadster. A 54in. weighs 40lb. only for a roadster. Price £16 5s.

67. *The Star No.* 2.—The chief difference is solid forks, plain front, and cone back bearings. The same good material and details are kept up. A 54in. weighs about 4lb. heavier. Price £14.

68. *The Star No.* 3.—These and all varieties have Stanley heads, but the No. 3 is painted instead of polished, with iron backbone, forks, V rims, only forty to fifty spokes, &c. Bearings as in No. 2; a front brake is added. A 54in. weighs 46lb. Price £12 10s.

69. *The Star Racer.*—A really light easy-going machine; eighty light steel nipple spokes, ball bearings both wheels. A 54in. only scales 32lb. Price £15 15s.

70. *The Whitmore Improved Safety, or Bi-tricycle* (Lloyd and Company, Great Hampton Bicycle Works, Church-lane, Wolverhampton).—This machine (Fig. 12) is best described—if we may be allowed to use an Irishism—as a "three-wheeled bicycle." The two rear wheels are 16in. in diameter, and are placed (from centre to centre) 20in. apart, and run on a bar, attached to which is a raised frame. On this the end of the tubular steel backbone works in a sort of universal joint or hinge, which allows it considerable side play. To counteract this "wobbling," two strong springs are fixed to the upper frame, which press against the tail of the backbone either side, and so keep it upright. The object of this arrangement is that, when passing over uneven or rough ground, one wheel may be raised higher than the other without disturbing the equilibrium of the saddle, as the backbone always remains perpendicular, and so, where the first pattern would have caused an almost unavoidable fall, this improved description may be ridden with safety. In turning

corners the backbone and front wheel are inclined inwards, while the rear wheels remain level. For learners it is claimed to be of great assistance, as it can be mounted when at a standstill, and the rider can sit comfortably on it without having to exercise acrobatic balancing feats. Again, a still stronger point in its favour is that it is capable of ready conversion into a bicycle *par et simple*, by merely unscrewing a safely set screw and bolt, which pass through the backbone, and substituting a single small wheel. To accomplish this the backbone is made in two pieces, the junction being at a point some 6in. above the step. Both

FIG. 13. THE WHITMORE IMPROVED SAFETY, OR BI-TRICYCLE.

portions of the "spine" are lined for some inches to give additional strength, the inner tube or "lining" of one projecting so as to fit into the other. Through this treble thickness the bolt passes; the join is neatly made and not readily noticed. The objections are difficulty of mounting, at first only, as when the foot is on the step the backbone sways about uncomfortably, but this is mastered in time. Weight behind is another drawback, but it must be remembered that it is really a tricycle, and, as such, extraordinarily light, the whole machine being a little under "pounds for inches," *i.e.*, a 52in. is about 50lb. or 51lb. With regard to detail of construction the wheels have about sixty direct

action steel spokes, screwing into large gun-metal hubs (6in. wide), which are collared on a steel axle. Roller bearings are fitted to all; they are adjustable and bolted to solid forks; crescent rims carry the rubbers, generally ¾in. and ⅝in. respectively. The makers have lately introduced a new saddle block, or rather spring, which supports the pigskin and adds to the comfort, making the actual spring feel much more pliable. It is, as shown at Fig. 12, either fixed at rear to the backbone, and supported by a rubber buffer in front, or it is bolted to the neck just behind the Stanley head, and terminates with a clip. A front wheel brake is fitted to all; the supports are clasped round the steering bar, and the spoon is bent to the shape of the rubber. For those who wish to use a tricycle, and at the same time not only get over the ground quickly but retain the appearance of a bicycle, and be able at any moment—for instance, in a crowded street—to "rest on their oars," or rather pedals, without advancing, and, when in a more venturesome mood, to discard the three and ride on two wheels, the machine is eminently suited. Price, £10 to £10 10s.

71. *The Special Swan* (R. Mothersill, 97, Cheapside, London, E.C.)—From the extraordinary appearance of the machine portrayed in the cut (Fig. 13) it will be seen at once that there must be some novel feature in its construction. This consists in the swivelling handle bar, which is made to "swivel" or turn round parallel with the wheel, with a view to economise space when the machine is stowed away. The pedals are also of a peculiar design, and are readily removed, with the same object in view, so that in place of requiring a width of 22in. or 23in. for the rudder and nearly as much for the pedals, the length of the axle (11in.) is all the room it occupies. To those who have only a narrow passage in which to stow away their machines this is an important object. To accomplish these ends peculiar means are resorted to. The steering rod is held by brass journals, which bring it nearer the rider. These are joined by double semicircular pieces of steel, which act as a guide to the right-hand pin. The latter passes through both a projection on the bar and the journal, holding them together. In place of screwing in, the bolt is provided with a spring, so that it cannot fall out, but it is removed by a gentle pressure, and the right handle is turned round over the saddle. The pin is then replaced in the projection on the rod, and keeps it in position by passing between the guards. The pedals, by quite a new arrangement, are made to conform to the same rule, but they are entirely taken off in as short a time as it takes to loosen other varieties. It will be seen from the illustration that they have the end of the slot cut right away and the space left open; two deep conical grooves are cut in the face of the crank parallel with the slot. On

the end of the pedal face there is a boss, or projection, with two raised cones, which, when the pedal is placed in position fit into the before-mentioned grooves, so that if the nut is screwed up tight it has the effect of drawing the sides together and keeping the pedal from slipping. By slightly loosening the nut the treadle is removed and put out of the way. Both can be replaced in a couple of minutes. The adjustable crank is attached in a rather novel manner; the head is con-

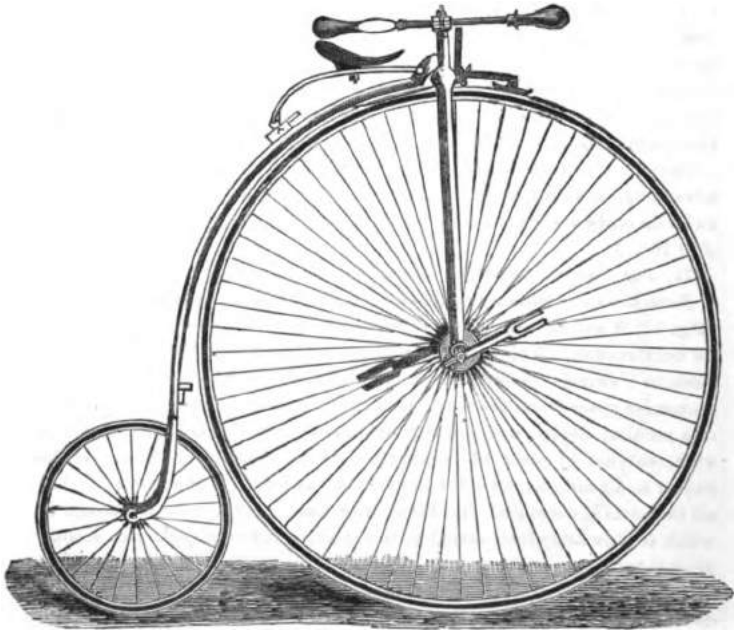

FIG. 13. THE SPECIAL SWAN.

tinued beyond the axle, the ends being held together by a bolt and nut. The portion lapping round the spindle has a flat side, which prevents it from turning round. In other respects the machine has not many specialities. The wheels have crescent steel rims and about seventy rather fine spokes, which are lock-nutted into phosphor bronze hubs. The nipples stick a long way out, and spoil the appearance. Hollow forks are used in this variety only; the head is the well-known Stanley, and the front brake (lever) has a self-adjusting spoon, which exerts an even pressure on the rubber and does not dig into one place. Plain steel parallel bearings only

are used. They are very broad, and consequently make a wide tread. The spring is bolted to the neck and hinged to a coned bar, which slides in a metal case at its tail end. The action is easy and comfortable. A short saw step is placed on the point where the hollow steel backbone joins the solid portion above the back forks. The small wheel is generally 17in., runs on cone bearings, and has twenty-two or twenty-four spokes. The various improvements show the inventor to be a man of great ingenuity. A 54in. weighs 45lb. to 47lb. Price, 54in., £18.

72. *The Swan No.* 1.—Most of the special features are retained; the handles are slightly different, the Stanley head having a sort of ball top. The steering rod swings round as in the Special Swan, but is sometimes placed in front of the head. Sixty-eight spokes are lock-nutted into small solid iron hubs, which are extra wide—slightly over 6in. Very small narrow plain bearings, with large brass lubricators, are fitted to the driving wheel; the top of the bearings being forged to the end of the solid forks. A higher arch is given to the spring, which is bolted to the neck, and terminates with a clip tail sliding on the tubular backbone. Either red or grey rubbers are cemented into V iron rims. Other particulars same as already described, with the exception of weight, which is slightly in excess. Price, 50in., £15.

73. *The Swan No* 2.—In place of a horizontal action the handle bar swivels perpendicularly. The front brake is made to partly detach, and the steering rod is held in front of the head by brass journals. The support on the left side unscrews, thereby allowing the right side to be depressed and the left raised straight up. The head is made open, something like the old Special Challenge. The centres are very long; the lower works in a hole in the bridge or bottom cross piece, and the upper is tightened by a pin with a female cone, which is held by lock nuts. Iron angular or V rims, with only forty-eight charcoal wire spokes (lock-nutted), and plain iron hubs, with rubber tyres of ⅛in. and ¼in. respectively, form the wheels. The inventor must be a firm believer in the old parallel bearings, for they are used in all three varieties, here very small, but they project into the hub, and close up to the crank head in order to make it more dust proof. The lower ends of the forks are hollow, to allow the top of the bearing to slip in, when it is additionally secured by bolts. The cranks are fixed, but have the patent slot and pedal. The spring is longer than No. 1, and works in a small brass guard, which is affixed to the iron backbone. Cone bearings, adjusted by a milled edge, are used for the rear wheel. There are no special features in the rest of the machine. Weight of a 54in. about 50lb. Price, any size, £12 10s.

74. *The D.H.F. Premier* (Hillman and Herbert, Premier Bicycle Works, Coventry).—In this machine (Fig. 14) the now celebrated double hollow

forks are just introduced. They consist of round tapered steel tubes—two on each side—the ends of which run into small cases, or "lugs," as they are technically termed. These are in turn knuckle jointed on to the bearings. They grow larger as they ascend, from ⅜in. to ½in., and, from touching each other, to ⅞in. apart, at a point just above the wheel, where they pass through the first bridge or support on which the lower centre

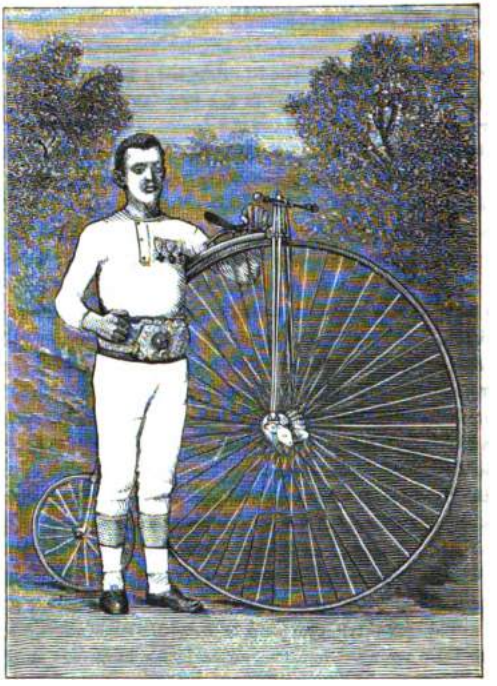

FIG. 14. THE D.H.F. PREMIER.

works (in a steel cup); the four tubes then draw nearer to each other, and finally run into the top plate, which also forms the handle bracket. The steering bar is placed in front, and is 21½in. long, by 5½in. above the rubber. The centres are extra long, fully 5in., this gives increased rigidity to the backbone and whole machine. A front lever spoon is fixed before the head (which is, of course, open), and is applied by drawing a small lever towards the handle by the fingers. The backbone is large and strong, being 1⅜in. in diameter where it joins the solid portion of the neck,

whence it gradually tapers as it sweeps round the front wheel to the back fork. The front portion of the spring is curled round a bolt which passes through the neck; by so doing the spring is kept close, while at the same time, a certain amount of play is gained. The tail end is bolted to a steel rod, which slides in a case affixed to the backbone. The driving wheel contains about sixty direct action spokes of fine steel wire, fixed to large gunmetal hubs which are six inches apart. For bearings on the front wheel a single row of balls employed, which are placed in a case with a deep groove, and touch each other, not being divided. If adjustment be required, it is made at the sides in what is known as the Sheffield style, the case being in two halves, held together by bolts and nuts. This makes a splendidly easy running bearing, as all bearings and other parts subject to friction are—actually, and not merely called so—*first hard*. The rear wheel runs on balls placed in a steel ring inside the hub, and the adjustment is made by a very simple method, almost identical with the ordinary cones. They add immensely to the freedom of propulsion, both for the road or path. The trailing wheel, which is generally 17in., has twenty-two or twenty-four spokes, and gun metal hubs. Detachable cranks are fitted to all machines, and nearly all have rat-trap pedals. The whole machine is made of the best material, by skilled workmen, and a large and valuable stock of special machinery, and it presents an elegant appearance, though whether the open head equals in beauty the Stanley steering gear must be left to individual tastes. Lightness and strength go hand in hand. A 54in. roadster weighs about 38lb. or 39lb. Price for 54in., £18 10s.

75. *The D.H.F. Racer.*—This differs but little from the roadster; a slight reduction of weight is made all round, smaller rubbers are employed, ½in. and ¼in., lighter steel felloes, ball bearings both wheels, springs placed very low, sixty to eighty finer spokes, direct action. A 51in. weighs about 33½lb. Price about £18. It was on one of these machines that G. Waller, of Newcastle-on-Tyne, won the Long Distance Championship of the World early last year at the Agricultural Hall, when he rode 1172 miles in the six days. We saw the machine after it had gone over 4000 miles, and, save the rubbers, it was very little the worse for its long journey, and looked fit for double the distance; he also used one in the last race, Sept. 1 to 6, when, at the same place, he covered 1404 miles—the total time allowed for riding being 108 hours. It has also carried other noted riders to success, and many fast times have been made on it.

76. *The Chelsea* (Beach and Co., 58, Gale-street, Chelsea, London, S.W.)—This machine is lower priced, has small roller bearings, the cases of which are bolted to the solid fork ends. The cranks are fixed, but

have brass lubricators. The same wheels as in the Special or Semi-Racer. The spring works through a small brass clip on the steel backbone, and is of a pliable nature. The Stanley head is similar to the others, and has a front lever spoon brake. Hubs of slightly smaller size, but wide—6¼in. This, and the fact that ordinary rubber pedals are used, make the tread wider than in the Racer, 16¼in. Seventeen inches is the height of the back wheel; it has cone bearings. A 50in. weighs 42½lb. Price, any size, £8.

77. *The Chelsea Semi-Racer.*—This machine has a straight Stanley head, with the handles carried in front; they are 20½in. long, 5½in. above the rubber, and have ebony "nobs." The lower arm of the front wheel brake projects out a greater distance than usual, and terminates with a small roller; sixty direct action spokes are put in nearly every sized wheel, and large gunmetal hubs, which measure 4½in. deep by 6in. broad, slightly recessed for the double ball bearings of the Humber type, which are employed. They are bolted on to the solid forks. Detachable fluted cranks, with the usual pedals, also form part of the machine. The spring, which has a roller at the tail end, and a steel band encircles the steel tubular backbone to keep it in position; in front it is bolted to the neck. Cone bearings are fitted to the rear wheel, which is generally 17in. in diameter; it, like the front, has V steel rims, and ⅝in. tyre to ½in. of its leading companion, and twenty spokes. Just above the back forks the backbone is made square at the point where it joins them. The saddle is attached by the usual bar, but in place of the clumsy thumb screws neat nuts are employed. The saddle itself is web seated. A 54in. roadster, all complete, with wrench, oilcan, and pouch, weighs just 45½lb. They are strong, reliable machines, fit for all-round work on any roads. Price, any size, £12 10s.

78. *The Chelsea Racer.*—A much lighter variety, and, though mainly intended for use on the path, is strong enough for service on the road where the surface is good and the rider not too heavy. It has the same number of spokes as its last-named stable companion, but lighter crescent steel rims and smaller tyres, the size of the latter being reduced to ⅝in. and ½in. The gun-metal hubs are recessed, and allow Bown's ball bearings to take up less room, thus bringing the feet closer together, the tread being 14½in. The cases of the bearings slip up into the hollow steel forks, to which they are bolted. The head is kept small and the handles low, only 3½in. high by 20½in. long. They are also in front, in order to carry out closeness of build. The spring has a hinge-clip tail, and is much nearer the backbone. Ball bearings (Bown's) are also affixed to the small wheel. Detachable cranks and rat-trap pedals are fitted, as the latter form a more secure hold for the foot. This variety deserves to be better

known than it is at present, as it is well made, highly finished, and very light—a 54in. scaling only 37½lb. Price, any size, £13.

79. *The Special Chelsea.*—Not much change is made in this class, strength being increased by the addition of weight well distributed. The hollow forks are retained, but rollers replace balls for bearings. The Stanley head and handles are employed, the latter having horn ends; the front brake is a lever spoon. The hubs are under 6¼in., and of gun metal; the spring slides on a clip tail. To suit the taste of different riders, the step can be raised and lowered. In other details the description of the Semi-Racer applies; the trailing wheel runs on cones. A 52in. weighs 41lb. Price, any size, £11.

80. *The Bristol* (Thomas Morgan, 1, Victoria-road, The Ware, Bristol).—The builder of this machine has followed the popular taste in general outline, and the wheels have from sixty to sixty-eight (according to size) direct spokes. The gun-metal hubs are extra width, 6¼in., and large size, 4¼in. deep, with flat edges, and are considerably recessed, so as to allow the bearings to take up less room. Rudge's "patent adjustable" bearings are bolted to hollow, bayonet-shaped, steel forks, and can be easily got at by removing the detachable cranks, which are held on by a taper bolt and nut. Beck and Warwick's patent potential rims are used; they are something of a flattened-out U shape, and the red rubber, a size smaller than is usually employed, viz., ⅞in. and ¾in. respectively, is held in very firmly by means of cement and a canvas band, which is inserted in the tyre. A wise plan has been followed in making the handle bar very long—23in. is the average. This gives great power and ease in steering; it is affixed in front of the Stanley head, 5½in. above the rubber, and has horn knobs. The front wheel brake is short, and the spoon is kept close to the shoulders of the fork. Pliability and strength are combined in the spring, in which no room is lost, as it is close built, and terminates with a large hinge clip, sliding on the steel backbone. Rudge's famous bearings are also used for the small wheel, which has twenty-four direct spokes, and is usually 17in. high. The Bristol machine is without any special features or remarkable innovations; but, instead, the popular taste is followed as nearly as possible, and the machine is therefore plain but good and well made, suitable for rough riding or lighter work. A 54in. weighs 42lb. Price £16 10s.

81. *The Bristol No.* 2.—Made very like the above, but with solid forks and plain bearings to the driving wheel, while the trailer is fitted with cones. Price for 54in., £13.

82. *The Carlton* (H. E. Kear, Red Cross Iron Works, Red Cross-street, Bristol).—This is a capital but not well-known machine. Long handle bars—which we have often advised—are here adopted; they are 22in. in

length by 5½in. high; and made in one piece, with a boss or solid ring in the centre, which portion is driven on the top of the head and keyed to make it secure. The centres are both "males," the lower works in a hardened steel cup, and the top screw is necessarily a "female." The screw is very firm, and a hole is drilled throughout its entire length, in order to afford a ready means of lubrication to the centres, so that there is none of the usual difficulty in oiling this important part of the machine. The front wheel is made up by sixty-eight direct steel spokes the size generally used being No. 12 (Birmingham wire gauge). The hubs (gun metal) are of good depth, and extra wide—6½in. This causes the "tread" to be broad, 16½in. Hancock's moulded rubbers are entirely used, the sizes being ⅜in. and ⅝in. They are cemented into steel crescent rims. All machines have fixed cranks, but a small washer fits over the end of the axle, and is held by a small screw, the object of which is to prevent the key working loose and falling out. Rudge's ball bearings are used to both wheels; they are bolted in front to hollow forks, but solid are more frequently used. A double spring—*i.e.*, a thin plate that fits partly over the ordinary spring—is used; it is broad, pliable, and slides on the steel hollow backbone by a hinge clip. The back forks are made extra strong by spreading out wider at the top; in this they correspond with the front. The rear wheel averages 16in., unless ordered 17in. A front wheel brake only is adopted; it acts as usual, the only difference being that the lower "arm" is more arched. Leg guard and the etceteras that are usually required form part of the outfit. The various portions are forged on the premises, and the whole machine is well made—strong and handsome. The weight of a 50in. strong roadster we found to be 43lb., but a light roadster is under 40lb.—in fact, a 54in. semi-racer comes nearer the latter weight. Price, 50in., £16 10s.

83. *The Carlton No.* 2.—Only a few alterations are made; an open head replaces the Stanley, and the forks are solid. Rudge's bearings are also discarded for the cheaper parallel or plain bearings, hardened for the driving wheel, while the back wheel runs on a taper pin; in other respects the workmanship is the same; both have saw steps and toe rests (if required). These changes pull down the price. The weight remains about the same as a strong No. 1. Price, 54in., £13.

84. *The No* 1 *Universal* (Griffith Brothers, Clyde Works, Heath Town, Wolverhampton).—This machine has Bown's patent ball bearings to both wheels, hollow steel front fork, and sixty direct action spokes screwing into the usual gun-metal hubs, which are firmly collared on a steel spindle and axle. Light steel crescent rims with red rubbers cemented in and detachable (steel) cranks are fitted. The pedals are usually rat-trap. A neat Stanley head surmounts the forks, and the handles are placed in

front. They are of fair length, and have horn ends; an ordinary lever spoon brake also forms part of the head gear. The spring is bolted to the neck in front, and slides freely by means of a hinge clip tail on the weldless steel tubular backbone. The machine is finished all bright, carefully made and fitted with the usual extras, including suspension saddle, valise, spanner, &c. The weight varies, but averages 40lb. for a 50in. Price, any size, £15.

85. *The No. 2 Universal.*—But little different from the before-mentioned, the chief variation being that solid forks take the place of hollow, and while Bown's bearings or rollers are retained on the front wheel, only cones are used for the rear wheel. Price, 52in., painted, £10 10s.

86. *The No. 3 Universal.*—Almost similar to the Special; iron hubs, lock-nutted spokes, iron backbone, trouser guard, &c. Price, 50in., £7.

87. *The No. 4 Universal.*—Last and lowest priced of the series. The spokes are considerably reduced in number, only thirty-six going to a 50in. wheel, which, moreover, has V iron felloes, lock nuts, and iron naves (hubs); the latter are 5¼in. broad. Even in this class roller bearings are used, solid iron forks, sugarloaf Stanley head, front brake, brass clip to the spring. These springs are the same in all makes, and extra good. Iron backbone, leg guard, coned bearings to trailing wheel; latter is rather smaller, being 16in. in diameter. It is no particular novelty. With this and all kinds a patent alarum (which only rings when pressed), oilcan, and spanner are supplied gratis. A 52in. weighs about 44½lb. They are strong and cheap machines. Price, any size, £6.

88. *The Special Universal.*—Another branch of the "family," with hollow forks and about fifty lock-nutted iron wire spokes, gun-metal hubs, U rims, and roller bearings, fixed cranks, rubber pedals; handle low, either over centre or before the Stanley head, which is the same type as the others. Brass is introduced in more than one place as an ornament, and forms the clip of the spring and brake. The small wheel runs on cones. Average weight 7lb. less than the old standard of "pounds for inches." Price, any size, £7 10s.

89. *The I X L Universal.*—Although a more attractive machine, and seemingly quite as good in every way, for some reason this variety is quoted at a lower price than No. 3; certainly, nearly any rider would take the I X L in preference at the same money. The spokes of the driving wheel, to the number of sixty, screw direct into large gun-metal naves of the regulation breadth, 6in., and are headed into the steel U rims. The steering rod is 18½in. long, with wooden handles, and 5in. above the wheel. Roller bearings are bolted to the solid iron forks, and the springs have a clip tail end, which works on the iron back-bone. Rear wheel of course, runs on cones; red rubber tyres, ¾in. and ⅞in.,

are employed, and a 52in. complete for the road scales 43lb. Price, any size, £6 6s.

90. *The Special Tempest* (W. Lewis, Tempest-street, Wolverhampton).—This machine has seventy-two fine wire spokes, direct into gun-metal hubs, steel crescent rims; the hubs are both deep and broad, and recessed to admit Bown's bearings. The latter are bolted to the hollow steel forks. Neat detachable taper cranks are employed, with rubber pedals, adjustable, to suit length of stroke fancied by the rider. A small straight Stanley head, with fixed handle bar, 21in. long by 5in., above the red rubber tyre; a front lever spoon brake and leg-guard are also added. The spring is pliable, with hinge joint and sliding clip tail; tubular steel backbone. Bown's noted ball bearings also facilitate the easy running of the small wheel, the general size of which is 18in., twenty-two spokes, U rims, &c. The machines are light, elegant, and great care is taken in their manufacture. A 52in. scales about 40lb. Price, 52in., £12.

91. *The Tempest* No. 2.—This make has sixty direct spokes, steel half-moon rim, gun-metal hubs, 6in. apart, and generally red rubber tyres of the average size. A front brake is placed before the Stanley head, which is of the ball top variety. The spring is curved, and slides by means of a hinge joint on the steel bone, while it is bolted to a strong thick neck in front. An improved kind of cone hardened bearing has been adopted, which is easily adjusted, neat in appearance, and bolted to solid forks, but rollers are substituted free of charge if desired. Ordinary cones are fitted to the rear wheel, and needle lubricators form a ready method of communicating oil to the working parts. A 52in. weighs no less than 47lb. Price, 52in., £6 10s.

92. *The Tempest No.* 3.—This has fifty direct spokes, crescent rims, gun-metal hubs, short ball top Stanley head. A front brake is included, and the hinge spring works on an iron "bone;" cones to back wheel. A 52in. weighs 46lb. Price, 52in., £6.

93. *The Tempest No.* 4.—A still cheaper class; V iron rims, lock-nutted spokes, iron hubs, cone bearings throughout, iron spine, &c. Price £5 10s.; weight, 50in., 43lb.

94. *The Transient* (W. H. Wood, 3, Pearson-street, Wolverhampton).—There is no special point in this machine; it has a Stanley head, with the upper portion formed after a pattern that seems very popular in Wolverhampton, i.e., a ball top, and the handle bar is brought next the rider by means of a lug or brass journal; it is either fixed for a front brake or free to turn when a rear wheel brake is used. The wheels are made up of fifty-four extra large charcoal wire spokes to a 52in.; they are lock-nutted into iron hubs. Roller bearings are bolted or forged to the rather neatly

shaped front forks. Fixed foot rests and rubber pedals; the rubber blocks on which the feet rest are roughed to prevent the feet slipping. An elastic spring slides freely at its lower extremity on the steel tubular spine; the latter varies in size from 1¼in. at the joint where it is brazed to the neck to ⅜in. on joining the solid portion above the back forks. The rear wheel, which averages only 16in., runs on cone bearings, has twenty spokes, and possesses the advantage of being easily taken out without springing the forks. The machine is evidently built for strength, as we found a 52in. weigh 49lb. Price, 50in., £7 5s.

95. *The Special Transient.*—Double balls to front and single to back wheels, rather more spokes, detachable cranks, polished all over, and

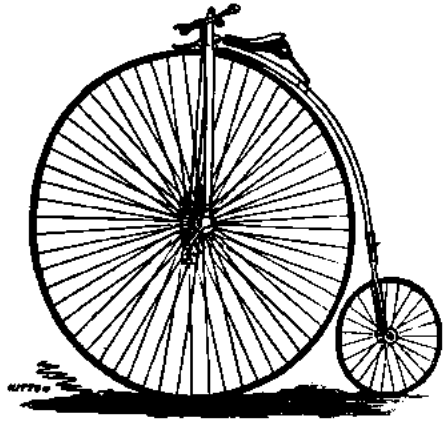

Fig. 15. The University Bicycle.

fitted with alarum. Weight about the same as No. 94. Price, 50in., £9 10s.

96. *The University* (W. Patrick and Sons, Wolverhampton).—This machine is built on what may be termed popular lines. It has a neat, straight, Stanley head, with the handles carried slightly in front, and these are 32in. long, being tipped with horn, in two colours. The bar is, of course, rigid, and 5½in. above the tyre. Both the front lever brake and trousers guard are made of brass. Roller bearings are generally used. They are in unadjustable hardened cases, and are bolted to the fork ends, which are solid, but being extra wide, are consequently strong. A slightly different method is pursued to secure the detachable cranks; in place of the pin, which generally has merely a flat side passing through a D hole, a bolt here runs right through both axle and crank head, and is

held by a simple nut, by tightening which the (taper) pin is drawn farther in, and so makes the attachment more secure. Rat-trap pedals are fitted; they are adjustable, after the usual manner. Brass spring top lubricators are fitted to parts which require attention with oil. Sixty or more spokes are headed into crescent rims and screwed direct into gun-metal hubs, which are 5¼in. apart. The spring is kept very close—in fact, the saddle is less than 3in. above the wheel. Part of the neck is flattened, on which the spring is bolted. At the terminal point the spring has a hinge clip, and slides on the steel tubular backbone. 18in. is the general size of the back wheel; it has ¼in. grey tyre, and runs on cones. Price, up to 54in., £8, above that size, £8 10s.

97. *The University No.* 2.—Almost the same as the foregoing, but with ball Stanley head, and the spring more arched. Price the same.

98. *The Special University.*—This has double balls to the driving wheel, single balls to the trailing wheel, and adjustable gun-metal step, that may be placed at whatever height suits the owner best. In other points the same as the foregoing. Price, 54in., £9 5s.

99. *The Duplex Excelsior Hollow Fork* (Bayliss and Thomas, Excelsior Works, 80, Lower Ford, Coventry).—This is one of those good old Coventry firms whose name is synonymous with good work and sound material. They have always tried to keep up with the times, and the D. E. H. F. has been added as a new and superior machine to their already long list of popular steeds, and is a decided improvement on anything they have yet turned out. Its ruling feature is hollowness. The forks are cold drawn steel tubes, fairly broad, and pretty thick. This shape secures extra strength. They, moreover, run right up to the handle bar, thus forming an open head, something after the well-known Duplex model, only smaller and neater. This greatly decreases the weight, while it is very rigid; the centre is long, and the bottom end works in a steel cup cut in the lower bridge, which is supported by the forks passing through it. The upper "bridge" or plate is secured firmly to the forks, and has a journal in front which carries the "rudder." The top screw is kept well down; a projection coming out beneath makes it firmer at the point where it screws into the centre. The steering rod is itself also a steel tube tipped with horn knobs. In this, again, weight is avoided and strength gained. The driving wheel contains sixty direct spokes with large heads, so that they may obtain a better grip of the gun-metal hubs, which are large, broad, and handsome. For the strong roadsters full inch red rubbers, of extra good quality, cemented into steel crescent felloes, are used. Double ball bearings are also employed; they run in parallel grooves, cut in the axle and case, and are adjustable by side screws; but once "set" properly it is a long time before they require to

be tightened up. The cases are made very dustproof, and it is difficult indeed for anything to work in, so that the free action of the ball is undisturbed by particles of grit. The cases are attached by means of a hinge joint to the fork ends. This arrangement, as we have frequently explained, is much superior to bolting, as it breaks the twisting strain thrown on the bearings from the handle bar when turning corners, or, indeed, at any time when much force is used. Detachable cranks, on an improved plan, are also employed; the crank is firmly secured, while at

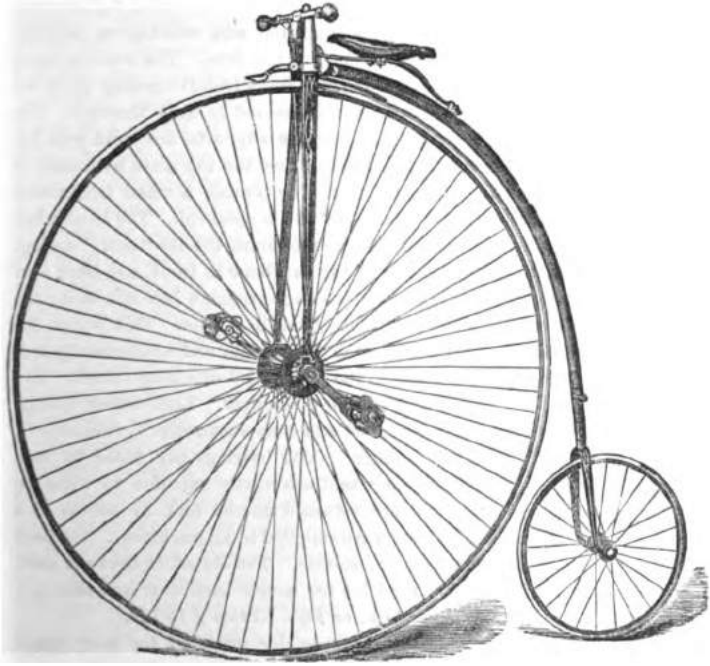

FIG. 16. THE DUPLEX EXCELSIOR HOLLOW FORK BICYCLE.

the same time it is readily removed, being held by a taper D-shaped wedge, which is drawn tighter by means of a screw head and hexagon nut. The spring is made according to the fancy of the rider, and is either of the ordinary type, with cliptail, &c., or the lower end is bolted to the (hollow steel) backbone and the front left free, the middle being supported by a rubber buffer. A front brake is usually fitted; it is, however, of the ordinary type, and offers no feature for remark. Balls,

eight in number, are also fitted to the rear wheel, which runs very noiselessly and easily. The rear wheel is generally 17in. in diameter, and has ¾in. tyre. A 54in. weighs from 42lb. or 43lb. Price £16 10s.

100. *The D.E.H.F. Semi-racer or Light Roadster.*—Similar to above, only made a degree lighter—some four pounds—and the rubber tyres being ⅝in. and ½in. Price the same.

101. *The D.E.H.F. Racer.*—Meant for work on the path, weight is still further saved; ½in. and ⅜in. rubbers are adopted, and a 54in. is cut down to 33lb. to 35lb. Price the same.

102. *The Duplex Excelsior.*—This is the old and well-known machine that for so long was the premier product of the firm. The steering head is open, and made in one solid forging, the forks (solid) running up to the handles, are curved slightly forward for the rod to pass through. The centres work as in the D.E.H.F., only the supports are solid with the forks, and the centres are adjusted from below the top plate by means of steel rings, which can be turned round by placing a small instrument in a series of holes, until the requisite "fit" is obtained. The handle bar is solid. This is one of the few machines retaining the old "bow" spring, which is welded to a continuation of the backbone in front, and bent over upwards and backwards, the centres passing through a hole cut in it; the end slides on a small polished portion of the backbone. This brings the weight of the rider nearer the centre of the spring, and consequently it is more elastic and "gives" easily to the "bumps" of a rough road. The backbone is rather larger, and therefore stronger. Lock nutted spokes, fifty-six, or one per inch, steel hubs, and rims outwardly V, inwardly U, form the wheels, with inch rubber. Cone bearings are fitted to both wheels, but those to the driving wheel are vastly superior to what are known as ordinary cones, and are attached to the fork by means of a hinge joint. Detachable foot-rests are supplied to all machines. The back wheel is 13in. high, and has ⅝in. rubber. The old roller brake is used. The machine is a really fine roadster for rough hard wear and tear, but naturally heavy, a 54in. being 47lb. or 48lb. Price £15 10s.

103. *The Irish Duplex.*—This is specially intended for very rough riding. The tyres are 1¼in. on the front and 1in. on trailing wheel. A 54in. weighs about 50lb. Price £16.

104. *The Light Roadster Duplex.*—Considerably lighter, and the appearance made more attractive by putting on a short spring; front brake, &c.; weight, 42lb. to 43lb. for a 54in. Price £15 10s.

105. *The Duplex Racer.*—Scarcely made now; the D.E.H.F. having taken its place. It has light U rims, a good number of fine spokes, lock nuts, roller or ball bearings, solid forks, small open or Stanley head, short stiff spring, steel backbone, cone bearings to the rear wheel, fixed

cranks, rat-trap pedals, &c.; ¼in. rubbers. Weight 37lb. to 38lb., for a 54in. Price £15 10s.

106. *The Duplex Semi-racer.*—Stronger than above. Lever brake to front wheel, and weight 40lb. Price the same as racer.

107. *The Duplex No.* 2.—Ordinary V rims, iron backbone, otherwise same as Duplex.

108. *The Excelsior No.* 1.—A cheaper class. Iron backbone, V iron rims, lock-nutted spokes, long centres, roller spring and brake; strong roadster. Weight, 50lb. for a 54in. Price £14.

109. *The Excelsior No.* 2.—Last and least in the category. Iron rims, backbone, &c.; no brake, lock-nutted spokes, &c. Weight about 52lb. for a 54in. Price £12.

110. *The Fluted Hollow Fork Centaur* (Centaur Bicycle Company, West Orchard, Coventry).—The forks of this machine are weldless steel tubes rolled into shape shown (Fig. 17). They have almost the appearance of a double hollow fork with the dual "legs" joined in the centre. The object is, that each side supports the other, or, to quote the maker's own words, "the thrust upon the crown of the arch A is resisted by the crown of the arch B, and *vice versâ*." This effectually prevents any twisting of the forks, and at the same time forms a very light and immensely strong arrangement. The metal is about the thickness of that shown in the block, and the forks run from the bearings to the handle bar without join. The widest portion is at the joint where the lower bridge is supported. Here they measure 1¼in. in breadth, but gradually decrease in size as they descend to the bearings, until they become only ¼ of an inch. They also grow gradually smaller as they approach the handle bar, which is a hollow rod, 22in. long, with black or green horn knobs. This leaves the head open, but is considerably narrower and neater than usual. The centres are long and firm, working in a female cone centre on the lower bridge, and the top is held by a screw (as usual), which passes through a boss joining the two fork heads, and supporting the steering rod. The spring is bolted to the neck, and is rather long, the tail end working by a hinge joint in a sliding slot or short round bar, which moves freely up and down in a metal case, brazed to the backbone. This is a secure and pleasant method (as it "gives" when bumping over the inequalities of a rough road), and does not get shaky. The wheels are made up with light steel crescent felloes, ¼in. and ⅜in. rubber (red) tyres; fine wire (13 gauge) is used for the spokes, which number seventy-two, direct action. The gun-metal hubs are of that dark rich hue so attractive to the eye, but seldom seen. They are also large,

FIG. 17.

4¼in. deep, and the breadth varies according to the size of the wheel, 5¼in. for a 50in. wheel being the average, but we saw one with a 6¾in. hub. Exceedingly neat light taper cranks, known as the Centaur Patent Detachable, are used. The end of the axle is "threaded" and a similar worm cut in the crank boss, one being right and the other left, so that when screwed on, instead of loosening they become tighter and tighter, and in order to prevent the evils that would arise from back pedalling, a hole is drilled through both crank head and axle, into which a taper steel pin is placed and tightened by means of a small nut; rubber or rat-trap pedals, according to order, are fitted. Double ball bearings are fitted to the driving wheel. These consist of ten small steel balls on either side, divided into two rows, and kept equi-distant, but not opposite, by a perforated ring. They run in parallel grooves cut in the axle and case; they are adjusted from the side on the Sheffield principle, or balls of a shade larger can be substituted, which operation fulfils the same end. It need scarcely be added that the wearing surfaces are all extra hardened —much better than in the general run of machines. The cases are knuckle-jointed to the fork ends, and made very dust proof. Single ball bearings are used to the small wheel. If preferred, a new parallel bearing possessing some novel features is substituted. This consists of two bosses or shoulders of hardened steel placed inside the fork ends, and the (solid iron) hub is considerably recessed, to allow two large steel (hardened) bushes to be sunk into it, on which the projections on the fork ends work. They are drawn nearer together by a large steel pin passing through the axle, and dust is excluded by means of a leather washer. A capital adjustable step is called into play; it can be raised or lowered over 2in., to suit various lengths of leg. Front wheel brakes of the well-known grasp or lever variety are used. A suspension saddle is sent out with each machine. The D.F.H.F. is a splendid machine, light, strong, elegant, fit for any work, all parts made of sound material, and it may be thoroughly relied on. The weight is about 42lb. for a 54in. Price, painted, £16 10s.

111. *The Double Fluted Hollow Fork Centaur Racer.*—Same as above, only a little lighter, balls to both wheels, no brake, leg guard, &c. A fine mount for the path. Direct spokes seventy-two or eighty to the large, and twenty-eight to the small wheel. A 54in. scales some 35lb. or 37lb. Price £16 10s.

112. *The Wolverhampton Champion No.* 1 (Thomas Lane and Son, Hampton Bicycle Works, 75, Temple-street, Wolverhampton).—This forms the medium class made by the firm; it has very wide hubs, 6¼in., of gun metal, well recessed so as to allow the roller bearings to be brought nearer each other. The spokes are of steel wire, lock nutted, and one is put in to

every inch of the height of the driving wheel. They are additionally coated with a non-rusting compound, which preserves the appearance and saves the trouble of endless polishing. Steel crescent felloes with red rubber complete the wheels. Detatchable cranks, secured by a taper pin and bolt, are used. The choice between rat-trap or rubber pedals is left open to the taste of the rider. The forks are solid iron, strong, and of a neat shape. A Stanley head of the straight order has the handle bar screwing in at either side; this is about 20in. to 22in. long. The spring is bolted to the neck and has a considerable arch near the tail, where it terminates with a hinge clip, and is very pliable and easy. Steel case-

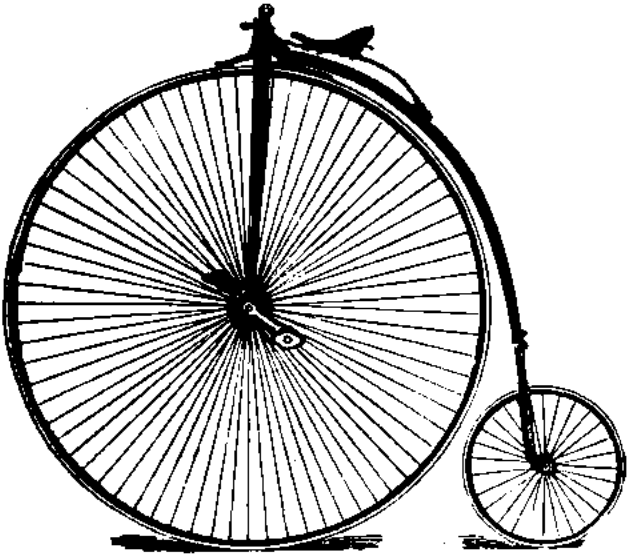

FIG. 18. THE DOUBLE FLUTED HOLLOW FORK CENTAUR.

hardened cones are supplied for the bearing of the small wheel, which is generally made 16in. to a 48in., or 18in. to a 52in. or larger front wheel. A brass front brake is adopted, acting by a spoon on the rubber from a grasp lever. A 52in. weighs 43½lb. Price, 52in., £8 10s.

113. *The Special Wolverhampton Champion.*—Direct action replaces the lock-nutted spokes, and the same wide hubs are used, light steel crescent rims, red rubbers, cemented in, and Rudge's celebrated patent ball bearings to both wheels. The entire machine is finished all bright, except the felloes, which are painted and lined, and extra care is taken

with it in building, so that, on the whole, it forms a very fair machine at the price asked. Price, 54in., £12.

114. *The Wolverhampton Champion No. 2.*—A cheaper machine than No. 1. It has a spoke to the inch, direct action, gun-metal hubs, not so large as in No. 1, U rims, fixed cranks, solid iron forks, and a ball Stanley head. An improvement is made in the material of which the brake is formed, the more usually employed iron taking the place of the showy but not attractive brass. Little other change is made, save that the backbone is iron, and the driving wheel runs on plain bearings or rollers, and cones for the rear wheel. Since we saw the machine we believe the maker is using steel tubes for all backbones. Price, 50in., £6 5s.

115. *The Clifton* (Thomas Pitcher and Sons, Clifton Bicycle Works, Lewens Mead, Bristol.)—In this machine the handles are the best looking and most comfortable we have yet seen, being of prettily-coloured wood and capitally shaped, large, with rounded ends, so that they do not tire the hands. No objectionable screws stick out of the ends. The "knobs" screw over, and are secured, so they cannot work loose. The total length is 22in., which has been proved by experience to be the "happy medium." The bar is made of steel, and has a central boss, which screws into the remainder of the head (Stanley), and forms the upper portion of it. The top screw, by passing through this, is held firmly, so that the steel centres cannot readily work loose. Extra strength is gained and the pliability of the spring increased by placing a leaf or secondary spring over it, consisting of a thin steel plate the same width and about three-quarters the length of the main one, and secured to it by means of bolts passing through the lower, and a slot in the upper, which allows it to be adjusted with the saddle (to which it is firmly secured). By this arrangement the saddle cannot slip, and is at all times firm, and even should the spring snap the "leaf" retains it in position. The spring is altogether very comfortable and safe, and terminates with a very neat hinge-clip, which freely slides on the backbone. Some weight is saved by boring out the shaft of the neck, generally left solid; it is brazed into the steel tubular backbone, which continues hollow right down to the rear forks, and thus another objectionable bit of solid metal is saved. This makes a more rigid junction than the common plan of having about two or three inches of iron welded between the two. An improved form of cone bearing is used for the back wheel—hardened steel bushes are sunk in the gun-metal hubs. The pin is tapered with one non-locking loose cone. The adjusting nut is placed outside the fork end, and has only to be turned to tighten up or drawn out should the wheel have to be removed, which prevents any springing of the fork. If preferred, ball bearings are used, free of extra

charge. For the driving wheel double balls find favour, but Bown's are substituted if preferred, without altering the price. The cases are welded or brazed into the fork ends. A good front wheel grasp lever brake is used; the fulcrum on which it works is made very firm. The wheels, which, like the whole machine, are carefully constructed, have handsome large gun-metal hubs, 4¾in. deep, by 6in. broad. They are well recessed, and nicely turned. The number of spokes is regulated by the size of wheel, one being put in for each inch in height. They are of steel wire, No. 11, B.W.G., and, of course, screw direct. Grey rubber tyres, of the respective sizes of ⅞in. and ¼in., are held by cement into light crescent steel felloes. The cranks are neat and light, either detachable or fixed. The pedals have wooden blocks in place of rubbers, it being a local fancy, and not so liable to slip. The throw of the pedal is only 1½in., from 4½in. to 5½in. We have already spoken of this machine as being a first class one. It is thoroughly well made, all wearing parts are hardened, and the forgings of the framework made on the spot. It is well fitted, and the "tread" measures 14½in., under the average. A 54in. scales just 40lb. Price, 54in., £16 10s.

116. *The Rigid Wheel Clifton.*—This was one of the earliest creations for the rigid wheel mania, and it was briefly described in *The Bazaar* in 1875. The idea is to gain rigidity by placing a bar across the wheel. It differs considerably from the old Ariel principle insomuch as a flat steel rod passes from felloe to felloe through the axle, the ends being held by two cases which project from the rims, but the rod is not bolted to them, a certain amount of play being allowed. The hubs are put on with a right and left hand screw, and so arranged that when the wheel requires adjusting the axle is turned by the crank, and by that means the hubs forced further apart, thus tightening the spokes. The hubs cannot slip back again by the ordinary action of the pedals. The principle answers very well, but the appearance is strongly against it, and none have been made for some time, although the maker still supplies them to order. The other points are like the Clifton, though the weight is slightly increased. Price, 54in., £17s. 10s.

117. *The Ten Guinea* (E. A. Tranter, Yerbury Factory, Trowbridge.)—In this machine Campbell's patent rims are employed, the principal feature in which is the beautifully true manner in which they are made, being of crescent steel, ready rolled, brazed and bolted, with the holes for the spokes drilled right and left. These are tapered and slant slightly inwards, so that the spoke heads have a firm bed to lie in and are not subject to undue pressure in any direction. The spokes, which are of charcoal iron wire, are held by nipples and locknuts into iron hubs. Capital rubbers—made by the National Rubber Company of France—

extra good in quality, are held by cement. They are of the now usual size—⅛in. and ¾in. for the respective wheels. Plain parallel bearings are fitted (unless an extra charge of £2 is paid for Bown's). They are well recessed into both the hub and crank-head, with the double object of excluding dust and getting a narrow tread. Starley's patent detachable cranks and ordinary rubber or rat-trap pedals complete the wheels. Solid bayonet shaped forks are surmounted by a straight Stanley head, of Beck and Co.'s design. The opening is kept small, and the neck goes close up to the crown of the forks, which arrangement shortens the distance between the top of the backbone and the centres, and lessens the strain of that important "connecting link." 22in. is the usual length of the

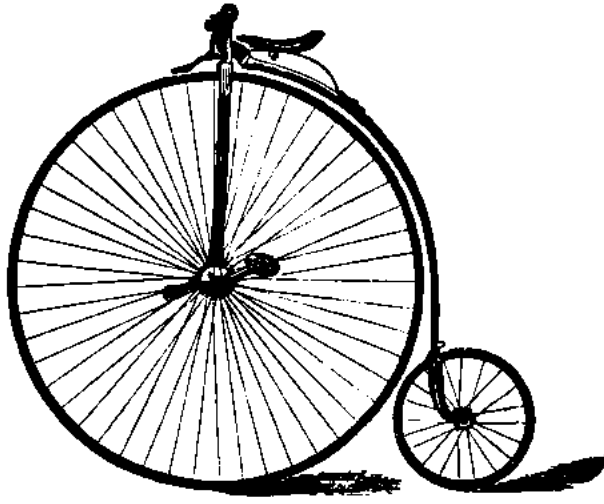

FIG. 19. THE TEN GUINEA.

handle bar, and it has flat ended "knobs," the height above the tyre being 5in. A front spoon brake is attached; a small steel spring between the lever and the bar keeps it raised when not in action. In order to freely lubricate the head, the top screw is drilled throughout its entire length, so as to admit of its being easily oiled. The spring is rather longer than usual, and its tail end terminates with a hinge clip. This is dove-tailed, and fits over a solid piece of metal screwed on the steel backbone with corresponding grooves. By this means the elasticity of the spring is promoted, side shake avoided, and rattling prevented. By

making the rear forks with extra broad shoulders they are strengthened, and not so liable to twist. Double cone bearings, one side adjustable, are used for the back wheel—17in. is the average height; spring top brass lubricators are fitted to both it and the front wheel. Of the price, proclaimed by the title, we say nothing, except that the machine is worth it. The weight is about the average, a 58in. scaling 42½lb.

118. *The Wiltshire.*—A cheaper and lower class machine, turned out by the same maker; its points are not remarkable, but it is a strong built bicycle, fit for rough work, or adapted to those whose financial resources will not "run" to a higher priced conveyance. Lock-nutted spokes are also relied on in this make, but the number is considerably reduced, being brought down to forty; the iron hubs are 6½in. broad. The rubbers are larger in the front wheel, being a full inch in place of ⅞in., but only ⅞in. in the small wheel. The latter is 18in. high; for both V rims are

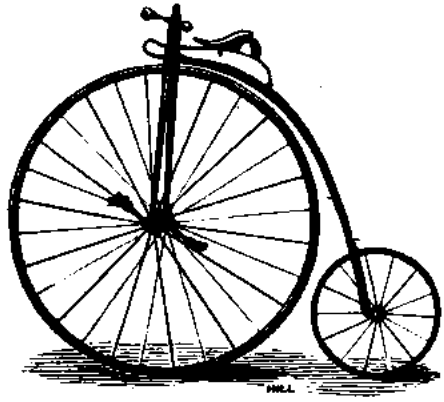

FIG 20. THE WILTSHIRE.

used. Plain Sheffield parallel bearings, or, if preferred, cones, are fitted to the large wheel, adjustable at the side, and secured to the solid forks by a hinge joint; the forks run right up to the steering rod, which is 22in. long, and supported by large brass journals, which project in front; this makes an open head, but the neck is more of the Stanley pattern. The spring is considerably arched at the rear end, and terminates with a clip tail, which slides on the tubular iron backbone. A front lever brake is put on, and in its absence 7s. 6d. is allowed off the price. As is generally the case in lower priced machines, the weight goes up, a 50in. scaling 45lb. Price, 50in., £8 7s. 6d.

119. *The Club Safety* (Coventry Machinists Company, Cheylesmore, Coventry; offices and show rooms, 28, 29, and 30, Holborn Viaduct, London, E.C.).—The real idea of this Safety is merely an enlarged edition of the Pony, with similar double cranks, slightly altered, and with considerable rake; the former point of similarity is further changed by modifying the action; in place of the lower crank swinging freely it acts as a lever, and the upper or main crank is held in position by a link chain. This, indeed, forms what may be termed the great feature of the Club Safety; as it is claimed that by its aid all top hamper in the shape of long levers, arms, &c., is done away with, and, therefore, the appearance improved and weight saved, in addition to the steering being easier. The front wheel has roller bearings and the Universal Joint; attached to the case of this, on the outer side, there is a small skeleton pin wheel, or a kind of cog, 4in. in diameter, with thirteen teeth, pointed, and much farther apart than would be the case were it a true cog. The crank proper is very strong, about ½in. square by 5in. long; it is impossible to have an adjustable slot under present conditions, so that the pin which holds the second crank, or, to be correct, the lever, passes through a hole, in which it turns freely; but inside (*i.e.*, next the wheel) the crank head there is placed another pin wheel, similar to the one attached to the bearing case; round these an endless linked chain is placed. It has nothing to do with the motive power, but merely holds up the levers, which, without it, would fall down and be useless. The action of the chain is merely that of coiling and uncoiling; it does not work round, the respective links retain the same position, and, of course, the second cog does the same. It merely describes an orbit round the axle. When on the down stroke there is a great strain on the lower side of the chain, and a considerable loss of power; but it is not entirely wasted, as the strain is from the crank end to the centre of the wheel, and it seems to help in drawing it forward. The second crank is curved downward and upward, being about 12in. long, or 11in. from the pedal, which is supported by a straight bolt capable of being raised or lowered 2in., to the head of the crank. This brings the pedals very low, but the height can easily be regulated, as the universal joint has a small hole in the centre of it into which a small stud projecting from the inside of the lower middle part of the fork end fits loosely. In this case there are three holes, and by undoing the bearing and twisting round the joint case so as to bring a different hole under the said stud, the pedals can be raised or lowered some 10in., so that the same machine will suit nearly any man, as may be judged from the fact that the one we tried was only a 50in., yet we could ride it as easily as a 60in. If the pedals were at their highest, a man of 5ft. could as easily ride it. The action of the pedals

is the same as a machine with 5in. throw, but, owing to the arrangement of levers, there appears to be a considerable difference. Rake is, after all, the great thing, and the cause of all the other changes. Adjustable rakes are a failure, and, as before explained, it would be next to impossible to steer a machine with 10in. rake if the centres were in a line with the forks. To obviate this, the plan of putting a straight head on slanting forks was adopted on the 'Xtra, and claimed as a patent, but this is disputed by the Coventry Machinists' Company, who state it was used formerly, which invalidates the patent, but time will prove this; suffice it to say, the Club Safety has 10in. rake, and, with the saddle (centre), 7in. back, this places the rider's weight 17in. behind the centre of the wheel, safe enough for anything. Owing to the saddle's position, although it is 5in. above the tyre immediately beneath, it is really only about 1¼in. above the highest part. The backbone is only 35in. long, making the saddle very accessible, as it is but 30in. from the step. The splendid workmanship of the firm is well enough known, and hardly needs recapitulation here; but, suffice it to say, the wheels are, as usual, hollow felloes, Handcock's moulded rubbers, ⅜in. front and ⅞in. back, fifty-two spokes, secured by large nipples into iron hubs 5½in. wide and very strong. Oval backbones were first made popular by the company, and they are entirely used. They measure in the largest part 1⅛in. in depth by 1⅛in. in thickness. The "spring of springs" is attached, and additional pleasure thereby imparted to riding. An 18in. rear wheel is fitted with the Club cone bearings, dust and grit proof. A fine long handle-bar has been adopted; it is now 24in. long by 5½in. above the tyre, and fixed, it and the other bright parts, hubs, spring, cranks, &c., are nickel-plated, and the painting is extra good. The arrangement of the forks may be dismissed as already tried and found successful. The head is *à la* Stanley, a neat pattern, with an excellent dust cover, and really hardened centres. On mounting for the first time the position of the pedals causes a curious feeling, but it steers capitally, more freely than the 'Xtra, though the feet have not the command in guiding found in an ordinary, and we noticed that when going at full speed the wheel was more inclined to "wag" or "wobble," especially in spurting; but it seems capable of considerable speed on the path. As a roadster it answers well on the flat, but at hill climbing is not as yet equal to its opponent. The waste of power tells here, and although the work is well under the rider and the pedals moderately close—14in.—not so much force seems capable of being put into the pedals, and ascents that had been frequently mastered on a 56in. 'Xtra (57lb.) were unconquered on the 50in. Club Safety, but, for one thing, the lower pedals are not yet made strong enough nor bent quite right. In appearance the Club Safety

is the best looking, there being no incumbrances about the forks, the simple chain and double crank taking their place. When the machine has undergone improvements, which will effect a considerable difference, we feel sure it will become a thorough success (among other things the weight—53lb. for a 50in.—requires to be cut down). Meanwhile, as a pioneer, we are highly pleased with it, and should recommend riders to investigate its merits.

120. *The New Speed Bicycle.*—With a view of gaining increased speed in racing, the Coventry Machinists Company has introduced a novel plan, whereby the return stroke is shortened, enabling a rider to get a quicker play with his feet, and thereby be able—to use a slang term—to "put the wheel round" faster. The gear is fitted to an ordinary Club Racer, and consists of an eccentric disc, 4¼in. in diameter, placed on the axle outside the forks, so that 3¼in. are in front and only 1in. behind. This has a groove on the outer edge, containing forty-one balls; on each side of and over this a cam or case is placed, attached to which there is a short crank with adjustable slot. The ordinary crank has a long slot, in which the shorter slides, and the object gained is that, when on the down stroke, the crank (by aid of the eccentric disc) gradually, lengthens until at the point where greatest power is applied it becomes 6in. long. From this it decreases as the force of the rider lessens, and it makes a quick, or, more correctly speaking, a short return, having on its upward journey a stroke of less than 4in. This is, of course, less tiring to the legs, and it is easier to keep the feet moving when travelling at the rate of a mile in 2min. 48sec., but at first it takes some time to get accustomed to the "kick up" action. So far it has gone the way of its many forerunners that had the same object in view (for it is a well-known fact that all attempts at speed-gearing have proved failures), by being met with the (yet) insurmountable objections of increased friction, and, notwithstanding the fact that every possible means were resorted to in the present instance to reduce it to the minimum, it has again proved the stumbling block, and, although it was fitted to a 60in. machine and tested by the champion (Cortis), he could get along no faster than on the ordinary—the great friction killing all benefit derived from the "quick return." The idea is quite feasible, but unless someone can be found with stronger legs than are given to the ordinary run of mortals, we fear the inventor's prophecy of a mile being done in 2min. 10sec. will not be verified.

ACCESSORIES.

Bells and Alarums.

Stop Bell (Hutchins & Co., Queen Victoria-street, London).—Some riders prefer the tone of the old sleigh bells, and for those whose musical tastes incline to a "tinkle-tinkle," this little sound producer is provided. The bell under notice has in the top a round hole, rubber lined, (a size smaller than the tongue), which is a metal ball secured to a short cord, on being pulled up it jams the ball in the hole and, of course, makes it silent; a slight touch releases it, when it at once re-enters on its noisy existence. It is generally secured to the handle. Price 2s.

Lamps and Oils.

Cooper's Patent Inextinguishable Hub Lamp (G. B. Cooper, 24, Canterbury-street, Everton, Liverpool; now of Hillman, Herbert, and Cooper, Coventry.)—Most of the bicycle lamps in use are apt to suddenly go out when going over rough roads. It is the chief aim of the Cooper lamp to combat this difficulty, which it seems to have effectually accomplished by suspending the lamp on weak brass wire coil springs. The top of the lamp is a hinge clip, which folds over the axle, and is held by a double bolt, so that there is no fear of its loosening; on the under part there is a spring which keeps it from shaking, and a brass regulator runs out from each side, so that it may be placed in any position, either in the centre or to one side. The body of the lamp, as already stated, is hung by springs, which coil round brass guards, keeping the lamp always in an upright position. On going over the least inequality the lamp slides up and down with an easy, graceful motion; a clip prevents the return action taking it too high. The back of the lamp opens out in two parts, one of which is the silver plated reflector, which can be easily brightened

up; the other exposes the whole inside, in order to renew the oil, &c. The best colza is burned; it takes half-inch hollow wick, and sheds a brilliant light. During the day it is buckled up by means of a hook, as the springs are not required then. It will be one of the best for use (but rather small), and well worth the half guinea charged. It is sold in London by Singer and Co., 21, Holborn-viaduct, and Goy, 21, Leadenhall-street.

Candle Lamps (Goy, 21, Leadenhall-street, and other dealers).—Taking pattern from the lamps in carriages, a bicycle light distributor has been introduced, which in place of oil carries a candle, be it an Ozokerit, wax, or more unpretentious composite. It runs down into a long round case, and is acted on by a coil spring, which pushes it upward as it is burnt. Whatever candle is used, the wick should be of the self-consuming order, as then it will require no attention. Of course it is a hub lamp, has white front light and small red at the back. The price is 6s. 6d.

Bags.

The Combination (J. Neville, waterproof clothier, Horton-road, Hackney, N.)—"This contrives a double debt to pay," as being rapidly converted into either a long or short journey bag, or folded up into a space that occupies but little more room than a saddle pouch. This end is gained by forming the bag out of very thin but light waterproof material. Taken in its ordinary form "it presents the appearance of a soft Multum in Parvo," as it is 12in. long, 7½in. broad, by 3in. deep, internal measurements. The outside colour is a deep dark red, and inside white. There are two flaps, which fold over across the top, and are joined by a piece of elastic. The top or large flap is made of strong waterproof canvas, which effectually keeps out the wet; two short straps on the top are for attaching to the saddle, while on the back there is a piece of wood held in leather cases, to form a steady attachment for the strap which passes round the spring, when it is held by a patent buckle of a novel design; lower down two straps pass round the backbone. At the end of the bag there is another small compartment of brown canvas, for oil can, spoke tightener, wrench, and such like implements usually carried by riders. In its full size it is of great capacity, and will take in an astonishing number of various articles. Should, however, occasion require only a medium amount of luggage, the broad band which passes round the lower portion of the bag can be shortened, and which at once reduces the length of storage room to 9in. Should, however,

even this form prove too large a bag, it can be folded up within itself, and the strap of the top flap passed round and inserted into the buckle of the tool receptacle. The whole then merely fastens under the saddle, the size then being 7½in. broad by 4in. deep, and 2½in. thick, weight 8oz. to 10oz.

Improved Multum in Parvo (Messrs. Maynard, Harris, and Co., 126, Leadenhall-street, E.C.).—This bag is generally accepted as a thing which every rider must possess, and, owing to the great success that it has met with, various means have been sought to improve it. The latest of these consists in a guard to pass round the backbone to keep it from shifting or sliding off at the lower part. The bag has on the back the usual wooden guard and clasp to go over the spring, and below, near the bottom, a second support; in the centre of this a strong leather covered brass clip is hinged, which folds round the backbone, and is secured by means of a clasp and arrangement to prevent its becoming unfastened. This rests on a rubber buffer, which takes off the jarring, and is an immense improvement on the old strap fastening. The whole bag is better finished, and has an outer pocket as well as one at the bottom, the latter for oil, spanner, &c. It is also more strongly bound with leather.

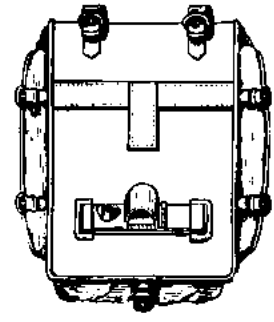

FIG. 21. THE IMPROVED M.I.P.

Lock and Key Pouch (Goy, of 21, Leadenhall-street, London, and other dealers). — Some riders are particular in not having their little store of portable "traps" meddled with; and in order to preserve their goods and chattels in security, this bag has been brought out. It is larger than the ordinary valise, and, like it, fastens behind the saddle; it is provided with lock and key. Price half-a-crown.

Knapsack (W. J. Spurrier, 90, New-street, Birmingham).—This consists of a light frame work made of cane, joined by straps, which pass under the arms and cross on the chest. Whatever has to be carried is wrapped in a small indiarubber waterproof sheet and then strapped on to the "frame." The size of the load is thus regulated, and there is no need to carry a bag of fixed size. When not in use it can be rolled up and put away. It is, however, hardly to be recommended to bicyclists, as no matter how well made or how light, it is heating and tiring. The price is 7s. 6d. Weight, empty, 11oz.

Miscellaneous.

Brasier's Spoke Tightener (D. Brasier, Temple-street, Wolverhampton).—It was formerly contended that direct-action spokes were more difficult to tighten than lock-nutted, as it was no easy matter to obtain a grip of the wire unless with a special instrument, and those supplied by most makers were not only costly but of most unwieldly proportions, heavy, and awkward. The total weight of the instrument under notice is about 2½oz., and it goes easily into the waistcoat pocket. It is made of steel, the body being very strong and solid, having a groove cut in the recess to fit one half the spoke. There is a slot about ½in. long, through which passes a slot bolt, holding a piece of steel the breadth of the solid

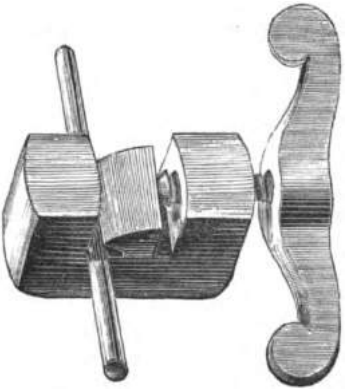

FIG. 22. BRASIER'S SPOKE TIGHTENER. (Full-size.)

portion. This has a coned edge, and is tightened by turning a long thumb screw, which, on placing the groove over a spoke, presses the coned side against the spoke, which is held in a firm grip; the long arms of the screw act as a lever, by which the spoke is readily twisted, and either tightened or loosened as occasion may require. It can be adjusted to suit any spokes of reasonable dimensions by simply altering the little screw which holds the sliding clip. The total dimensions are—length of thumb screw, 1⅛in.; height open to fullest extent, 1½in.; closed for pocket, 1⅛in.; length of body, 1⅛in.; extreme depth (without nut), ½in.; with nut, ⅝in.; breadth, ⅛in. In short, it is one of those indispensable adjuncts to the paraphernalia of a bicycle that no rider should be without. Price by post 3s.

Plowright's Mud Guard (James Plowright, Purfleet Bridge, Lynn).—This mainly consists of two wire arms bent into a hook at the bottom to fit over the bearings on the small wheel; the upper portion between the wires is covered with thin steel neatly painted to match the machine. It has no spring, screw, or bolt, its own elasticity keeping it in position by means of the curved head which slips under the back fork; all the mud is thus deposited on the receiver. It cannot become clogged, but should mud accumulate the guard is removed in something under 2½sec., shaken, and replaced. It does not in the least disfigure the machine. Those who ride 'Xtras will find it especially valuable, as the large back wheel "lifts" the mud pretty considerably. The price is very moderate. In ordering, the make, bearings, and size of rear wheel should be stated, also colour desired. Price 6s. 6d.

Bate's Patent Lubricators (Messrs. Lovedee, Son, and Bate, Wolverhampton).—The ordinary forms of lubricators entail many evils. When the supply has to be renewed the top of the reservoir has to be screwed off, generally with the fingers, a job few men relish, as the combined oil and dirt attaching itself to the skin is of so very adhering a nature that it seems to defy ready removal by ordinary washing. Added to this, the tops get loose, fall off, and are lost, which allows the grit to enter and attack the bearings at their most vulnerable point. Bate, who is rapidly earning a name as an inventive genius, has overcome the objection by means of his useful little oil holder. It is of much the same appearance as the ordinary description, but on the top there is a circular aperture, into which a ball fits; it is pushed up from the lower side by a small coil spring, and so always kept in position, preventing the dirt from finding ingress. All that has to be done is to push in the nozzle of the oilcan, when the ball slips partly aside, and, when full, or sufficient oil has been injected, it resumes its original position. They are now largely taken up by the trade, many makers fitting them. They can be applied to most machines, and are very cheap.

The Rolling Saddle (Lamplough and Brown, 135, Great Colmore-street, Birmingham).—The construction of the suspension saddle is sufficiently well known, but, for the benefit of any readers who may not have seen it, we may briefly state that the framework consists of thin metal plate, something in the shape of a scallop shell. The leather is supported by the rounded and turned down edges of this and the narrower front portion or pommel, so that where the fork rests the leather is merely suspended, as there are no hard sides to chafe the legs. Even with this, there was still something wanted, and observant riders noted that the connection between the rider and machine was too rigid, and that something like the the sliding seat in a boat was required, to form, as it were,

a "joint" between the two. This end has been achieved by the saddle now under notice, and it is gained by placing—in addition to the necessary cross bar—one 3in. in length, held at the ends by a support, resting on the main spring, midway. The round bar rests on a block of rubber, and as the bar is not fast at the ends, a "rolling" motion is given to the saddle with the least side pressure, ensuring an absence of friction. Moreover, it possesses a very important advantage. With the ordinary (fixed) saddle, the rider does not gain the due advantage of his weight to aid in propulsion; but in this invention, with each downstroke his weight is, so to speak, rolled over to the side and brought partly to bear on the descending pedal, putting additional force into it. This great advantage is performed unconsciously, and without any exertion of the rider, but nevertheless exists. On mounting for the first time the saddle feels unsteady, but this is almost immediately quite overcome, and there is little *perceptible* difference between it and another, as it does most of its good work by stealth, and, although the user may begin to think its good qualities are overrated because not obtrusive, he will find a difference on returning to the old form, for we believe the new to be faster for racing (where every yard tells) and far more comfortable for touring, and we hope it may meet with the success it deserves during the coming season. Those who already possess a suspension saddle can get the fastener and rubber plate separately for 6s.; they are easily attached, and the benefit to be derived we have already described. The fastener makes the saddle a little higher, but the dipping action of the side is an antidote to that. For tricycles a larger saddle is made, and for the latter vehicle it is doubly valuable—more especially to those machines where the action is rotary and placed below the rider. The price for saddle and fastener complete is 15s.

The Patent Æolus Ball Bearing (Wm. Bown, 308, Summer-lane, Birmingham).—On examining the Æolus, it will be seen that the outer case is formed of gun-metal, inside which there is placed a steel grooved ring affixed firmly to the case; in this the balls lie. They do not, however, touch each other all the way round, as it is claimed that by leaving a certain amount of "play" friction is reduced. The position is shown in Fig. 23. A steel (hardened) collar slips over the axle, to which it is screwed. This has double cones projecting from it, forming a groove in the centre, into which the balls fit; the collar exactly fits the steel rings, so that dust is kept out. On the outer side, i.e., next the crank, a loose steel cap, grooved exactly similar to the lower one, fits over the balls, and is kept from revolving by two guards; over this again the outer gun-metal case comes, which has a screw of a very fine "pitch," so that it can be very gradually screwed into the body of the bearing and adjust-

ment made to a nicety, as equal pressure is brought to bear on all parts. The edge of the outside case is milled, and a small clip with corresponding ends is held firmly down on it by means of a screw, partly shown in Fig. 23. When the bearing requires to be tightened, all that has to be done is to unscrew the nut, lift off the cap, and turn with the fingers until the right degree of tightness is reached. The least move is sufficient, as the case has only to be turned the fractional part of an inch.

There are only four points of friction on each ball, which are shown in Fig. 23. If the balls touch all the way round this would be increased to six, but the friction is reduced to the lowest possible minimum, and lubricants are scarcely required. All working parts are of steel, thoroughly case-hardened, and seem proof against wear. During a six days' bicycle race,

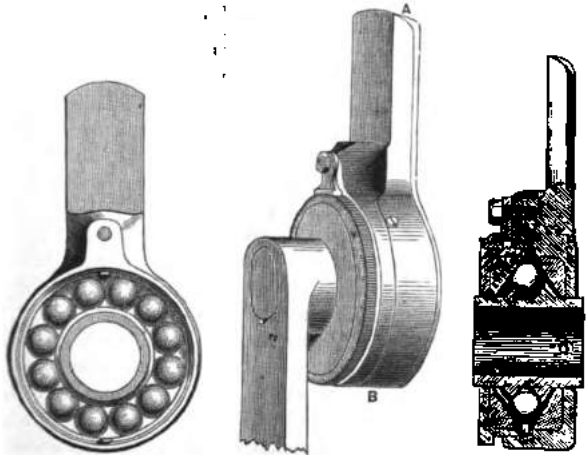

FIG. 23. THE ÆOLUS PATENT BALL BEARING.

early in 1879, at the Agricultural Hall, Andrews, one of the competitors, rode during the "full" day of eighteen hours the extraordinary distance of 220 miles, on a machine fitted with the Æolus, without once dismounting or "oiling up"; indeed, the bearings were not once touched from the time training began till after the race, when, on being opened out, they were found not only free from dirt and grit, but not worn in the slightest, although they had run nearly 2000 miles. This is a very important and satisfactory test both of their easy running and durability.

As we have before stated, the Æolus bearings can be fitted to almost any machine with but slight alteration. A great proof of their popu-

larity is afforded by the fact that more than half the makers in the country are now fitting them. One firm alone—Singer and Co.—gave an order for 1000 pairs, and their use is increasing daily. In the metropolis Crooke and Co., the Paddington agents, make a speciality of fixing them, and also sell them separately.

The A B C Bearings (the Acme Bicycle Company, St. George's Foundry, Pope-street, Birmingham).—In the A B C we are introduced to a capital combination of balls and cones. First, the *bowls*, as they are here termed, are of hardened steel, and in shape a kind of double cone. These bowls, nine in number, revolve on steel spindles, which are held by a steel cage. The ends of these spindles can be screwed up, thereby tightening the bowls, by means of an ordinary watch key. The body, or bearing surface, is a hood or hardened steel collar, which forms part of the crank head. This has a rounded groove for the bowls to run in, and it fits over the axle. This case goes right up into the hub, and at the outerside is held on by the usual bolt, so that not only the crank but bearings as well can be readily removed. A most ingenious plan is adopted for universal adjustment. Similar bearings suffer from the defect of being capable of adjustment from one side only; but in the A B C the inner case—i.e., next hub—is made with a left hand screw; the outer—i.e., next crank—has a right hand screw. Both these have steel cups, or rings, with rounded grooves, which press against the bowls. The outer edges are milled, and a small steel pin passes through a projection in the case, having at each extremity a small cogged or milled wheel. On loosening the lock nut and turning the little wheel, both cases are twisted round in opposite directions, and so brought nearer together, exerting an equal pressure on the bowls from both sides. The great advantages of this system will be readily understood, especially by those who have some practical knowledge of the subject. We should add that the edge of the bowl does not touch, but the top slides, or of course adjustment could not be accomplished as described.

The same principle is carried out in the back wheel, but only four bowls are used on either side. These go right inside the hub. Two steel rings fixed inside the hub offer one bearing surface on each side, while the others are adjustable. The latter consist of the cones for taking up near the case and caps. The caps fit one over the other, and make it very dust proof. To tighten, the outer lock nuts are screwed up, which presses the fork ends nearer together, and consequently the bearings are drawn closer. The axle has one loose cone, kept from turning by a D hole; it is strong and lasting, while it runs splendidly.

An almost exactly similar plan is carried out for the pedals, and therefore these do not need a detailed description. The A B C bearing is

one of the best introduced, all parts being beautifully made from standard patterns, so that they are interchangeable in case of wear or kindred cause for renewal. The bearing runs smoothly, and friction is brought to a very low degree, but there is one great fault, and that is the fitting, which, although perfect in itself, is not carried out with a regard to reducing the "tread," as at present it makes any machine with a 6in. hub 17in. in the tread, but this has also been reduced.

The Acme Dressing Case.—When touring, riders are often put to great inconvenience for want of a comb and brush, and also a shave is not easy to obtain, without trusting to the mercies of the village barber; to obviate this, Mr. E. H. Hindley, of the firm of Maynard, Harris, and Co. (126, Leadenhall-street), has designed a capital little case, containing all requisites for a complete toilet, not forgetting toothbrush, soap, razor, &c. It fits on the bottom of an M.I.P. bag, and only costs 10s. 6d. complete.

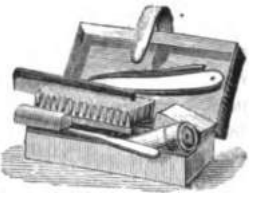

FIG. 34. THE ACME DRESSING CASE.

Oil Can Case (J. Mason, 9, Church-street, Kensington).—The contents of a rider's M.I.P., after a long run (when the lubricating vessel has not been placed in a separate compartment) are often an unsightly mess, oil being here, there, and everywhere. A neat little case to obviate this can now be purchased. It is made of dark leather and lined with velvet. Price 2s., post free.

Stanley Bicycle Club's Annual Exhibition.

February 3rd to 6th, 1886.

This show, the most important ever held, took place in the magnificent new Holborn Town Hall, which had only just been thrown open. This splendid building, in Gray's Inn-road, is easy of access, being five minutes' walk from Holborn Viaduct, but, despite the dimensions of the beautifully decorated grand hall, and the fairly sized adjoining "small" hall, want of room was greatly felt. As for the show under notice, several makers had to be declined space, a mistaken policy, we think, as it would have been better to have curtailed the number of machines exhibited by some firms so as to have had the exhibitors as representative a body as possible. Be that as it may, the Stanley Exhibition, as a whole, contained an unrivalled collection of machines.

The machines exhibited were admirably ranged in rows, on a raised dais covered with crimson cloth, which showed off their beauty of form to the best advantage; each machine bore a card, giving maker's name, title of machine, height, number of spokes, bearings of front and back wheels, price, and weight. The latter was, with a couple of exceptions, merely estimated, and, therefore, not to be relied on, as we have found by experience that not five per cent. of manufacturers' weights are at all near the truth. The number of spokes was also at times at variance with that given on the labels.

Bicycles.

Notwithstanding the numberless improvements that have from time to time been introduced, makers still seem fertile in resource, and visitors to the show could not fail to be struck by the great advance made over last season's machines in many directions; for the old firms, especially the Coventry Machinists' Company, seem determined not to let the grass grow under their feet or to let their young rivals outstrip them in the race for novelty. The Coventry Machinist Co.'s display proved very attractive, and it was an open question whether the "Speed" bicycle or

Club 'Xtra Safety attracted greater attention. Amongst other exhibits by this well-known firm were a 56in. racer, pure and simple, which looked made for its work; a new type of machine, with roller bearings to the driving wheel, angle iron felloes, and *direct* spokes, at the low price of £12 10s., a machine for boys offered at £6 10s., and three or four ordinary Club Roadsters, which grand machines gained the usual approval, more especially the "spring of springs." In all twelve bicycles were shown. The remainder included one with adjustable rake, where, without dismounting, the rake could be changed from 1in. to 10in., but even then it did not seem by any means too safe. An alteration was shown in the second crank of the Pony, whereby the pedal was made to catch in the axle and serve as a most comfortable footrest. The rival to the 'Xtra or Club Safety was of peculiar action, and had a permanent rake of 10in., and the pedals were considerably behind the axle, and never advance in front of it. There is every prospect of a large demand for this type of machine during the coming season, as many riders now prefer to avoid needless accidents when they can travel at the same speed. A most interesting case, containing all the parts in section, was also exhibited. Their new Safety Club had the same top or head as the 'Xtra (its vital point), but the levers were supported by a short chain. Their "Speed" bicycle exhibited a new idea for gaining increased speed by a quick return stroke of the pedal. This seems likely to answer, and as it has been fitted to the 60in. Club Racer won by Cortis a short time since, a practical trial of its merits may be soon looked for; but fast as the "demon" is, it is scarcely probable that he will realise the computed time that the explanatory card gives, *i.e.*, 2min. 15sec., to do which the Amateur Champion will have to improve (with its assistance) 32½sec., or about 345yds. in a mile.

Hydes and Wigfull have at last made a move onward, and the Stanley is greatly improved. The machine exhibited had hollow forks and ball bearings, somewhat on the Æolus plan, that could be adjusted to the $\frac{1}{1000}$th part of an inch. The forks were of a novel shape, nearly round, strong, but not handsome. The firm has gained the services of Mr. Crooke, the well-known Paddington agent, who now acts as the London representative. There were several other changes in the familiar form of the Stanley—a novel spring curled up behind and non-slipping pedals being among other innovations. The Chester remains a plain-looking substantial machine. The firm exhibited several other machines, including an Improved, 52in., plated, sixty spokes, balls both wheels, those of the rear being placed in the fork ends.

W. O. Aves, of City bicycle fame, exhibited a further improvement on that capital bearing—the Pickwick. In the machine on view, fine

large hubs were employed, and a long and easy spring, making the machine fit for any work.

Messrs. Hickling and Co., who, in addition to their London house, carry on business at Maidenhead, besides their usual makes, exhibited three samples of a new low priced machine, termed the Berkshire, with angle iron rims and ball bearings to both wheels. The most notable of the other exhibits of the firm were a 52in. polished Timberlake, with new crank and hinged bearings; and a 54in. with Rudge's bearings.

Coventry taste, in the shape of lock-nutted spokes, iron hubs, &c., quite marred the effect of the fine D.H.F., exhibited by Hillman and Herbert, of Coventry; it had sixty-eight spokes, ball bearings, and was closely built; but was quite eclipsed by another of the same type, with direct spokes, hollow forks taken right up to the handle bar, which was similarly constructed.

James Carver, of Nottingham, who gained a name by the hollow spoke, which readers may remember made its *début* at the first Stanley Show in 1878, has made considerable improvements in them. Formerly, the large size made them rather objectionable and thick, but now the gauge has been reduced to No. 12, thinner than the average solid spoke. They have also improved heads, stronger and lighter. The machines shown, a 57in., with its companion, a 54in. solid spoke, made a pair of beauties. As usual, owing to the splendid finish put on these machines, a label had to be attached to inform the public that they were not plated.

Harrington, of the Isle of Wight, exhibited a splendid 56in. Arab. Amongst its many special features it had mechanically fixed tyres, eighty fine spokes, broad and deep light steel spokes, and a new cradle spring, the seat being supported by a curled steel wire, giving a universal movement.

Humber, Marriott, and Cooper, of Nottingham, seem to have secured almost a monopoly of the racing path. Among the six bicycles exhibited were machines for Fred. Cooper, a 55in.; two 57in. for well-known riders; and the 59in. (about the most beautiful in the whole show) on which the Hon. Keith-Falconer rode two miles in 5min. 36sec.; it only weighed 35lb. In it and the other racers every point was studied to secure speed and easy running. A 53in. was also on view, to be used by Cann (who for years has ridden a Stanley) in some long distance races; it had a novel spring, supported by a rubber buffer at the tail end.

The exhibit of W. Hosier, of Coventry, termed the Coventry Star, had several good points and a pleasing outline.

A 52in. Nancy Lee, with A B C bearings to both wheels, eighty-four

direct spokes, hollow forks, half bright, complete, at £16 15s.; a 54in. Special Nonsuch, with plain bearings, 17in. head, iron hubs, white handles, &c., at £9; and a No. 1, at £7 11s., were representatives of the South London Machinist Company's make.

No less than six fine Invincibles were sent by the Surrey Machinist Company. This group was the lightest lot in the show, the 57in. racer only scaling 33lb. (guaranteed). The spokes were looped through the hub, and screwed by nipples into the rim, price £15 10s., painted. A 52in. roadster weighed 37lb.; another 56in. racer 33lb.—the pick of the lot being a 56in., with sixty direct spokes, single balls, &c. There were also a 38lb. 54in. racer, and a 52in. roadster, all with the hollow rims, oval backbones, &c.

Two new and neat machines were sent by Pansey, of Clapham—they are known as the Wanderer and University. The latter had a locking system to the spokes.

The Acme Bicycle Company introduced several improvements, including a spring fitted with ball bearings; the 50in. exhibited was priced at £25 4s. An Acme, with balls to both wheels, £15 15s.; and an XX, with forty-four thick spokes, £11.

The Tangent and Coventry Tricycle Company (late Haynes and Jefferis, of Coventry), exhibited a comparatively low-priced but certainly *not* cheap machine in the Mechanic's Bicycle, priced at £8 8s. It had cone bearings, iron V rims, thick iron wire spokes, large lock nuts, iron hubs, ditto backbone, back wheel roller brake, and, in short, was anything but a credit to the old house. A peculiar bend was given to the spine of a 54in. Tangent, which brought the small wheel nearer the large. An improvement was made in a 58in. Tangent with the same rear wheel arrangement, the whole "lines" and details being better, but the tread was 17½in., and price £22. The new Safety bicycle exhibited by this firm was a decided move from the useful to the ridiculous, it consisting in nothing more than a revival of the boneshaker built on modern lines, the pedals being placed low down between the wheels, and the seat above in the centre of a long easy spring; the front fork was "raked," and driving power was communicated to the rear wheel by multiplying action and an endless chain. The machine certainly looked safe, but its appearance was sadly against it.

Although Singer and Co. were not among the regular exhibitors, a specimen of their workmanship was present in the form of a 60in. 'Xtraordinary, which had been lent by a well-known racer, who had used it in several races during last year. It was remarkable as being the only 'Xtraordinary that had won a prize in the south of England. It attracted considerable attention, and was a striking object with its

10in. rake, more especially as it was the largest machine in the room.

Messrs. Simpson and Co., of Mansfield, have improved the Special Tubular Defiance. The one exhibited was of undoubted strength, the backbone looked strong enough for an engine, the hubs were very deeply recessed, Bown's bearings were put to the wheels, eighty direct spokes, long curled spring, &c. The handle had three balls, one ivory one at each end and another in the centre. It was a powerful machine, fit for any work. The one on view was built for Mr. E. B. Shipton, of the B. T. C., who makes use of his bicycle for business, traversing thousands of miles all over the country.

Wm. Keen, of Norwood Junction (brother to the champion), had four machines, the best being a 55in. F.H.F.N., with eighty-four fine spokes, balls to wheels, large hubs, &c.

One of the most startling innovations was the advent of the old Stanser, with hollow forks, ball bearings to both wheels, lighter hubs (but spoiled by being, like the rims, painted black). The sizes were 54in. and 52in.

The North of England Bicycle Company's exhibit did them every credit. The machine was finished all bright, and elaborately chased and engraved with fern leaves, eastern scrolls, &c. The hubs were of extra size and appearance, and altogether made a handsome machine, cheap at £20.

Garrod, of Uxbridge, sent a 54in., beautifully burnished by hand, that had run about 5000 miles, but which showed no signs of wear save in the rubbers. He also exhibited a very good 52in.

John Keen, ex-champion, had but one machine, a fine 54in., with double rear fork. The Eclipse is sufficiently known without comment.

Devy, who has gained a widely-recognised name for cheap work, had six machines, commencing with a 52in. semi-racer, hollow forks, steel backbone, Bown's balls to both wheels, long handle bar, direct spokes, &c., all for £10; a 52in. Special, £9 5s.; 50in. Express, £7 5s.; and the new Wonder, or Tower bicycle, which machine had direct spokes, gun-metal hubs, plain bearings, crescent rims, Stanley head, for £4 10s.

Lewis, of Wolverhampton, sent two Tempests—one at £5 10s., and a 52in. Special Tempest, part plated, with iron pedals, weighted, but not sufficiently, price £8 10s.; both were chosen from stock, and neither did him justice.

J. Beach, of Wolverhampton, exhibited a 52in. Special Alert, No. 3 Advance, and Special Advance.

The Centaur Bicycle Company, of Coventry, exhibited a fine 54in.

Centaur, with seventy-two lock-nutted spokes, shifting saddle, ball bearings, &c., at £16 10s.

Lewis, of Romford, who always builds his machines up to date, exhibited a 54in. having 102 direct spokes, Bown's bearings, painted black and gold, price £14.

Passing over four good steeds built by Starley and Sutton, Coventry, we come to the Uneclipsed, by Hancock, of Bishopsgate-street Without, which deserves honourable mention. This machine was built for some eccentric rider who would have hubs 7½in. wide. This, of course, made the tread wide, but by good fitting it was kept down to 16in., or equal to 14in. in ordinary cases.

Gorton, of Wolverhampton, exhibited a Perfection, and a Special Racer, with seventy-two direct spokes, hollow forks, ball bearings (Rudge's), very well fitted into the recessed hubs, same balls to small wheel; all parts, save rims, highly polished.

The Atalanta, exhibited by W. Sargent, had a new spring, with front shackle, resting on blocks of rubber; small wheel runs on reversed cones.

There were also exhibited a grand 52½in. Rudge, on which Waller won the six days' race at Hull; five Humbers of varying size, two all bright, including the rims; five Desideratums, all 52in., with their usual features, price £10 5s.; and a 50in. Express, by Plowright, with direct spokes (another surprise), and his capital mud guard. This makes the last of those most worthy of mention out of the 125 exhibited.

Accessories.

Goy, the well-known outfitter and agent, showed about 20 per cent. of all the machines on view, and occupied nearly half the great hall, his stand being placed at the end under the gallery. Another well-known firm, Clare and Sons, showed a varied stock of caps, gloves, capes, uniforms, &c.; and a comparatively new house, at least new in its connection with the wheel cause, S. Withers, of 43, Cheapside, seemed determined to make a plucky bid for a share of custom from bicyclists requiring hosiery, ties, shirts, &c.

E. Tyler, of 42, Exmouth-street, E.C., exhibited some very good bicycle medals, all showing skilful workmanship. The Club badges shown by him were also most creditable in style and reasonable in price.

Messrs. Anderson, Abbott, and Co. showed a large array of bags, all black, but light and waterproof. These included several tricycle bags, a double one specially made for the Challenge, and another, which

looked capable of holding the wardrobe of an entire family. They even supply "medical bags," for doctors who are given to riding, to carry their instruments. The Anti Pluvium suits came in for a share of attention, more especially owing to the break in the weather.

Lamplough and Brown, of Birmingham, exhibited some new saddles; the Roller, previously noticed at length, is now made in a variety of colours, green and brown, and for tender riders a special saddle has been prepared. The latter is extra soft and covered with white doeskin, it looks nice at first, but soon soils. They also had on view some handy little tool cases, small and neat.

Non-slipping rubbers have been in considerable request, more especially for town riding, and the largest makers of tyres, Handcock and Co., who have been at great expense in laying down plant and moulds to cast the popular moulded rubbers now so generally used throughout the country, exhibited a new anti-slipping tyre. It was formed in two parts; the inner or under, of soft red and fluted in fine grooves, is cemented into the rim; the outer half is of hard whitish grey, with deep grooves. These close with side pressure, and are said to be effectual in stopping slipping. The hardness is killed by the bed of softer material it is lined with.

Multum in Parvo bags are pretty perfect, but there are many little indispensable items that require to be carried, yet are awkward to stow away. In order to obviate this difficulty, Mr. E. H. Hindley (of the firm of Maynard, Harris, and Co., Leadenhall-street) has cleverly designed a little Acme dressing case; it is certainly the acme of M.I.P. goods, and a marvel of compactness, for in a neat leather case of exceedingly small dimensions there are to be found a hair brush, tooth ditto, shaving ditto, razor, soap, comb, &c., all for 10s. 6d. It is a very valuable adjunct to any outfit, and readily goes to the bottom of the ordinary bag.

In all matters where the outfit of the bicyclist is concerned the house of Goy, of Leadenhall-street, comes to the fore. Amongst the more recent novelties he exhibited was a tin sandwich case to keep the eatables cool, a convertible cap, whereby a polo can be changed into a helmet instantly, or *vice versâ*, and a new notice board, introduced by the Bicycle Union, to be placed at bad hills. The red letters on the board were clearly painted, or rather enamelled, on a white surface, stating "This Hill is Dangerous—Bicycle Union." When adopted in different parts of the country they will prove invaluable to tourists.

Salsbury's lamps have gained an enviable notoriety, and recent improvements will make them still more popular. Formerly they sometimes—owing to the heat generated by the flame—broke off and caused

accidents, but a new fastening has been adopted that makes such an occurrence impossible.

The paraffin lamp exhibited by Lee gave a splendid light, and the wick could be turned up from the outside without opening the door; it also had a safety fastening.

Cooper's Inextinguishable lamp had many admirers, and the excellent system on which it is suspended has only to be tried on rough roads to prove its value. It will be news to many to hear that the patentee of this lamp has gone into partnership with Messrs. Hillman and Herbert.

Æolus bearings were shown in full force, and a case contained balls of all sizes. Keat's bugle stand, as usual, proved a noisy corner—thousands of these bugles have been sold. The Centaur Bicycle Club had one of their capital drawing room gymnasiums or rowing seats—an invigorating indoor exercise.

Messrs. Mappin and Webb, the well-known silversmiths, had a grand array of "pots," cups, tankards, and all kinds of prizes, which caused racing men to cast many a covetous glance in the direction of their stand. A case of badges, &c., was shown by W. Boyden, 34, Woodlea-road, N., which reflected credit on the designer.

We must not forget to notice the series of capital old engravings representing "The Old Hobby Horse" in the days of its glory; they were lent by a member of the Canonbury Bicycle Club, and considerable money and time must have been expended on the collection.

Tricycles.

Transferring our notes to tricycles, we found the first to be quite a new variety, by Hickling and Co., dubbed the "Telescopic." Its title indicated its chief point, that of closing up. The small wheel was placed in front, and the chain worked on the centre of the axle. Price £17 10s.

Stanley Brothers came out strongly with several Salvos, the first being a No. 2, lighter and narrower than the usual patterns. The seat could be adjusted so that either a boy or life guardsman could ride it. The Sociable was a large double seated machine, for lady and gentleman, or two of the same sex side by side. It was of great size, and had a couple of enormous carriage candle lanterns surmounting it. The Salvo No. 1 was styled the "five-barred gate," owing to the number of cross bars under the seat. This was the ordinary class, but heavy for a weak rider. Its appearance is well known.

No. 5, an Excelsior, the cheapest tricycle in the hall, had the driving wheel on the left, a medium sized one on the right, and the small one behind, much the best plan. Ball bearings were put everywhere; they are applied to both wheels, each end of the crank axle, &c., in all seventy-eight steel balls are used. Of the workmanship, it is sufficient to name Bayliss and Thomas as the makers.

The Nancy Lee double *dos-à-dos* tricycle was too narrow for safety, and the spokes gigantic—gauge 7—the largest we have seen used in a modern machine, but it was very light, and could be taken indoors.

Nos. 8, 9, 10, and 11 were machines by Bayliss and Timms, Coventry, but they were not quite up to 1880 form, and, moreover, the poor painting and bad colours spoiled them. They included a double machine, (side by side), 4ft. 4in. broad.

No. 12, the Coventry, with lever pedals, but improved steering gear, acting by rack and pinion instead of a long handle.

No. 13. The same, with rotary action of the feet, and strap brake. The first tricycle (modern) introduced, and still a great favourite. Double tricycles are evidently being inquired for, so many makers are producing them. Among the most striking exhibited was the double convertible Centaur; it was very wide, and had the small wheel in front. Should only one rider desire to use it he could quickly unship one wheel and replace it by a smaller, thus forming a single machine; the operation being performed in five minutes. The price, including the spare wheel, was £23 2s. The firm also showed a single one fitted from the larger, the Special Centaur with two wheels the same size driven from the right side; and the Compressible. The width of the last-named could be reduced from 40in. to 30in.—a useful arrangement. The Triumph, by Warman and Laxon, built after the most popular model, had small wheel at the back, large to left, and rotary action of the pedals, the power being communicated by three wheels, an improvement on chains.

We expect to see the new Club tricycle create no small stir in tricycling circles. The one exhibited was driven by "rocking" levers, but doubtless the rotary will soon be applied. Both large wheels were employed for driving, and either or both could be thrown out of gear, as they were worked from the handles, so that the single turn to either side released that wheel and allowed a small circle to be made. Furthermore, it made only two tracks; and last, but not least, the rider was wholly clear in front, and quite a large box could be carried, such as a photographer's kit, on a frame placed behind. The ordinary Club had three different sized wheels, the small one behind; it was guided from the right side, brake power was applied by the foot in front, while on the rests. Ball bearings were fitted to the two larger wheels.

The whole machine was light and elegant, and £19, the price asked, was not excessive.

The only other three-wheeler exhibited was a Meteor, by Stanley and Sutton, of Coventry. This had two wheels in front, similar in size, and the other behind, only one acting as a driving wheel; plain bearings. Price £16.

From the evident interest with which the ladies regarded the machines we expect to see many new disciples of the art at an early date. It must be remembered that tricycling is but in its infancy, and improvements are being made daily. Most of the machines now in use are rather heavy for one lady to propel alone, but already makers are producing specially light machines.

TRICYCLES.

1. *The Challenge No.* 3 (Messrs. Singer and Co., Challenge Works, Alma-street, Coventry).—This machine has been comparatively lately introduced, to meet the wants of those who wished for a tricycle with rotary driving power and at a lower price than the former machine, which was then issued and which is just now undergoing great and important improvements. The arrangement of wheels secures a free open space in front of the rider, who can mount and dismount at a moment's notice. The driving wheel is the largest of the trio, and is placed to the left; it has crescent steel rims, with a rubber tyre of ⅜in. in diameter, which is securely held in its place by cement. Fifty or fifty-two direct action spokes, drawn larger at the head, screw direct into small but broad iron hubs, which measure 3¼in. in depth by 6¼in. in breadth. On the inside of the wheel there is placed a large skeleton cog wheel, 9in. in diameter; attached to this there is a flange ¼in. broad by 6in. deep, on which the strap brake acts. The wheel on the right is 30in. high, and its axle is placed from 5in. to 6in. before that of its larger companion. This is done to equalise the balance and to secure a purchase for the framework. The latter consists of steel tubing—a curved (downward) backbone with two branching legs in front. These spread out and descend, their extremities, which are solid and turned slightly outwards, being provided with an adjustable slot, in which the ends of the axle are held. Driving power is applied by a rotary motion of the pedals, placed on the axle shaft, which is bent into the form of a double crank, giving a 6in. throw of the pedals, and the feet are never more than 12in. apart, while the tread is greatly reduced, and consequently improved, being, as compared with a bicycle, only 9½in. Thus the feet are never placed in an awkward position or unduly strained by being separated to an abnormal extent. The power created by the pedals is communicated to the driving wheel by means of an endless chain band with open links, which fit over the cog wheel already described, and another similar one placed at the left end of the axle. By altering the sizes of these wheels, greater or diminished speed can be obtained. As the

chain may slacken with wear it can be adjusted by means of the slots in the ends of the framework. This principle of driving is now very generally being adopted, and it answers capitally. "Saddle or seat?" is settled by using either, according to choice; and riders of any height may use the same machine, as it can be raised or lowered 8in., so that while a rider who is only "five feet nothing" will not find it too large, a man of over 6ft. will not be cramped. The seat (when that form is used) is supported by a long double spring, which admits of a sort of rolling motion, allowing, therefore, greater power to be applied to the pedals. It is very easy

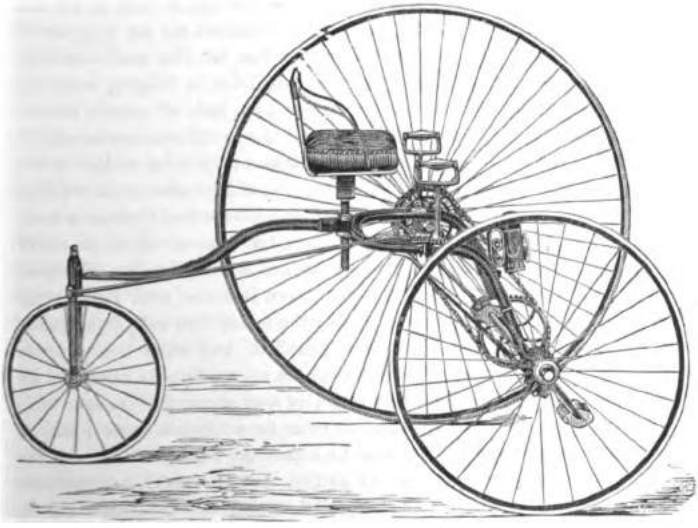

FIG. 1. THE CHALLENGE NO. 3 TRICYCLE.

and comfortable, and not unsteady. In order to allow still further for the varied heights of riders, the seat can, by means of a slot in the solid portion where the backbone joins the front forks, be moved farther back from the pedals. When a saddle is used (much preferable to active riders) it has an additional spring, altogether making a delightful support.

A wise plan has been followed in the position of the brake and steering handles; they are the best distance apart, proved by long experience with bicycles (22in.), and are placed almost on a level with the seat when at its medium height. The handle to the left is connected with the brake,

which is of the strap order; a metal band is clasped round the flange we have already described, and by pressing out the handle the strap is tightened and the wheel almost stopped, or the force can be regulated as wished. This forms a grand brake, and with it a rider is safe on almost any hill. Back action of the pedals can also be resorted to.

On the right is placed the steering handle; it acts by means of a rack and pinion, a long rod extending to the rear wheel, or rather to a short arm which projects from the head, which is a revival of the old dome pattern. The tail of the backbone is joined to centres, which are held by the usual top screw, and works on the bridge (a support which crosses the fork just above the wheel). By this arrangement the steering is very direct, and less than a half turn of the right handle is sufficient for all purposes of guiding; indeed, the least move is enough when on the road, and hold has never to be relaxed. The small wheel is 18in. in height, with ¾in. tyres, and runs midway between the other two, but, of course, behind. There are thus three separate wheel tracks. As to the measurements, the extreme width, taking the outside of the nuts on the side wheels, is 3ft. 4in., but the right wheel can be easily taken off, which reduces the width to 2ft. 10in., so that if cleverly manipulated, it can be taken through a doorway; the total length is about 6ft. 6in., or a trifle more. In all machines which have only one driving wheel it makes a considerable difference which way a turn is made. It should always be taken with the driving wheel outside and the free wheel inside; the latter then acts as a species of pivot, and the driving wheel runs round it, but when the opposite course is pursued the driving wheel requires a considerable circuit. As tricycles are frequently required to turn in a circumscribed space, such as on a path in a private domain, or even in a narrow cross road, it is useful to know exactly what may be done. As a great misconception exists among makers on this point and on that of weight, we pay particular attention to both. On carefully testing the Challenge No. 3, with the steering gear locked round as far as it will go and the driving wheel outside, we found that the circle made measured just under 11ft., while, reversing the action, it was increased to a ring no less than 13ft. 6in. across; and placing a machine on the scales, the index hand denoted that they supported a weight equivalent to 75lb.—by no means heavy as tricycles generally go, for it must be remembered that with three wheels there is a lot of extra framework not present in a bicycle; if a saddle be used it brings down the weight to 72lb., but we expect to see it brought down to 65lb., or even less. The pedals were originally far in advance of the seat, so that they were apparently worked in a slanting direction. Since then a great improvement has been made in that respect, the pedals being brought much more under the seat, consequently the action is

more direct, and therefore not only less laboured, but far greater power can be used, and the position of the rider is a more natural one, and presents a more graceful appearance. Plain parallel bearings, steel case-hardened, are used for all three wheels, and each is provided with a pair of spring top lubricators; these have a round orifice in the top, which is filled by a ball pressed upwards by a spring inside; this effectually excludes the dust, while at the same time they can be readily charged with oil by simply pressing the "ball" aside with the nozzle of the can. Only three sizes of driving wheels are made as a rule; 50in. being the *standard*; that height is kept in stock and can always be had immediately.

The Challenge No. 3 will be found a capital machine, strong, easy running, and fairly light. About the workmanship or quality of material employed it is scarcely necessary to say anything; the firm of Singer and Co. being a sufficient guarantee in that respect. It is painted in two colours, price £16 for a 50in.; should a larger wheel be desired, the price increases 5s. per inch.

2. *The Devon Tricycle* (Exeter Bicycle and Tricycle Company, Exeter; London Show Rooms and Agents, Messrs. Maynard, Harris, and Company, 126, Leadenhall-street, E.C.).—This machine made its *début* in the metropolis at the show held in the Agricultural Hall last September, but the one then shown was merely a test, and, like most first attempts, was rather crude. Since then it has been vastly improved, and the manufacture undertaken in a regular way. As will be seen by the illustration (Fig. 2) the design is that of two large wheels side by side, with a pilot wheel in front, but it possesses a special feature of undoubted advantage. In most machines there is only one driving wheel, but by a patented arrangement both wheels are utilised for that purpose on the Devon, so that there is no loss of power. The wheels are generally 52in. in height, and have fifty-two (Coventry) direct action spokes, large at the head; a style peculiar to the city of wheels; the iron hubs are only 3¼in. deep, but very broad, 6¼in.; light crescent steel rims; and ¼in. rubber tyres, cemented in. On the inside of the wheels, but not in any way attached to them, are two (one on each side) skeleton cog wheels, 8in. in diameter. It is the manner in which they work that forms the strong point of the Devon. Actually they are fitted loose on the axle, which has several (six) grooves cut in its face; whilst on the inside of the hub of the cog-wheel two pawls or picks are placed. When the wheel advances they catch in the teeth or grooves, and so propel it. Both sides act similarly. By this plan the wheels have an independent as well as a combined action, so that one may be lifted and spun in a reverse direction while the other is at rest or being turned the opposite way. This allows a turn

to be made to either side with equal facility, as the inside wheel remains at rest, so that a very small circle can be formed. We cannot give the exact diameter, as the space where we inspected the Devon was too circumscribed to admit of reliable tests in that direction, but we should say about 8ft. to 9ft. By this plan the feet also remain at rest when running down hill, and besides giving a very comfortable position, it brings the weight very low down and adds to the general stability.

There is no dead point with the pedals; often machines have to be backed, or the wheel itself gripped and pushed round till the crank is at the proper angle to apply the down-stroke, but with the Devon only a half or quarter (back) turn has to be given, which the least touch of the foot suffices to accomplish, to place the treadle in the best position—another

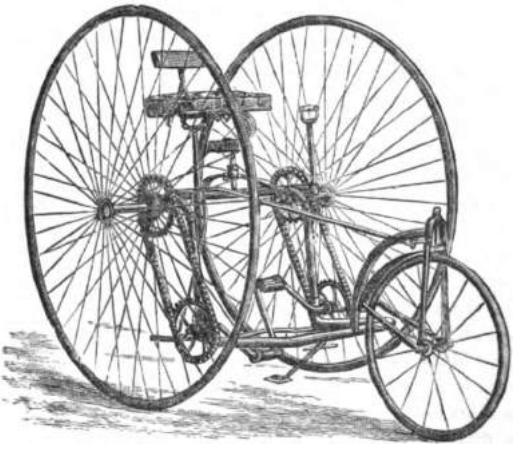

FIG. 2. THE DEVON TRICYCLE.

point in its favour; but as there is a *pro* and *con* to every question, the Devon cannot be worked backwards at all, its movements being entirely progressive, and in some cases this would be considered an objection. From the fact that both wheels are driven equally, there is no twisting side strain or inclination to go more to one side than the other. The framework consists of steel tubing, and runs down at either side, just inside the wheels, and comes out nearly horizontal, raised slightly, and made in front with rounded corners, in order to bend the tubing. Midway the front bone is joined to it, and supports the pilot wheel, the general height of which is 22in., and runs on cone bearings; it readily obeys the

balm, which consists of a long rod, acted on by the right handle. At the point where the frame bends outwards the cranked axle is supported. The pedals are rubber clothed, and 9in. apart, with a 5¼in. throw; therefore the feet are never stretched. Outside the frame on the ends of the axle is placed the second pair of cogged wheels; an endless chain band passes round these and those on the axle; if the former should stretch, compensation can easily be made by adjustment. Should greater speed or more power be desired, spare cogwheels, large or small, are supplied, that can be easily attached.

The whole machine is very compact, the back of the front wheel being only 4½in. in advance of its "followers." As this brings the weight pretty far back, a steel curved rod projects out from the back and comes near the ground, in order to guard against the improbable contingency of a back fall. The saddle or seat will be found comfortable. When a saddle is used it is supported on a series of springs, the first being bowed, and in turn resting on another placed crosswise, the whole crowned by a Lamplough and Brown's suspension roller saddle, so that comfort in this direction, at least, is secured. It may be stated that the patentee of the Devon invented the peculiar advantages of a rolling seat, and was the first to adopt it; he afterwards disposed of his vested rights to Messrs. Lamplough. Those who prefer a seat can have one attached in lieu of the pigskin. The space between the handles is 20in. The left is fixed, while the right is used as a rudder to direct the "pilot"—less than a half turn suffices. From the position of the handles, saddle, and pedals, great force can be put out in driving, and the rider's weight materially assists in propelling the machine—for the combined action of pulling against the handles and the rolling saddle forces the weight directly down on to the pedals, and as the rider is nearly upright, he can fairly stand on each pedal in hill climbing, and it is surprising the slopes that can be got up in this manner.

Brake power is applied by a broad iron slipper or shoe placed at the end of a short lever, the fulcrum of which is in the centre of the front frame, just behind the small wheel. The arm is bent backwards, and is fitted with a short cross bar for the feet when speed has to be checked; on pressing it down the shoe acts on the ground, but as a comparatively large surface is brought to bear, it is not inclined to wriggle or slip about. Its power is undoubted. Only plain bearings are used for the driving wheels; the front runs on cones, and the rider is protected from flying dirt by a mud guard. In general measurements the extreme width is 3ft. 6½in., which cannot be reduced. The space between the wheels (inside) is 28in. The seat can be raised or lowered about 7in. or 8in., so that the play of the leg is the same as on a bicycle. The weight is far too great, the

machine we sealed being just over 160lb.; but, with improvements during the season, we expect to see that greatly reduced. The machine must be mounted from the left side, and the action of the pedals (especially to a bicyclist) requires some considerable practice before the rider feels at home or can appreciate their advantages. The Devon is undoubtedly a first-class machine, and sure to be very popular, especially among those who wish to go fast. The price is £21.

3. *The Leopold Tricycle* (E. A. Tranter, Yerbury Factory, Trowbridge, Wilts).—This machine is built on very similar lines to the old Coventry, the main principle being to place the large or driving wheel on the left, and the small wheels on the right. The illustration (Fig. 3) does not convey a correct impression; it is the trade mark, the title Leopold being applied by special permission of H.R.H., and registered.

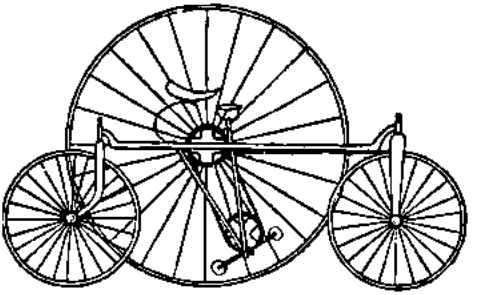

FIG. 3. THE LEOPOLD TRICYCLE.

The illustration is what the machine was, but not what it is. The two wheels are much farther apart (36in.), and do not overlap the larger, but are almost clear of it on either side. They are used for steering, or rather the front one only is, it being connected by a steel rod with the right handle, which is fitted with a ratchet arrangement, so that it immediately answers the slightest touch. By having the two wheels disconnected an advantage is gained, as, when turning, the rearmost wheel does not "follow its leader," but takes an inside or smaller circle, and so preserves a better balance and affords a steadier support to the rider. This is partly caused by the shape of the rear fork which automatically steers it. These wheels have another special feature. In most, if not all other machines, the small wheels have the ancient socket steering arrangement, but here the Stanley head is

brought into play. They not only add to appearance but are lighter and more effective. Cones form the bearing surface, and the height of the wheels is 24in. All the framework is of steel tubing except the cross pieces, which are thin flat iron bars. The action of the pedals is rotary, and the axle bent so that the "play" of the feet is similar to that on a bicycle, only they are much nearer to each other. The other two strong supports run down from each side to hold the axle and pedals in position. On the inside of the left support a skeleton cogwheel (having only four crossbars or spokes) is placed. This is, of course, firmly fixed to the axle, the chain is linked round it, and a similar one is secured to the axle of the driving wheel, by which means power is communicated. Should the chain become loose, adjustment for wear can be made, there being a slot in the lower portions of the bracket supports for that purpose. The front crossbar is a steel tube, and bent inwards, to allow additional room for the legs and permit of the work being more directly beneath the rider, and also because of the peculiar shape of the spring—which is merely a strong flat band of spring steel, secured to the framework, curled upwards, and bent over frontwards. The rider has thus no support under him, but is sustained by the elasticity of the spring. Either a seat or rolling saddle can be used; even with the former there is a certain amount of "roll," owing to its breadth and single central support. By placing the handles about 22in. apart, and low down, the arms are kept in a natural and easy position, while their full power can be utilised, as in going up hill the weight of the propeller is pulled directly down on to the pedals, so that instead of a twelve-stone man having to carry his weight as luggage, it lends a material aid in propulsion in climbing ascents, as he can fairly stand up on the pedals. We have already explained that the right handle steers the machine by a slight movement. The left is connected with a steel riband which winds round a flange on the upper cogwheel, so that on pressing out the handle the strap is tightened and speed checked, or back pedalling will either effect or assist in producing a check in the speed. Fifty-four inches is the average height of the driving wheel; it has crescent steel rims, best ¾in. red rubber, and about fifty-two spokes, lock nutted into iron hubs. The axle of this wheel passes right across the machine, and the end works in plain bearings just under the bar, between the small wheels. As already mentioned the small wheels are 24in. in height, and they are of similar construction to their large fellow traveller, only the rubbers are ½in. in diameter, and the diminution in the number of spokes is in accordance with their size. The Leopold has sold well, and appears to give every satisfaction. It is now made lighter than when we saw it in October, 1879, when we weighed a Leopold against a Coventry (both with seats), and found the scales to record 93lb. and 95lb. respec-

tively; but the Lepold may now be calculated at about 80lb. to 85lb. The price is also moderate, £16, for which the machine is neatly painted in three colours, except spokes, spring, hub, &c. It will be found a good sound machine.

4. *The R. A. Tricycle* (The Coventry Machinists, Cheylesmore, Coventry; London Show Rooms and Offices, 28, 29, and 30, Holborn Viaduct, E.C.).—In this machine the guiding wheel is placed at the rear; this, as we have before explained, makes the seat far more accessible and also more easy to vacate, as the rider has no cumbersome framework in front to cage him in, and moreover, the working parts are kept low down, so that the saddle (or seat) can be reached without climbing.

The general size of the driving wheel is 40in.; it is placed on the left hand, its opposite neighbour being only 33in. and the trailer 18in.; the latter touches the ground at a point 37in. behind where the others meet the earth. Handles are placed at either side and slightly in front of the seat. These are 18in. apart. The left is fixed and the right acts as the helm, both can be raised or lowered to suit the varied height of the saddle, for, were they not capable of this needful alteration, they would hardly ever be at a suitable height to correspond with the rider's length of limb. Steering is effected by turning, or rather slightly moving, the right handle. The lower part of the rod connected with the handle has a cogged wheel, the teeth of which fit into the ratchet of a bar which slides between guards and runs out behind to a short-arm, which projects from the right fork of the small wheel. The action is very sensitive, and care must be taken to give only a half quarter turn to the handles, or less for ordinary steering. The handles also act as a lever to pull against when force is employed. Brake power is applied by a small roller acting on the front of the right wheel by means of the toe pressing down a short lever when the feet are on the rests, but we believe a double strap brake is to be applied shortly. The present one is powerful, but the strap will be an improvement.

Hollow steel tubing forms the framework; it is bent somewhat horseshoe-wise, with the front ends carried farther out and not brought so near each other as would be the case were the form of the horseshoe more closely followed, the width at the narrowest part being 25in., while the extreme length is 29in.; 3in. from the front ends small roughed projections are placed to serve as footrests. This main frame is strengthened by cross pieces, and they help to support the saddle or seat, which rests on a novel spring—a combination of spiral bars and rubber supports—very pleasant and easy; a rolling suspension saddle, with the new back support, makes a fitting crown to all; for ladies or others a seat can be used.

The driving power has the Rotary Action (whence the initial letters), and the lower framework is supported by two tubular steel bars, which slant slightly forwards; the extreme length of the axle is 24¼in., and on the left end, outside the bar, is placed a pin or cogwheel. It is by increasing the size of this and making the top one smaller that the power is made equal to a 52in. driving wheel, so that with each revolution of the pedals the driving wheel advances over 13ft. 7in., instead of only 10ft. 5in. A chain passes round both wheels, as usual. The axle has plain bearings, but they are fitted with the universal joint, which effectually prevents any straining of the bearings. The pedals have a 6in. throw, and the tread is only 7½in., and at the lowest point of the stroke the pedal

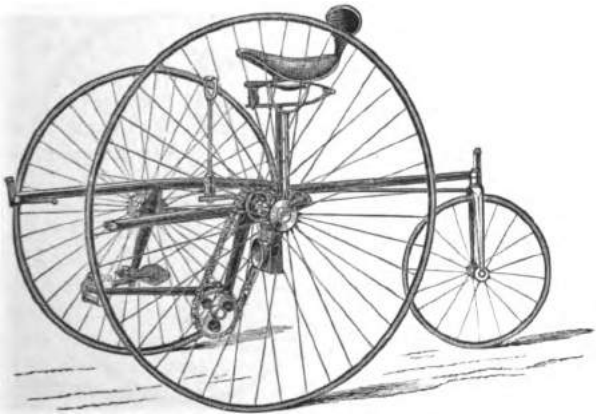

FIG. 4. THE R. A. TRICYCLE.

comes within 3in. of the ground. Ball bearings are put to the larger wheels, and the noted "Club" cones to the back, which, by the way, has a "centre" head, with a cover to prevent dust getting in. The wheels also partake of the Club pattern, and have the famous hollow felloes, which consist of a steel tube rolled into a double half moon shape. This is immensely strong and very light. About fifty-two or fifty-four strong spokes are held by large nipples into iron hubs. Hancock's best rubber tyres are adopted, the size being ¾in. and ⅝in. respectively. The remaining points are well and favourably known in connection with the firm's other steeds. As to width—the rock whereon so many riders and makers split—it is from centre to centre of the two main wheels 29in.,

inside 25in. (elbow room), while the extreme outside measurement is 35in., so that it can be navigated through any door that is a yard wide.

The R. A. has many advantageous points. It is extremely handy, elegant, portable, and light—only 74lb—about the lightest we have scaled, and by the saddle being so directly over the work there is no loss of power. We expect to see the R. A. a great (and deserved) favourite. The price, elegantly painted and part plated, is £18 18s.

5. *The Club Tricycle* (Coventry Machinists Company).—One objection to the ordinary tricycle is the fact that it makes three wheel tracks, and, consequently, causes more friction, as the road must be taken as it comes, and good spots cannot be picked, for if one, or even two, wheels escape a

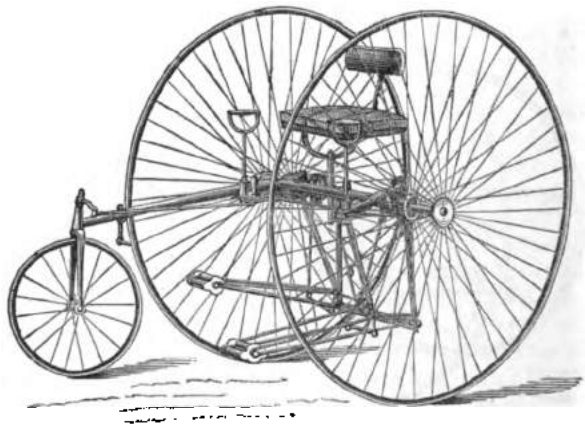

FIG. 5. THE CLUB TRICYCLE.

rough piece, the third is sure to bump over it, disturb the peace of the rider's mind, and shake his body. In this make the difficulty is overcome by its only having two tracks, and another great point is also gained, by using both wheels to attain the progressive action. By an ingenious arrangement, either or the pair can be thrown out of gear. This is effected by the handles, but chiefly automatically, as the mere effect of turning to either side throws the wheel that side out. To explain. The handles are 22in. apart; they can be raised or lowered to suit the height of any rider. The right handle is the chief agent; it is just before the seat; the bottom of the handle is fitted with an eccentric, which acts on rods connected with the toothed flanges of the wheels. The left wheel is

controlled by a light bar, which crosses the machine; a bent bar moves the right. On the inside of each hub the flange is cut into six notched teeth; opposite this, sliding on the axle, is a collar with its outer face in the form of a clutch, with sixteen teeth notches to correspond with those of the hub. This collar is worked by the rods already mentioned. Ordinarily, both are "in," and the wheels drive as if fixed to the axle, but are released for turning. In running down hill, by turning a small handle which is placed low down on the left side, and locking the latter back, so that it cannot slip, the pedals may be used as foot rests, and the right handle is left free for its original purpose, that of guiding, and as both clutches are "out," the steering is solely effected from the small wheel by a pinion fixed to the rod of the right handle and joined to a short arm projecting from the Stanley head of the pilot wheel.

The main framework consists of steel tubing, and is very strong, the chief cross-bar being 22in. long and 1¼in. in diameter; it is placed 4in. in front of and just above the axle; this supports and braces together the front part of the frame. On the right side an oval tube is carried out for 31in. in front, and to the extremity the small wheel is placed; it is exactly before and in a line with the large one, so that it goes in the same wheel track. The total length of the axle, *i.e.*, extreme width of machine, is 38in., or 26½in. measured from wheel to wheel (inner hubs). The flanges, projecting an inch on either side, make the distance between the teeth on the hubs 24½in., but the rider has about 30in. elbow room. The axle itself is double cranked, the bends being 9½in. apart, with a clasp placed over each. This axle supports what are known as the "rocking" levers, which are on a curious principle. A single thin rod (15½in. long) is hinged to the clasp, runs down to the front arm of the "cradle," and passes through a double or loop rod, the top of which end is hinged to the main bar of the framework, and the lower similarly fixed to the back arm of the cradle. The actual levers are 25in. long. The rear ends work on a steel cross-bar, 16½in. long; it is supported by two steel tubes, which connect it with the top framework by means of the continuation of the top cross pieces; the whole arrangement is very firm and rigid. Four rods form each lever; two main ones braced up by a thinner, which is arched over a bridge near the centre. This imparts great additional strength. Six inches from the end of the lever the cradle is placed; it consists of a two-armed rest; the arms are 2½in. long and placed at an angle of about 45deg., being bolted to the connecting rods as already mentioned. The cradle "rocks" when the pedals are being worked, this being the origin of the title. The object of the dual or loop rod is to afford a purchase for the other to pull against and to hold up the cradle and levers. The cradle works freely on a steel pin between the lever

rods. By this arrangement the length of leverage is 19in., and as the pedals are within 4½in. of the ground at lowest point, and about 15in. at the highest, the stroke is rather over 10½in., while the tread is only 9in., so that tremendous power ought to be got up.

Coming to the seat, we find that form of support for the body is always adopted. It is 16in. long by 8½in. broad, and covered with a soft cushion, held in a wooden frame, with side arms, back rest, &c. This is supported in front by a bowed spring and rubber buffers, and the whole held by a rod, which passes through a boss on the rear side of the main bar, by means of which it can be raised or lowered some five inches, the general height (medium) being 8½in. above the axle. Owing to the many parts and the new principles involved in the Club, it is rather difficult to describe, but we hope that, with the assistance of the accompanying block, our remarks will be understood. The wheels are of the ordinary Club type, and generally 52in. in diameter, with ⅞in. Hancock's red moulded tyres, the hollow felloes, iron hubs, nipple spokes, &c. Roller bearings are applied to the supports of the framework over the axle, and the noted cones to the front (small) wheel; the latter is 18in. high, and touches the ground at a point 32in. in front of its "following" companion; the large being 31in. apart, measured in the same way. For brake power, a short lever, having a coned roller at one end and roughed projection at the other, is placed just in front of the right wheel, and fixed to the bar which runs out to the small wheel. To apply the brake, the lower arm is pushed out by the right foot, making the roller press firmly into the tyre. Lubricators are fitted to all oiling parts, and the pedals are like those of a bicycle, and run on cones.

The Club Tricycle has many special attractions, especially in the utilisation of the driver's full power, by using both wheels instead of only one, as already explained, and the steering facilities are unexcelled, though it will not turn in a very small space; it requiring a breadth of about 12ft. or so. We have frequently pointed out that the wheels should be arranged so that the rider has a clear space in front, although some—both cyclists and makers—prefer the other way; the former is found here, and it can be easily mounted. Despite its weight, 93lb., it runs very easily, and will prove a valuable roadster. It is handsomely painted and part plated. Price £22 for a 52in.

6. *The Swing Lever Tricycle* (The Toledo Steel Company, Volante Bicycle Works, Eden-street, Hampstead-road, London, N.W.)—This firm have lately, with the help of Mr. Davies, as patentee, introduced several types of machines, and, among other novelties, a curious foot action, from the "swinging" motion of which the above name is taken. It is quite different from any other machine we have seen, and the movement of the

pedals is more of a push-forward with a sudden upward thrust than the ordinary. One ruling characteristic of all this group of tricycles is that they are worked on the up-stroke, and not on the down-stroke, and in the one now under notice it is more like back-pedalling all the time. The actual levers are pretty long, and bent into what may be termed the segment of a circle; the tail end is affixed to the cranked parts of the axle by means of a case containing roller bearings, to lessen the friction. The fulcrum consists of a rod, 13in. long, hinged to the front portion of the frame, and also hinged to the lever. These rods swing with the rise and fall of the pedals, and impart the curious motion spoken of. The pedals are brought well under the seat, and, instead of the stroke being a downward curve, it is really like back-pedalling. At the finish of the stroke the pedal "kicks up," lifting up the feet suddenly (something like the "quick return" of the Coventry Machinist Company's "Speed" Bicycle). The motion is strange at first, but this wears off, and those who have tried it seemed well pleased with the change. The front end of the levers branches out into a prong, between which the pedals are placed. The throw of the pedals—usually 10in. long, while the height (i.e., rise and fall) is only 4in.—can be changed by regulating the length of the swinging rod.

An oblong framework supports the seat, and forms the body of the machine; this consists of an iron tube (with rounded corners) at both sides and back, but the front crosspiece is a solid bar. The frame is continued out on both sides; it dips down, is carried very low, and turns into the front small wheel, which will be found only 16in. high. The seat is firmly supported by two bowed springs, working in slots on the rear bar, but held by adjustable balls, which screw through a bracket on the front crosspiece. By means of these the height can be adjusted as required for different riders; the seat is slightly tilted forwards. Steering is effected from a handle, not of orthodox spade shape, but a simple lever, which, instead of being turned is depressed or raised; it acts on the steering wheel by means of the usual rod and arm bracket. This form of guiding is preferred by the makers to the rack and pinion; the handle, however, does not offer so firm a grip until one has become accustomed to its use, and can pull at the proper angle without affecting the rudder.

Both wheels run on the axle, which is 3ft. 2in. long; this gives the total width of the machine. The general size is 50in., and only the left wheel is used for driving, the right being free upon the axle. The wheels have crescent rims, fifty direct spokes, iron hubs, rubber tyres ¾in. diameter, and the brake power is gained by the "strap;" a wooden block 4in. in diameter is fixed on the axle at the left side; round this there is placed a loop or ribbon of steel, both ends of which are hinged to the left handle.

On pressing this out the band is tightened, and the revolutions of the axle therefore checked; it is powerful in action. The best materials are used for its construction, and all wearing parts are thoroughly hardened. We found the total weight of the machine to be 77lb., and price about £13 10s.

7. *The Lever Tricycle.*—This is the original tricycle made by the Toledo Steel Co. The wheels, &c., are the same as in the above, but the body of the machine is an oblong framework, 27½in. by 13in. The main part comes out in front and slopes down to the front wheel, as in the foregoing. The levers are from 28in. to 30in. long, and 10½in. to 12½in. from the end, and they are hinged to a rigid bracket support formed by two rods, which run down from the front and back of the frame. By this a direct leverage of about 18in. is gained, and, by the position of the fulcrum when the

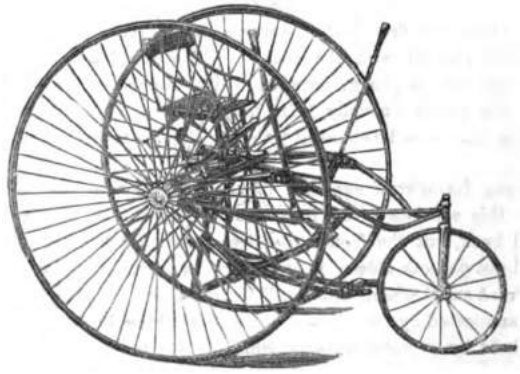

FIG. 6. THE LEVER TRICYCLE.

pedal is pressed down, the end of the lever rises, and by the connecting rod (15½in. long) pushes up the cranked axle, and helps to lift and force forward the machine. These arms can readily be adjusted; and thereby the length of the stroke regulated some 5in. or 6in. Each lever consists of two flat iron bars braced together and perfectly straight. The pedals can also be altered by means of three holes. The rise and fall of the treadles is 12½in.; 50in. wheels are used, and the extreme width, from outside to outside, is about 44in. In order to gain extra power hand levers are also made use of. Old riders may possibly remember a popular tricycle in 1869 (made by C. P. Button, 143, Cheapside, E.C.), called the Rantoone, in which both arms and legs were made use of. It was brought to our recollection by the present lever, allowing, of course, for the lapse

of time and consequent improvement. The arm levers are either single or double, the former being the general system; the handle is hinged to a boss (about 19in. in front of the axle) projecting from the inside of the tube framework, and has a rod (22in.) hinged to its lower extremity; the rod, in turn, is clasped round the axle, which has another bend, for the purpose of applying force. By this plan there is no dead point, and full power can be put forth by either one or both arms; one is preferable, as then the right can be used for steering. At any time the hand lever and its connections can be removed (either or both); the machine then becomes an ordinary lever. A ground brake is employed. Just under the left (fixed)

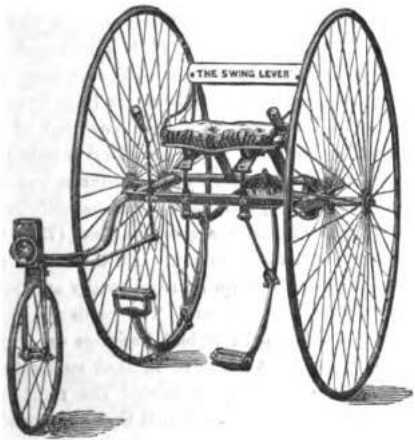

FIG. 7. THE TWO-TRACK SWING LEVER TRICYCLE.

handle, there is a small lever, easily grasped with the fingers, which, by means of rods, causes a shoe to act on the ground as a drag. The price of a machine without hand levers is £16 10s.; with one, £17 17s.; with both £18 18s., and the weight, in the first case, 94lb.; with one, just over 100lb.; and with two, about 106lb. Best roller bearings are used to parts where much friction arises.

8. *The Two Track Lever.*—Another variety with but slight variations, chiefly in the oblong frame and arrangement of wheels. The former is reduced to 21½in. by 14in.; owing to the decreased width of the machine it is just under a yard—to be exact, 35½in. Two bowed springs support the seat, as in all varieties. The hollow outer frame is only continued out on the right side, and in place of turning toward the centre it bends

slightly downward and to the right, where it is joined to the head of the small wheel. This is placed immediately in front of the right large wheel, and, consequently, there are only two wheel tracks, a feature desired by many but attained by few, as it saves an immense amount of friction, and, moreover, it is easier to pick out a good piece to travel on when going over an indifferent road; besides the rider is spared the terrible jolting occasioned by three wheels, each bumping over a distinct portion of the highway; the whole machine is more compact, and the rider has a clear space in front, so that mounting and dismounting are easy, and there is none of that caged-in feeling common to those who use machines with a small wheel in front. A strap brake, acting round a wooden sheave, as described before, is applied, and everything else is the same. Price £15 15s. The weight, too, is reduced to 85lb. avoirdupois.

9. *The Two Track Swing Lever Tricycle.*—Yet another description, or rather a blending of other sorts. The illustration (Fig. 7) explains it. The principle and position of the wheels is the same as that of the two track lever with the swinging levers. The front wheel is only 16in. high, and one peculiarity is that it runs very truly, and requires but little attention in the way of steering. All parts have plain, beautifully cut, and well hardened bearings. The weight is a good deal less (75lb. to 78lb.), and the seat has a back rest and easy cushion. All the machines sent out by the firm are to be fully depended on as trustworthy and sound in every respect, and deserve to be well-known. The price for the Two Track Swing Lever Tricycle is £13 10s.; if ball bearings or other extras are added, they are, of course, not included in that moderate price. The small wheel is placed either before or behind the right or left wheel, according to order, but its general position is that mentioned.

10. *The Meteor Tricycle* (Starley and Sutton, Meteor Works, West Orchard, Coventry).—During the last few months this firm have shown an extraordinary fertility of resource in respect to three-wheelers. Their old productions have been either entirely replaced or improved beyond all knowledge, and in addition several new types have been introduced, prominent among which stands the Meteor. The outline of its construction is that of which we have so often spoken favourably. The framework is of steel tube, rounded at the back, with the front legs bent down, and from the centre the backbone runs out horizontally for 25in., and by means of a socket head holds the 22in. guiding wheel, which runs on cone bearings. An arm 5in. in length projects from the right side of the head, attached to which is a light rod, which runs to below the right handle. The last 9in. of it is notched with teeth, acted on—rack and pinion-wise—by a small wheel at the lower extremity of the handle. In more than one point the Meteor differs from other machines. Instead of the wheels

working on a common axle, each having an independent support, and their respective axles are bolted to brackets affixed to the "legs" of the frame at a height of 20in. from the ground. This determines their size at 40in. Contrary to general rule, this machine is driven from the right side, and the axle, with an extreme length of 24in., is placed between the ends of the "legs," here 21in. apart, and outside the right is placed a 9½in. skeleton cog-wheel. A chain passes round this, and one of 7½in., which is fixed to the axle of the right wheel. The pedals are of wood, large and flat, with a throw of 6in. and a "tread" of 8in. Either a seat or Lamplugh and Brown's new saddle. When the former is used it rests on a low spring, which, besides being easy, imparts a rolling motion, and thereby throws more weight into each down stroke. The main support is a bar, passing through the solid boss where the backbone joins the frame. It has a deep groove, into which is screwed a bolt, so that the height can be made to suit the rider. The handles are just above the level of the seat, a little in front of it, and 20in. apart. The right is for steering; and guiding is effected by a half turn of the wrist. The left is a fixture, and just below it is placed a small lever, which acts on a thin rod attached to the top arm of a very powerful spoon brake, which acts on the rear wheel. Other details offer no special point for comment. The wheels have the usual sized rubbers and half-moon rims, fifty charcoal iron spokes lock nutted into broad strong iron hubs. The tracks of the front wheels are 31in. apart, the back wheels resting on the ground 41½in. behind. The extreme breadth is about 40in. This can be increased or decreased as desired. In order to pass through a doorway the left wheel may be rapidly "unshipped" by unscrewing the bolt. This reduces the width 9in. The total length is 70in. to 71in. The machine turns to either side with equal facility—an advantage not possessed by many. The weight averages about 75lb. The bearings are either hardened parallel or the maker's improved rollers. The whole machine is neatly painted, and it not only presents a pleasing appearance to the eye, but its thoroughly workmanlike shape will be a strong recommendation to riders, and it is certainly cheap at £16. It may be inspected at the London agents, Cooper, Box, and Co., 103, Queen Victoria-street, E.C. The makers have several other designs, notably their latest, the Princess, only for ladies or children, built very much like the above, only much lighter and more compact.

The Tricyclists' Guide to Machines and Makers.

In all tricycles the seat is made adjustable to suit persons of different heights.

Most machines, not specially designed to reduce in width, can be reduced by removing one wheel.

The sizes in block type are Standard sizes.

The following diagram shows the position of the wheels in all the different tricycles yet made. The numbers accompanying them are those referred to in the Guide. The wheels are indicated by lines—the thick ones being the DRIVING wheels, and the front of the machines face the right hand:

EXPLANATION.

Bearings of Driving Wheel or Wheels.	Reference Number to shew position of Wheels.	Cushioned Seat or Saddle.	B—Balls. C—Cones. P—Parallel. R—Rollers. Lr—Lever Motion. Ry—Rotary Motion. Cs—Cushioned Seat. S—Saddle. L—Lady. G—Gentleman.
Bearings of Guiding Wheel or Wheels.	Rotary or Lever Motion.	Suitable for Lady or Gentleman.	

SIZE, NAME, PRICE AND MAKE OF MACHINE.	Weight.	Width. Ordinary.	Width. Reduced.	Throw of Cranks or Stroke of Levers.	Brake.	Extras.	Specialities.
	lbs.	in.	in.	in.			
Advance—No. 1. J. BEECH, Gladstone Works, Wolverhampton. £ s. d.							
B 1 S / B Lr G — 48 50 52 54 56 — 14 0 0	80	36	—	10	Lever Spoon.	—	All bright.
Advance—No. 2. B 1 S / B Lr G — 48 50 52 54 56 — 12 0 0	80	36	—	10	Lever Spoon.	—	
Bedford. G. WOOTON, Gwyn-street, Bedford.							
F 9 C^s S / F Ry^a L^r L G — 50 52 54 — 16 0 0	90	39	—	6	Front Spoon.	—	To seat two Persons, front wheel ridden like a Bicycle, riders sit dos-a-dos.
Broad Arrow—No. 1. E. A. TRANTER, Trowbridge.							
B 3 C^s S / B Ry^a L G — 50 — 20 0 0	58	38	—	6	Friction bands.	With plain bearings £4 less. Plated £5 extra.	
Broad Arrow—No. 2.							
F 3 C^s S / F Ry^a L G — 50 — 17 0 0	80	36	—	6	Friction bands.	Plated £5.	

SIZE, NAME, PRICE AND MAKE OF MACHINE.	Weight.	Width. Ordinary.	Width. Reduced.	Throw of Cranks or Stroke of Levers.	Brake.	Extras.	Specialities.
		in.	£ s. d.	lbs.	in.	in.	
Celer et Audax. W. LEWIS, Cleveland-road, Wolverhampton.							
P 2 S / P B^{J} G	85	39	50…12 0 0 52…12 5 0 54…12 10 0 56…12 15 0 60…13 10 0	—	6	Friction bands.	—	Rider sits as on a Bicycle and drives direct on axle, small hind wheel acts by the swaying of the body.
Centaur—"Compressible." CENTAUR BICYCLE AND TRICYCLE CO., Coventry.							
P 10 C^{s} / P B^{J} L G	48 50	40	16 10 0…65	30	5½ to 6	Friction bands.	Saddle and springs, 10s., ball bearings to driving wheel, £1, to steering wheel, 10s.	Compressible without detaching any part, Interchangeable seat.
Centaur—"Special."							
P 10 C^{s} / P B^{J} L G	48 50	38	16 10 0…65	—	6	Friction bands.	As Compressible.	Adjustable handles and seat.
Centaur—No. 1.							
P 10 C^{s} / P B^{J} L G	48 50	38	16 0 0…65	—	5½ to 6	Friction bands.	As Compressible.	Adjustable handles. Interchangeable seat.
Centaur—"School."							
P 10 C^{s} S / P L^{J} L G	30 to 45	30	32… 6 10 0 34… 6 10 0 36… 7 0 0 38… 7 10 0 40… 8 0 0 42… 9 0 0 44…10 0 0	—	10 to 12	—	—	Steers with Bath Chair Handle.
Challenge—No. 1. SINGER & Co., Coventry.							
B 1 C^{s} / B L^{J} L G	80	36	42…20 0 0 46 48 21 0 0 50	22	12	Spoon on Driving Wheel applied by foot.	Bright £3 10s. Plated £6. Spokes £1 10s.	Folds to reduce width by merely slackening nuts.

SIZE, NAME, PRICE AND MAKE OF MACHINE.	Weight.	Width. Ordinary.	Width. Reduced.	Throw of Cranks or Stroke of Levers.	Brake.	Extras.	Specialities.
	lbs.	£ s. d.	lbs.	in.	in.			
Challenge—No. 3. SINGER & Co., Coventry. B 12 C B E L G	48 50 52	16 0 0 16 0 0 16 10 0	75	36	6	Friction bands.	As No. 1.	Fitted with Screen to hide feet for Ladies. Price £18 for 50in.
Champion. A. MARKHAM, 345, Edgware-road, London, W. P 2 C P L L G	50	16 0 0	75	36	12	Spoon Driving Wheel.	—	
Club. COVENTRY MACHINISTS' Co., Coventry. B 5 C B L L G	48	22 0 0	80	38	12	Spoon on Driving Wheel applied by foot.	—	Patent rocking Lever Action. Both wheels can run free down hill and treadles remain stationary.
Compressus. STARLEY AND SUTTON, Meteor Works, Coventry. P 11 C P E L G	48	17 17 0	75	39	30 or 6	Front Wheel Spoon worked by foot.	Ball Bearing, 12s.	Driving wheel and frame detaches from frame carrying large wheels, which compresses, and so can be stowed away in any corner.
Compressus—No. 2. STARLEY & SUTTON, Meteor Works, Coventry. P 11 C P E L G	48	17 17 0	70	39	30 to 6	Front Wheel Spoon worked by the foot.	As No. 1.	This Machine is made double to carry two persons. Price £24.

SIZE, NAME, PRICE AND MAKE OF MACHINE.		Weight.	Width. Ordinary.	Width. Reduced.	Throw of Cranks or Stroke of Levers.	Brake.	Extras.	Specialities.
Convertible—when Double. CENTAUR BICYCLE AND TRICYCLE CO., Coventry.								
	in. £ s. d.	lbs.	in.	in.				
B | 10 | C^2 / B | B^T | L & G	**50**...21 0 0	100	56	—	6	Friction bands on both Wheels.	32in. Wheel, &c., to convert into single Machine, £3 3s.	Adjustable Seats. Steers with Bath Chair handle and Semi-circular rack.
Convertible—when Single.								
B | 15 | C^6 / B | B^T | L G	**50**	—65	29	—	6	Friction band on one Wheel.	—	
Coventry. TANGENT AND COVENTRY TRICYCLE CO., Coventry.								
P | 8 | C^6 / C | L^T | L G	50...18 0 0 52...19 0 0 54...20 0 0 56...21 0 0	80	33	—	12	Friction band.	Either machine can be made double to carry two persons at £5 extra.	Extra treadle to get shorter stroke at will.
Coventry—Rotary.								
P | 8 | C^6 / C | R^T | L G	50...18 0 0 52...19 0 0 54...20 0 0 56...21 0 0	80	33	—	6	Friction band.		
Coventry Express. JACKSON AND DOUGLAS, Jordan Well, Coventry.								
R | 10 | C^4 / C | L^T | L G	40...16 16 0 44...17 17 0 48...18 18 0 52...19 19 0	74 ...	38	—	10	Trailing brake.	—	Wheels run loose when descending hills. Bath Chair Steering handle.
Coventry Perfection—No. 1. BAYLISS, THOMAS, & CO., East-street, Coventry.								
P | 10 | C^6 / P | L^T | L G	**46** 48 50 } 16 0 0	70 ...	36	—	10	Trailing brake.	—	

SIZE, NAME, PRICE AND MAKE OF MACHINE.	Weight.	Width. Ordinary.	Width. Reduced.	Throw of Cranks or Stroke of Levers.	Brake.	Extras.	Specialities.
Coventry Perfection—No. 2. BAYLISS, TIMMS, & Co., East-street, Coventry. £ s. d.	lbs.	in.					
P 10 C^s / P L^v L G — 46 / 48 / 50 — 16 0 0	70 ...	36...—...10			Friction band.	—	Side Steering handle, back arrangement.
Coventry Perfection—No. 3.							
P 4 C^s / C R^v L G — 48 / 50 — 14 0 0	65 ...	36...—... 6			Friction band.	—	
Coventry Perfection—"Sociable."							
P 10 C^s / P L^v L A G — 46 / 48 / 50 — 21 0 0	85 ...	52...—...10			Friction band.	—	To carry two persons. Each crank works independently of the other.
Desideratum. HARRINGTON & Co., Stewart-street, Wolverhampton.							
R 2 S / C L^v G — 50... ...15 0 0 / 52 to 56...16 0 0 / 56 to 60...17 0 0	60 ...	30...—...10			—	—	Rider sits as on a bicycle, but between two large wheels.
Devon. EXETER BICYCLE & TRICYCLE Co., 10, Sidwell-street, Exeter.							
P 10 C^s / C R^v S L G — 52...21 0 0	...96	...39½	...—...	...5½	Shoe Brake, applied by foot.	Both middle and seat, £1 1s. extra. Plated, £4 10s. extra.	Saddle or seat on patent rolling principle. No dead centre of pedals. Cannot be worked backwards.

SIZE, NAME, PRICE AND MAKE OF MACHINE.		Weight.	Width. Ordinary.	Width. Reduced.	Throw of Cranks or Stroke of Levers.	Brake.	Extras.	Specialities.
Dublin. SINGER & Co., Coventry.	in. £ s. d.	lbs.	in.		in.			
P 1 C^{4} / P L^{F} L G	40...16 0 0; 42...18 10 0; 44...19 0 0	80	36	—	9	Spoon driving wheel.	Screen to conceal feet, £2 extra, others as "No. 1 Challenge."	Motion of pedals is oblique and not perpendicular as in "No. 1 Challenge."
Emperor. DENNE & Co., Station-street, Sittingbourne.								
P 2 C^{6} / C B^{J} L G	52...12 15 0	56	36	—	7	Friction band.	—	
Excelsior—No. 1. BAYLIS, THOMAS, & Co., Coventry.								
B 4 C^{6} S / B B^{J} L G	48, 50 — 16 16 0; 52, 54 — 17 6 0	75	36 or 39	—	6	Friction band.	Plated all over, £6. Hubbs, spokes, and handles, £2.	Patent gear in lieu of chain gear. Ball bearings to all moving parts. Brake on medium sized wheel if desired.
Excelsior—No. 2.								
C 4 C^{6} S / C B^{J} L G	48, 50 — 14 0 0; 52, 54 — 14 10 0	80	39	—	6	Friction band.	As No. 1.	
Excelsior—Hand Lever.								
B 4 C^{6} / B L^{H} L G	44, 46, 48 — 18 18 0	86	39	—	10	—	—	For ladies and gentlemen having the use of their hands only.
Fairy. J. RICHER & SON, Crossley Villas, Twickenham.								
E 7 C^{6} / C L^{F} L G	48, 50 — 14 10 0	57 & 61	30	—	9	—	Brake, 10s. Drawer under seat, 5s.	

SIZE, NAME, PRICE AND MAKE OF MACHINE.		Weight.	Width. Ordinary.	Width. Reduced.	Throw of Cranks or Stroke of Levers.	Brake.	Extras.	Specialities.
Flying Dutchman. HILLMAN, HERBERT, & COOPER, Coventry.	in. £ s. d.	lbs.	in.	in.				
P 4 C⁸ S / B R.⁷ L G	**48**…16 16 0	76	39	—	6	Friction band.	All bright £2 10s. Plated, £3.	Machine on which 50 mile championship was won, 1879.
Flying Eagle.								
B 14 S / C L⁷ G	46…15 0 0 **48**…15 0 0 50…15 0 0	60	30	—	10	Spoon on driving wheel.	Ball bearings to back wheels, £2 extra.	
Household—"Bi-Tricycle." R. E. PHILLIPS, Dinham, Ludlow.								
B 1 C⁸ S / C L⁷ L G	**50**…18 0 0	65	36	24	10	Spoon on Driving Wheel.	Rotary instead of Lever motion, £2. Cushioned Seat, 10s.	This Machine is similar to the Challenge No. 1, and can be converted into an ordinary Bicycle in a few minutes, and so is suitable to any members of a family.
Imperial. W. SMITH, Crocus-st., Nottingham.								
B 10 C⁸ B / C L⁷ L G	50…17 10 0	75	39	—	9½	Friction band.	—	Machine can be made for two riders sitting dos-a-dos, price £25, and is provided with gear wheels to work two to one up hill, and one to one on the level.
Leopold. E. A. TRANTER, Trowbridge.								
P 8 C⁸ & S / P B⁷ L G	46…15 10 0 48…16 0 0 50…16 16 0 52…17 10 0	65	28 to 32	—	5½	Friction band.	Roller Bearings, £1.	

SIZE, NAME, PRICE AND MAKE OF MACHINE.	Weight.	Width. Ordinary.	Width. Reduced.	Throw of Cranks or Stroke of Lever.	Brake.	Extras.	Specialities.
		in.	in.	in.			
Lever—No. 1.							
TOLEDO STEEL Co., Eden-street, Hampstead-road, N.W.							
F 16 C C L L G	£ s. d. 50...16 18	lbs. 0...68	44...—...10		Friction band.	Brake to act direct on Crank, 12s. Pulleys and gut to drive both large wheels on two track Machines only, 17s. 6d.	Works with hand and treadle motion. Machine can be made to run in two tracks if desired, as No. 3 or 6 in diagram.
Lever—No. 2.							
F 16 C C L L G	50...16 16	0...64	44...—...10		Friction band.	As No. 1.	Works with Treadles only, can be made to run in two tracks if desired, as No. 1 machine.
Lever—No. 3.							
F 16 C C L L G	50...16 0	0...65	44...—...		Friction band.	As No. 1.	To work with Hand Levers only, can be made to run in two tracks, as No. 1 machine.
Meteor.							
STARLEY & SUTTON, Coventry.							
B 3 C C B L G	40...16 0 0 44...16 10 0 48...17 0 0	65	39...—...	5½ or 6	Hind Wheel Spoon.	Ball bearing, 12s.	Chain wheels are proportioned, so that a 40in. wheel equals a 50in. ; 44in. a 55in., and a 48in., a 60in.

SIZE NAME, PRICE AND MAKE OF MACHINE.	Weight.	Width. Ordinary.	Width. Reduced.	Throw of Cranks or Stroke of Lever.	Brake.	Extras.	Specialties.
		in.	in.	in.			

Nancy Lee.

SOUTH LONDON MACHINISTS' Co., Great Suffolk-street, Southwark, London, S.E.

	£ s. d.	lbs.	in.	in.			
B 16 C C LF L G	46...14 0 0 48...14 10 0 50...15 0 0 52...15 10 0	50 ...	30	—...10	—	Aprons, £1 10s.; to carry two persons, £3; plated, £10; bright, £5; brake, 10s. 6d.	Bath Chair Steering Handle, mud guards to all wheels.

Phillips.

R. E. PHILLIPS, Dinham, Ludlow.

B 2 5 S B BF G	50	16	16	0	0...65	33...—...	6	Friction bands or spoons on Driving Wheels.	—	This Machine can be ridden and steered without the use of the hands, the motion being similar to a Bicycle.

Princess.

STARLEY & SUTTON, Coventry.

P 3 C C BF L	36	15	0	0	0...55	39...30	5 or 5½	Hind Wheel Spoon.	Ball bearing, 12s.; plated, £5.	Same as "Meteor," with guard for dress.

R.A.

COVENTRY MACHINISTS' Co., Coventry.

B 4 S B BF G	40	18	18	0	0...64	35...—...	6	Lever Brake applied by foot.	—	Driving wheel speeded, so as to equal 50in. Rubber Suspension Spring.

Salvo—No. 1.

STARLEY BROS., Coventry.

F 10 C F BF G	50	19	0	0	0...90	42½	...—...6	Friction band.	Hall plated, £3; pair of Carriage Lamps, £1 10s.; Salsbury Lamp 10s.	Small safety wheel behind; both wheels drive.

SIZE, NAME, PRICE AND MAKE OF MACHINE.	Weight.	Width. Ordinary.	Width. Reduced.	Throw of Cranks & Stroke of Levers.	Brake.	Extras.	Specialities.
	in.	£ s. d.	lbs.	in.	in.			
Salvo.—No. 2. Starley Bros., Coventry.	P 10 C P E L	46	18 10 0	80	37½	—…5½	Friction band.	As No. 1.	As No. 1. Weight, with 40in. wheels, 70lb.
Sociable. Starley Bros., Fleet-street, Coventry.	P 10 C P E L G	50	24 0 0	…	57½	—…6	Friction band.	As No. 1 Salvo.	As No. 1 Salvo.
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Telescopic. Hutchins and Hickling, 30, Queen Victoria-street, E.C.	P 10 C P E G	40 50 52	17 10 0	70…39	30…	5½ & 6	Friction band.	—	Width is reduced by removing two pins, without the aid of a spanner.

	SIZE, NAME, PRICE AND MAKE OF MACHINE.		Weight.	Width. Ordinary.	Width. Reduced.	Throw of Cranks or Stroke of Levers.	Brake.	Extras.	Specialities.
Tom-tit.									
STARLEY & SUTTON, Coventry.									
	in.	£ s. d.	lbs.	in.	in.				
P | 14 | C^s S / C | B^J | G	24	12 12 0	49	30	—	5¼ to 6	Front Wheel. Spoon.	Cushioned or new leather seat, 10s.; ball bearing, 12s.	Driving Wheel is geared so as to equal a 48in.; by pushing back a spring, can be taken into two parts and stowed away in any corner.
Triumph.									
WARMAN, LAXON, & Co., Victoria Works, Coventry.									
P | 4 | C^s S / P | B^J | L G	48, 50, 52	16 0 0	60	39	—	6	Spoon on hind Wheel.	—	Adjustable handles.
Triumph—Folding.									
P | 13 | C^s / P | B^J | L G	48, 50, 52	16 10 0	60	39	30	5¼ to 6	Friction band.	—	Width reduced by slackening two set screws, and pushing small side Wheel under Machine.
Velocita.									
J. BICHER & SON, Twickenham.									
B | 13 | C^s / C | L^F | L G	46 / 48 / 50 / 52 / 54 / 56	14 0 0 / 14 10 0 / 15 0 0 / 15 10 0 / 16 0 0 / 16 10 0	61	30	—	9	—	To carry two riders, £3; brake, 10s.; drawer, 5s.	

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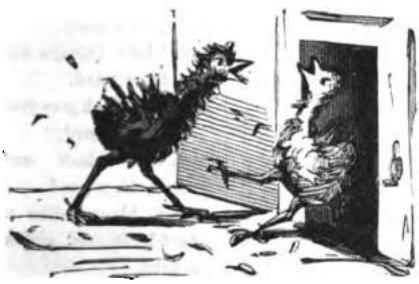

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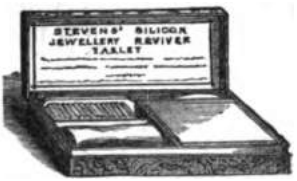

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INTRODUCTION.

ONCE more we submit our annual work on Bicycles and Tricycles of the Year. As in previous issues, all the descriptions contained therein are written from notes made during personal examinations, and they may be relied on for strict accuracy and absolute impartiality.

A word as to weights. The public have long since learned to take bicycle makers' statements *cum grano salis*, but it would require a very mountain of salt to take in most of the weights put forth by the trade. It is a matter of far greater importance than may be thought at the first glance. When machines are advertised as being especially built for ladies and children at the professed weight of 55lb. to 60lb., purchasers naturally expect something about that, and are therefore disgusted when they receive a machine weighing 90lb. to 100lb. In order that our readers may be correctly informed on this point, we make it a standing rule to weigh every machine we examine. Hence the discrepancy between the weights we give and those in the price lists.

Ladies are now, we are glad to say, joining the ranks of cyclists in rapidly increasing numbers. We use the word "cyclists" advisedly, for is not bicycling now thrown open to the fair sex through the Otto bicycle?

BICYCLES.

1. The Special Club Roadster (Coventry Machinists' Company, Cheylesmore, Coventry).—This bicycle has been still farther revised and corrected for the coming season. Every point has been studied, and the result is very gratifying to all concerned — maker, buyer, and rider. Taking the forks as the starting point, they are of tubular steel, double fluted, and hollow up to the head. The arch being made very broad

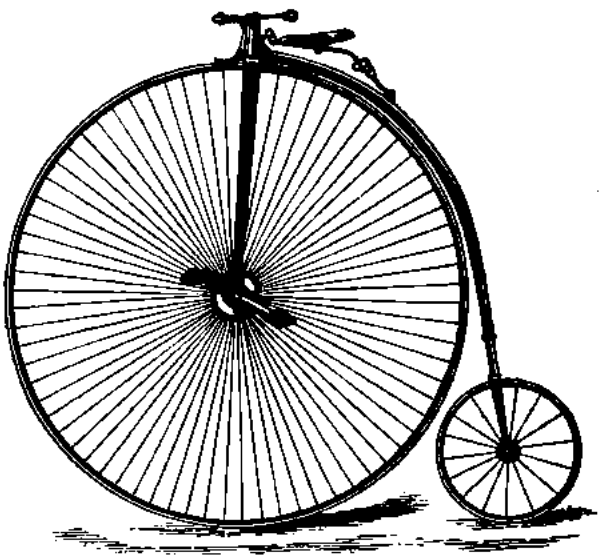

Fig. 1. The Special Club Roadster.

is exceptionately strong, and imparts great rigidity to the forks, which taper from 1¾in. broad to ¾in. near the bearings. The Stanley head is compact, neat, serviceable, but short, the handles being only 4¾in. (to the centre of the bar) above the tyre. In place of the top nut sticking out and forming a dangerous projection, it is countersunk in the boss or journal of the handles, so that it is flush with the top of the

bar; the latter is carried slightly forward and is two feet long—a length that gives full power over the driving, and effectually prevents any eccentric wobbling; the arms are also fully extended, and in going up hill great power can be put forth, as by pulling against the rod the weight is forced down on to the pedals. Fine large horn knobs are fitted to the ends. They are about the most comfortable we have felt in horn, as when made from that material they are generally so miserably small that they cramp and tire the hands. In descending a long, severe hill, a great strain is usually thrown on those fingers that clasp the brake. In order to obviate this the Club brake has two or three special points to be noted: first, the top bar, or lever, is longer than usual, and so is placed within easy reach of the hand; the other end has a corkscrew-like curl, which dips under the handle and keeps the upright bar of the brake close up to the head; the fulcrum is formed by a stud, projecting just above the crown of the fork arch, and the spoon is well shaped, the side lips turning down and the front up; it is also close to the head, thereby adding to the appearance. As to the check action, the upper bar, which runs parallel with the handles, has on the side next them a series of notches or teeth cut, which fit into a sliding clasp on the steering rod; this clasp screws into the journal of the handles when not required, and by it the pressure can be regulated to a nicety, as it is held by an arrangement on the lever, so that it remains fixed at any required force, thus leaving the hands entirely free for guiding. The dust cover to the head is a thin plated metal case, fitting closely half way round the Stanley head, and quite covering the opening; it is not only a great improvement, but protects the centres from all grit and dirt which otherwise would be thrown in and eat away the bottom cup, besides interfering with the free action of the centres which, by the way, are thoroughly hardened in this machine; the lower is a male and the upper a female cone.

Oval backbones are entirely employed, as they are capable of bearing a much greater strain, in the way that bicycle "spines" are affected, than the usual circular shape. They are also neat and light, and, owing to the extra depth, it throws the tyre into relief, and dwarfs it by comparison, making the felloe and rubber look smaller. The back forks are hollow and fluted, like the front; they are also strong and rigid. There is a solid bit between the termination of the hollow

portion of the backbone and the commencement of the back forks, and to this is attached the steps, slightly roughed, and 21in. above the ground.

For those riders who have not yet indulged in the luxury of the spring we will describe it. A small double-pronged projection sticks out from the top of the neck backwards. This supports a link, to which is fixed a block of rubber. The front end of the spring rests on the lower part of the rubber. A strong bracket is secured to the backbone and bent forward, and is joined to the main spring by a sort of double hinge. This merely acts as a connecting link, and does not form a rigid "join." The two ends of the bracket and spring overlap, and another rubber is placed between, so that bears all the weight. An ornamental plate, bearing the maker's name and address, covers the junction. By this means the whole weight of the rider is supported by rubber, and there is no "metallic vibration." This is the most desirable feature, and one of the greatest benefits that could be bestowed on a rider, as he is freed from the shaking usual with a rigid seat. The spring is only fitted to the Club, and to no other machine. Last year the blocks were sometimes complained of as giving way, but for this season some special ones have been prepared by Handcock and Co., which are not only handsomer, being of red rubber, but stronger and more lasting; even if they were to break no catastrophe would occur. The construction of the wheels is well known. The felloes are hollow steel tubes rolled into a double half moon section, combining great strength and lightness. The top ends of the spokes are held in the lower half of the rim, and screwed by the aid of nipples into solid iron hubs. The latter are now recessed in order to allow a portion of the case to slip in. The hubs are 5¼in. broad; the cranks are fluted, light and strong. The latter are fixed, not detachable, and have the usual slot for regulating the length of stroke. Either ball pedals or those with plain bearings, are used; the former are very easy, but the latter also run freely and cannot lock, as sometimes occurs with cones. The average tread is 14½in., or slightly more.

One of the leading features is the new ball bearings. They are on quite a different principle from any others, and in the outlines consist of a double row of balls. In the first place a collar, in the form of a rounded half cone, screws on the axle itself. The case has a central division, on each side of which is a rounded groove; a row of balls is

placed in each, and on the outer (or next crank) side the axle is tapped, and a cone corresponding to the inner (next hub) one is screwed on; the balls thus rest between the rounded sides of each groove, and not being tightly packed, do not grate against each other, gaining what the makers term "motion of translation." The outer face of the adjusting cone has a number of holes and the boss of the crank has a small hole drilled through it; a small steel pin is screwed into this; the end runs into one of the beforementioned holes, and prevents the cone twisting. When adjustment is required to be made, this pin is removed and the cone twisted round, by means of milled edge, until tightened, and the pin replaced. The whole workmanship is splendidly executed and thoroughly hardened. This bearing is one of the very best in the market, and were it only supplied to the general public, its inventors would do an immense trade, as by the double arrangement the balls are not so inclined to bite or bind, and, consequently, always run very freely, and either on the road or path would prove a valuable auxiliary to anything yet introduced. It is also wholly dustproof, as the inner portions project into the hub, and the adjusting cap overlaps the case on the outer, so that no grit can enter. There are sixteen balls on each side of the wheel; that is to say, thirty-two in all to the front wheel. Balls are also fitted to the back wheel, which runs very easily, and moreover, can be removed from the forks without any springing. In short, the Club is one of those sterling roadsters on which every reliance may be placed and journeys embarked on with perfect confidence as to the stability of the machine. The Coventry Machinists' Co. have here reached a higher point than ever in the estimation of the public. We may add that a 54in. weighs 43½lb., and costs £18 15s., a price at which it is very cheap, considering the workmanship.

2. The Invincible Racer (Surrey Machinists' Company, 85, Blackman-street, Borough, London, S.E.).—Great credit must be given to this energetic firm for the praiseworthy efforts they have made to render the bicycle lighter than is the general rule—but in this case it has not implied a mere reduction of weight, but actual increase in strength. This seemingly difficult problem has been solved by the extreme hollowness of their machines. This is carried to the greatest success in the rims, which have now earned a widespread fame. The felloes are made from the very finest thin sheet steel in two parts The lower

portion is ⅛in. in thickness, and is bent into a U shape; the top cover is ⅛in. thick, and is made with overhanging lips, which are brazed over the lower. The rim thus formed is simply marvellous in lightness and strength, and considerably startles those who see it for the first time. To look at it the weight appears heavy, but if taken up it seems an "airy nothing"; when tested as to its other qualifications

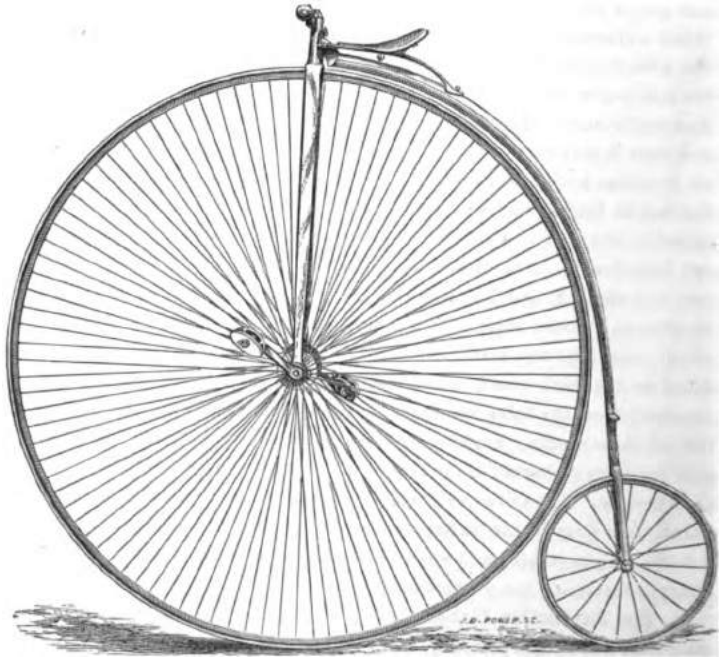

FIG. 2. THE INVINCIBLE RACER.

by holding it and jerking the hand up and down, it is found firm and solid, whereas an ordinary felloe would expand and retract to such an extent that the operator would be fearful of a collapse. Try a more severe ordeal: Take a light crescent steel 18in. rim, place it on the ground edgeways, and sit upon it, and a sprawl in the dust will be the

consequence, as well as a smashed up rim. Do the same with a S. M. Co. felloe, and it will form a strong and steady support for your weight, but by no means a comfortable seat; try to smash it by placing the foot inside, giving "a long pull, a strong pull, and a pull altogether," and the effort is futile. Two varieties of spokes are used, either direct, or those which screw into the felloe and are linked through the hub.

The special machine which we inspected was a noble 60in., constructed for the amateur champion, H. L. Cortis, of the Wanderers Bicycle Club, and we could have no fitter subject to build our description upon. In the first place, it is the lightest "sixty" ever built, but nevertheless is strong enough for almost anything. Only in size does it differ from other racers. One hundred very fine spokes, 16 gauge, are put into the front wheel; these are looped through the hub, about 1in. from its outer edge, and for that distance are brazed to it. They are carried back to the felloe tangentwise—*i.e.*, cross each other—so that they pull against one another, making the wheel more rigid. Half-rounded nuts are placed inside the hollow rim, and a small nipple screws up into this and holds the spoke head, so that adjustment, when required, is performed in an opposite manner to the usual rule. By screwing the nipples round, the spoke head is pushed further away from the hub, while the nut is drawn more firmly against the lower half of the felloe. This plan seems to answer capitally. The rubber placed to the front wheel is ⅜in., and that on the back ½in. They are cemented in, and the former deep or thick look about the rim does not exist to nearly such an extent, in fact, but little is observable between it and an ordinary; the total depth of tyre and felloe combined is only 1in.

The hubs are of gun-metal, 6¼in. wide (5¼in. or 6in. are put to smaller sizes) by 3¼in. deep. They are partly recessed in order to allow the bearings to fit closer. The last named are made on the Surrey Machinists' Company principle, a single row of ten balls, each ⅜in. in diameter. They are placed in a rounded case, with a deep groove, and touch each other all round, but are not too tightly packed. The case is adjusted on the Sheffield system, by bolts at each side; it is made to go partly into the hub, and, being well fitted, is very dustproof. For the back wheel a splendid bearing has been adopted; the mechanical principles on which it is constructed are excellent, and

differ from nearly all others in use. In most machines the balls are placed in the hub; by so doing they are brought closer together, and the steadiness of the wheel decreased. Moreover, as the balls are carried round by the revolving wheels they travel quickly over the small fixed cones on the pin, and, therefore, are inclined to wear much faster. Quite an opposite plan is carried out in the Invincible. Affixed to the inner side of each fork end is a small case, in both of these five balls are placed, separated by a perforated collar; the cones, with rounded grooves, are secured to the hub of the wheel, and the running surface they present to the balls, being, of course, very much smaller than the latter, a slow motion is imparted to them, thus reversing the usual order, while they run as freely as any. Another advantage is that an increase in the breadth between the balls is made, and, as explained above, this makes the whole backbone steadier. The hub is 3½in. broad by 1¼in. deep, and of gun-metal, and fifty spokes (twenty-five wires) are looped through in a similar manner to the front.

Before quitting the subject of wheels their extraordinary lightness deserves to be mentioned. An 18in. "back," complete, with pin, &c., scales 20oz.; and a 60in. "front," with axle, rubber, &c., but no cranks or pedals, scales only 13lb., and about 38½ per cent. of the entire machine. Notwithstanding this, their rigidity is very great, for subject to the common test of bringing a weight to bear on the extreme end of the crank (when horizontal) they remain quite firm, and there is no springing of the hubs, which is so common in weak wheels; at hill work this good quality is especially valuable.

The forks are now a variety of the bayonet type; but instead of being flat and thin, they are at the "shoulders" no less than ⅜in. thick, by 1¼in. broad, but owing to the neat proportions this thickness is not apparent. From the head they gradually taper till they reach the tops of the bearing cases, which are slipped inside them, and brazed on.

Long handle bars have come greatly into vogue—and rightly so—24in. is the general length. They are kept low, and are either straight or bent down to the (now) favourite "cow-horn" pattern, and placed slightly before the Stanley head. This is of a neat shape, and a close-fitting dust cover is placed over the opening to exclude dust and dirt; it is particularly required on racing paths, as the fine cinders get in and eat away the cups and centres. The "legs" of the head are firmly brazed

into the fine, broad arch of the forks. The backbone is brought close up to the head, and is oval, being 1¼in. in depth by 1¼in. in thickness. The oval form gradually becomes round, and the rear fork forms an unbroken piece with it—the spine being split up, forced apart, and the edges of the sides joined by plates of steel being brazed on the open part. This makes an extremely strong rear fork, very light, and without any objectionable join, weld, or solid portion. It may be interesting to note that the "Champion" likes the step 25in. high—this, of course, is different in every machine—indeed, a step is generally more of a luxury than a necessity on racers. A short spring—only 15in. long—is made very close, in fact, only 3in. above the tyre; the tail end has a short slot, and is held by a short screw; it has about ¼in. play up and down. The saddle is held by two light clamps, tightened by screws, which obviate the use of either a cross bar or the old thumbscrews, and the saddle cannot slip easily.

A novel plan has been followed in order to secure an equal stroke to both pedals; the cranks, which are of solid steel, light and fixed, being marked off like a measure from 5in. to 6in. by eighths, so that an exact distance may be ensured. The pedals are of the rattrap ball description, and very light, only 1½lb., for the pair; both ends are recessed, and contain a row of balls; the outsides are protected by a cap like the plate on the end of a boiler, held by numerous small rivets or screws. The tread is rather wide for a racer, between 14in. and 15in. We have already stated several times that all parts are extremely light, but 33½lb. is remarkable for a 60in. The price for any size (painted) is but £16 10s., a figure certainly low, and we hope the S. M. Co. will score a deserved success in the racing world, and that Invincibles may be more often seen in metropolitan contests.

3. The University Roadster (H. J. Pawsey, University Bicycle Works, Bedford-road, Clapham, London, S.W.).—A "Patent Interlocking Hub" is introduced with this machine, the design being to place an additional security on the spokes to prevent them becoming loose. The spokes themselves are sixty-two in number, and of either 11 or 10 gauge, and are headed into Beck and Warwick's "Potential" rims, or "fluted felloes," as they are sometimes termed, a cross between U and V, strong, but not so attractive as the half-moon shape. The spokes are screwed direct into gun-metal hubs, 6½in. wide by 3½in. deep, but between each

spoke end a short screw passes through the hub in such a manner that the side of it just breaks through the spoke hole, and pressing against it, locks it; this holds it firmly, so that it cannot twist and thus come unscrewed. The heads of these screws are countersunk, so that they are flush with the face of the hubs. If a spoke has to be renewed or altered, the screw is just removed with an ordinary screwdriver, when the spoke is easily rectified. The system seems successful, and it prevents the annoyance of rattling spokes. Rubbers of the standard sizes are cemented on both wheels, and hollow forks are employed. The front forks are knuckle-jointed to Bown's patent ball bearings. The backbone follows the curve of the driving wheel pretty well, but there is a solid portion between it and the point from which the rear forks spring.

The small wheel is regulated in size according to its leader; when the latter is 52in. this is 16in., when 56in., or larger, 18in.; it has gun-metal hubs and Bown's ball bearings. The neck is brought close up to the Stanley head, and fits so well, that it almost answers as well as a dust cover, besides being very neat. The handle bar is 21in. or 22in. long, with horn knobs. The brake top lever is extra well finished and placed, having a long, comfortable horn grasp, which is brought out nearly as far as the right handle, and kept close to it, so that full power can be applied, and the hand kept close to the end of the steering rod; this is an important point that receives less attention on the part of the trade than it deserves. A suspension saddle is supported by an ordinary spring with sliding case, or for a few shillings the Arab cradle will be substituted. Detachable cranks are fitted to every machine, with rubber pedals; the tread is about 15½in. When fully equipped with valise, spanner, oilcan, &c., we found a 54in. to weigh 47lb., and cost (all sizes) £15 12s. 6d. painted, all bright £16 12s. 6d., while if a rider is content to be behind the times and have cones to the rear wheel, the odd shillings and pence are knocked off.

4. The Wanderer Roadster.—So called, we presume, from the proximity of the works to the headquarters of the Wanderers Bicycle Club. It forms the lower priced machine of the maker's pair. The wheels have V rims, sixty-six spokes of 11 gauge, direct action, handsome gun-metal recessed hubs, better looking, in fact, than those of the University. Roller bearings are bolted to the front solid forks, and cones fitted to the trailing wheel. The cranks are also made detachable,

and are held by a collar pin and small nut, while the pedals are of rubber, and adjustable for about a couple of inches. A handle bar, similar to the University, is carried by a boss slightly in front of the head, and wood replaces the horn knobs. Other details are the same in both machines, but balls to the back wheel are only charged 10s. extra. An ordinary saddle is used, or 4s. extra for a suspension. Without a brake it is ten guineas for all heights, weight 3lb. to 4lb. above the University.

8. **The Exon Roadster** (The Exeter Bicycle and Tricycle Company, Maynard, Harris, and Co., 126, Leadenhall-street, London, E.C., and 31, West-street, Brighton).—This is one of the products of the firm which introduced the Devon Tricycle, but, unlike it, this machine involves no special points in workmanship, but relies on a plain design, embracing all the chief modern improvements. The wheels have eighty spokes, the gauge of which is known as "small 10." They screw direct into neatly moulded gun-metal hubs, 6¼in. wide. Handcock's red rubbers are cemented into the crescent steel felloes, Bown's bearings are used to the front wheel, and the top of the case is slipped into the legs of the hollow forks, and additionally bolted thereto. A 22in. handle bar finds favour; it is 5in. above the tyre, and placed slightly in front of the (straight) Stanley head. The gun-metal brake acts on the front wheel in the usual way, the spring is kept very close to the (steel) backbone, and bent still lower at the tail, where it works on a gun-metal barrel slide. Eighteen inches is the general height of the small wheel; it also runs on ball bearings by the same maker as those of the front; the rear forks are solid, and have a neat bend into the wheel. Riders of various heights can be suited in mounting, as the step is adjustable from 22in. to 25in. Fixed cranks are adopted, and the throw of the pedals can be altered from 4¼in. to 6in. They are either rattrap or rubber, according to order. Leg guard, suspension saddle, pouch, &c., are supplied gratis. The Exon will be found a strong good machine, fit for rough work. Its weight classes it among "heavy roadsters," i.e., 49lb. for a 54in., and all sizes are equalised in cost by being invoiced at £13 13s.

9. **The Humber Racer** (Humber, Marriott, and Cooper; works, Beeston, Nottingham: London branch and show rooms, 78, Richmond-road, West Brompton).—Among the whole list of makes, no one machine has gained so great a name on the racing path as the Humber, more

particularly in the metropolitan district, where the makers seem to have secured almost a monopoly with all the best riders of the day. So much so is this the case, that at all London race meetings a superabundance of Humbers is sure to be seen; indeed, during the season 1879 nearly one-half of all the prizes given for open events in London fell to riders mounted on this redoubtable machine, and, furthermore, several "best times on record" have been credited to it.

The bicycle whereon we based our notes was a 55in., built for Fred. Cooper, the junior partner of the firm and a celebrated rider, who at present holds the One Mile Championship, and, as a sample of his speed, we mention that, in the Amateur v. Professional race at Cambridge, he rode two miles in 5min. 37sec. His mount, however, does not differ in any material way from others supplied to ordinary customers, and may therefore be taken as a fair specimen of all. To commence with the wheels: the rims are of light steel, with the edges straighter than the general crescent type. This gives a better hold to the rubber, to secure which only cement is used. The general size of the tyre is ¾in. to the driving wheel, while that on the trailing wheel is only ⅝th less. Threescore and ten spokes are put into the front; the heads are sunk into taper drilled holes in the felloes, and screw direct into large handsome gun-metal hubs, the usual "play" being left; should any uninitiated readers not understand that term, we may state that in every properly made bicycle wheel, the thread, which is cut on the spoke (to enable it to be screwed into the nave), should never project beyond the hole, but be about ⅛in. inside; a great strain is thus taken off the weakest portion. The hubs are extremly neat, are 5¼in. wide by 4¼in. deep, and well recessed, so that the bearing case fits well inside.

The Humber has always been noted for its easy running, and this year the cage which keeps the balls separate has been dispensed with, and a double row of well hardened balls placed in two deep grooves in the axle and case; the last named is adjusted on the Sheffield system and slips up into the fork end, to which it is also brazed. A straight Stanley head surmounts the strong and well shaped hollow forks. The steering bar is 22½in. in length, and carried in front by a projecting boss, while it is very low—only 4½in. above the tyre. Very few makers can construct a properly shaped neck; most are simply hideous, and look as if they had been stretched out of shape by the weight of the rider; but

the Humber has one of the best necks we have yet seen. It not only has the strength where most required, but is extra deep perpendicularly, and short from front to back, thus bringing the butt end of the backbone close up to the head.

The latter has a very narrow opening, and, in order to allow of sharp turns, the neck is grooved. Instead of having "play" at the tail end, the spring works in front, where it is split into two parts, one passing on each side of the neck and working in fixed slides. The tail is curled round, and is held by a taper bolt passing through it and the supporting boss fixed to the backbone; should it wear loose, adjustment is made at this point. Lightness, strength, and rigidity are all thus attained. In the "spine" are rear forks; the former, instead of being drawn fine and having a useless solid portion, is kept large and hollow right down to the end; the back forks are also hollow, and are secured into the backbone. They have fine wide shoulders, and, while so light, are exceedingly strong as well as very neat. The back wheel is 16¾in.—also open to slight variation—has twenty-six spokes, and runs on single row ball bearings. These are placed inside the gun-metal hubs, and are adjusted in the most simple way. Fixed cranks are fitted to all; they are small and light, with an adjusting slot, to alter the throw from 4¼in. to 5in. As to the pedals, they run on a pin, and are a simple form of rattrap. Ball bearings are employed for them, if desired.

We have noted the most salient points of this machine, but cannot do justice to the rare excellence of workmanship and quality of material employed in its manufacture; every part has been carefully studied, and when any room for improvement suggested itself it was carried out, and thus the machine, while achieving beauty of outline, has secured simpleness of design with the best practial utility. In matters of important detail we found that the "tread," a point of the greatest consequence, was the narrowest we have ever measured, being only 11¼in., which gives the rider an immense advantage over one whose feet are sprawled 16in. or 17in. asunder. A rake of only ¼in. was supplied to the particular machine we examined, but this, being rather straight up for all except very erect riders, is increased to 1in. or 1¼in. Cooper rides with the saddle (near the centre) 7in. back, and the spring bent so low that the seat is only a shade over 2in. above the tyre. On "scaling" the 55in. we found it to be barely

32lb. A 54in. Racer costs £17, or, all bright, £17 10s., and good value for the money may be assured.

7. The Humber Roadster.—This differs but little from the racer. The rubbers are ⅛in. and ¼in. respectively, while the spring works on a shackle in front, and is raised considerably higher than in the racers. The bearings have a perforated collar which keeps the balls apart, the same as formerly used. A front brake is fitted; all other details are the same, save that the hubs are 6in wide and the pedals do not fit so closely, therefore, the distance between them is increased, but is still narrow. The weight goes up, and a 55in. pulls down the beam at 43lb. The price is 10s. above the racer, a painted machine for the road costing the same as an all bright one for the path.

8. The Nonpareil Roadster (J. Stassen and Son, 251, Euston-road, London, N.W.) — The "Stassen" is a household word among London riders for its strength and stability, and also, prior to last year, for its great weight and unhandsome appearance, especially about the hubs. The makers have now left their old track, and quite remodelled their machine. The hubs are still "mysterious," and the method of screwing home the spokes kept, as of yore, a comparative secret. This portion shows, perhaps, the most striking improvement of all; formerly they were very narrow, thick and ugly; now a much better and neater shape is adopted, the width increased to 5¼in., while the spokes, sixty in number, of 11 gauge, are ostensibly direct action. It will be remembered that these spokes are a fixture, and such a thing as a "Stassen" with a loose spoke is almost entirely unknown; this is owing to the peculiar principle carried out by the makers. The felloes are more of a U than a a crescent, the sides run straight up, and, being rather smaller than the rubber, the latter is inclined to spread over it, so that the rim cannot come into contact with stones.

For bearings a double row of balls are put to the front wheel. These are thoroughly well made and hardened, ten being placed on each side, subdivided by a perforated collar. The balls, each ⅜in. in diameter, run in grooves cut in the case and axle, the ends of the case fit closely round the latter and keep the grit out effectually; the cases are adjusted at the sides in the Sheffield style. A fine arrangement is carried out in the bearings of the back wheel, as, instead of placing the balls inside the hub, they are put in cases attached to the fork ends. Seven ⅜in. balls

being in each they are not separated by any cage, but run freely in the grooves. The pin has one loose and one fixed cone, which form the inner running surface of the balls; they are easily tightened by means of the nuts on the outside. A brass cap covers these, so fitted as to be very dustproof. This principle gives a good breadth to the bearing of the wheel, and consequent increased steadiness in its running power, and the balls have a slower motion than the cones they work on.

Hollow forks are this season exclusively used. They are of goodly breadth and very strong; the lower ends are forged to the top of the bearing cases, which go well into the recessed hub. Fixed cranks are used, and a mild form of rattrap pedal. This is different from others, and runs on a plain pin, without oil hole. Near the outer extremity of the centre bar of the pedal, there is a small boss; a screw passes through this, and, fitting into a recess cut in the pin, holds it firmly in its place. A small screw at each end has to be removed before the lubricant can be injected; but as the pedal only takes its bearing at the ends, the quantity of oil held in the centre is sufficient to last a long ride. This plan is much better in appearance, as there are no ugly nuts projecting, while it is most efficacious in action, and is non-locking. The whole are closely fitted, and the "tread" is under the average, being barely 14in. It has a Stanley had of the simple order, with a projecting boss to carry the handle bar, 22in. to 24in. long.

The famous eccentric brake has so often been described that it is well known to most readers; a slight change has however, been made in the method of application. Formerly it worked straight up and down like a piston, but now the eccentric, which is fixed to the handle bar, is attached by a link to a short bar, which is in turn similarly joined to a coned roller (covered by a dust cap)—on turning the handles this is brought to bear firmly on the rubber. It was one of the earliest front wheel brakes, and still remains very popular. The neck is kept very short, thus bringing the backbone close up to the head, a decided advance on the old "stretched" necks so many firms use. A light and easy spring is fitted, the tail slides in a simple small brass clasp. Leg guards and all the usual minor features are added, and the ordinary sized small wheel is 16in. to 52in., or 18in. to higher driving wheels. Of the general qualities of the Stanley we need only say that it is an old and tried popular favourite, and this year better than ever. A 52in. now weighs scarcely

45lb.—light roadsters under that—and it is strong enough for an Alpine tour. The price, all complete, is £16 for a 52in., rising half-a-crown for every 2in.; if polished and burnished all over it is £1 more.

9. **The Arab Roadster** (John Harrington and Co., 18, Norman's-buildings, Old-street, St. Luke's, London, E.C.).—This machine was formerly made in the Isle of Wight, but its excellence becoming known in the London market, a considerable demand sprang up for it, to meet which, and to be in a position to more readily cater for the general public, the inventor moved up to the metropolis a short time since. Among other special features, the mechanically fixed tyres are made immovable, and thus all danger from loose rubbers is obviated. This is accomplished by using strong crescent rims, into which the spokes are screwed by small nipples; midway between each spoke end a tiny nut is observed on the rim; these are screwed on the ends of hooks, and are used to bind down the rubber by the following method. Short bits of steel wire are run into the rubber crosswise, at a fixed distance apart (after it is in position in the felloe), and the small hooks are forced upwards until they link over the crosspiece, and the shank is passed through the rim and held by the aforementioned nut; cement is also used. This plan answers perfectly, and any spoke may be renewed without disturbing the rubber.

The spokes are of a light gauge (13) and eighty are generally put into a 54in. wheel. They are headed into the hubs; the latter are of a peculiar pattern, being made of thin steel, 5½in. deep by 6in. broad, and have a thicker flange, ¼in. deep, round the edges; this is recessed in order to allow the spokes to be readily passed through. A new plan is applied in the construction of the forks, which, although not exactly hollow, cannot be said to be solid; they are made of sheet steel, equal in thickness to a 17 gauge spoke. The sides of the fork are curled inwards. They are light and strong; the "lips" of the curl nearly touch at the small end, where the total breadth is 1⅛in., as against 1¼in. at the shoulder. A novel form of strap brake is used. On the outer side of each hub a 3in. (deep) flange is fitted; it has a collar or raised edge, which forms a deep groove; round this a bell chain, lined with leather, is placed; one end is hinged to the fork and the other carried round the drum and attached to a short double arm, that is in turn secured to a wire, which passes down the inside of the fork and

through a hole in the shoulder, and up to a short support on the handle bar, or rather, a cover, which fits over it for its entire length. Close to the knob a rest is made for the thumbs, both sides being exactly alike, but independent. On applying power, the wire is pulled up and the leather chain drawn tightly round the drum, thus bringing considerable force to bear on the centre of power—the hub. Brake power can be adjusted as required—a mild application, strong check, or sudden stoppage. By means of a nipple the wire connection can be adjusted should it stretch. A simple Stanley head is adopted. The handle bar is now made 24in., and is placed in front 5½in. above the wheel. Some room is lost here, as there is a good space between the highest part of the tyre and arch of the fork. Grit is kept out of the centres by placing a dust cover over the aperture; it is bolted to the neck. The latter is wisely kept very short, thus bringing the backbone close up to the head, not as shown in the illustration.

No special feature is to be observed in the backbone, save that it is left pure and simple, and kept hollow down to the rear forks. The latter are of the ordinary solid pattern. Something quite new in the way of springs (*vide* Fig. 3) has been invented and introduced. It is of the most simple construction, and, besides the clasp, consists solely of one piece of steel bar about half an inch thick. This is curled and twisted by powerful machinery into the shape given in the cut; attached to the lower bars there is a clasp to fit over the backbone; it is secured by bolts on the lower side. The spring is most comfortable, and imparts an easy and pleasant motion to the saddle, doing away with most of the vibration, and besides, yielding a sort of "all round" action, as it dips either forward or backward, and also "rolls" slightly. It can be fitted to any machine, and can be had separately, price 15s. The size of the backbone should be stated when ordering, and whether it be round or oval.

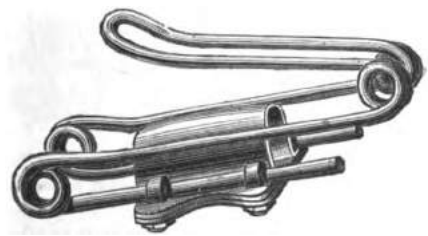

FIG. 3. THE ARAB BICYCLE CRADLE SPRING

Ball bearings are fitted to both wheels; those on the rear wheel work on a peculiar principle. The axle, or rather pin, of the wheel is fixed, and has a slightly recessed hub, similar in pattern to the front, with a projecting cone; a loose cone screws over the pin close up to this, and in the groove thus formed the balls—seven of 5-16in. diameter—work; of course caps or cases fit over this, one being attached to the fork ends. Adjustment is made by screwing up the loose cone, which is, however, kept from slipping by means of a small clip which fits into notches cut in the end; another cap fits over the outside of the fork; by removing this the cone can be slackened or tightened. It seems to form a capital bearing, and the whole wheel, generally 18in. high, with ¼in. rubber, is extremely light. Balls are also used for the driving wheel. The axle is

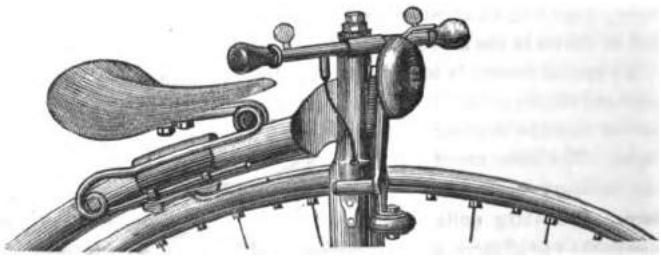

FIG. 4. THE ARAB BICYCLE, SHOWING SADDLE, BRAKE, ALARUM, ARRANGEMENT OF SPOKES, &c.

"tapped," i.e., a thread is cut on it to allow a large cone to screw over it against the hub. Facing this there is another similar cone; the latter has a milled edge, so that adjustment may be facilitated. Between these the balls work; they number six on each side, ¼in. in size, and fit in a perforated collar, outside which a steel ring with hardened groove is placed, wherein the balls find their outer bearing. Over all a large gunmetal case is fitted, having "hoods" or flanges, which project over the space intervening between the bearings and crank, and so exclude the dust. The cranks also screw on, and are held by a cotter pin; the nut which screws over the end of this also holds a small clip, which fits into the notches on the outside cone; by moving this it can be screwed up as required. From the manner the cranks are fixed on, i.e., with right and

left handscrew, the action of the feet tends to tighten them; but this plan has the disadvantage that the back pedalling has the opposite effect. We have already spoken several times favourably of the gong fitted to these machines and its remarkable efficiency. The pedals have a special oil reservoir, and the tread is 15in. The Arab is, in short, a high-class machine, well made, of sound materials, and well worthy of the good name it is rapidly gaining. A 54in. we found to weigh 45lb. complete. This size, neatly painted, costs £18 6s., or without any extras—its chief points—£15.

10. The Rawson Roadster (Messrs. Rawson and Greaves, Midland Counties Bicycle Works, Burton-road, Derby).—Mr. Rawson, the chief partner in the firm, has been for many years well known on the racing path as a professional rider of considerable ability, and since he has taken to manufacturing, he seems likely to score a success in that line also. The ruling characteristic of the "Rawson" is its compact and close build and extreme narrowness of "tread." The roadsters actually only average 12in., but this is with a 5in. hub; if it were increased to 6in. it would add stability to the machine, and even then the "tread" would excel nearly all others. The large hubs are of handsome appearance, and are 5in. deep, as well as broad; they are deeply recessed, and the bearings fit quite inside; the latter are made by the firm, and are on the principle of Humber's, *i.e.*, a double row of balls with side adjustment, the upper half of the case being welded on to the fork ends; they run very freely and steadily. About eighty fine spokes, 13in. gauge, are put into the front wheel, screwing ¼in. into the gun-metal, and have a firm hold. Beck and Warwick's Potential rims are employed, and hold either ⅞in. or ¾in. rubbers, according to the class of work they are meant for. Light steel fixed cranks fit very close to the forks, and there is no waste room in the rattrap pedals; the last named are cut away in the centre to save weight, or ball pedals can be had if required. The hollow front forks are of neat shape, broad and very strong; they are doubly secured, by brazing and bolting, to the Stanley head, which has a small boss in front, through which the handle bar (24in. long) passes. An ordinary front lever brake is added. The neck is made short, thereby bringing the backbone close up; it is kept hollow right down to the rear forks. For the back wheel bearing balls are also used, but on a slightly different principle from the general rule; they run in a steel groove

inside the gun-metal hub, and friction seems almost entirely absent, so easily do they work. 16in. is the average size of the "trailer," which is provided with twenty spokes, and either ⅜in. or ½in. tyre. The front end of the spring is recessed to fit over the neck, and the tail works on a shackle, by which means a good deal of jolting is saved. A saw step is fitted, and all the usual etceteras supplied. Taken as a whole, the machine is a first class one, well made in all parts, exceedingly handsome, and very light indeed — we found that a 52½in. only scaled 33½lb. The cost of a 52in., complete as described, is £16 15s., or £17 3s. 6d. with a suspension saddle, and 10s. extra is charged for all bright.

11. **The Rawson Racer.**—Same in general details, only made a little lighter, and the hub—at least of the one we measured—reduced to 4½in., but a 6in. hub will be put to order, so that this need not be considered as an objection; with the former size the tread was only 11½in. A size finer spoke—14 gauge—with ⅜in. and ½in. rubbers make up the other changes. Every part is closely built, so that the largest size can be ridden, while its lightness is remarkable—only 31lb. for a 55in. Price £16 10s. for a 54in. These machines are bound to make their way on the path when better known.

12. **The Viaduct, No. 1, Roadster** (Thos. Smith and Sons, Works, Saltley Mill, Birmingham; London Show Rooms, 61 and 63, Holborn Viaduct, E.C.).—Those riders whose incomes are of the small but regular class can seldom afford to pay down a large lump sum for a new mount, and, therefore, the easy terms of "half-a-crown a week" will be appreciated by them. The machines are of various classes, the No. 1 has forty-eight lock nutted iron charcoal wire spokes, broad and strong, iron hubs, and fixed cranks; the bearings are plain parallel, and adjust on the Sheffield principle, the upper half is welded on to the solid forks. A slight change is made in the front brake, a coned roller is brought to bear on the tyre by turning the handles—which, by the way, are short, only 19½in.—to which it is connected by a short bar and cam. The backbone is tubular, and the rear wheel runs on cones. A 50in. costs £7, and scales 46lb.

13. **The Viaduct, No. 3, Roadster.**—An improvement on the above, but the whole appearance of the machine is destroyed by putting lock nuts and nipples to the spokes, in large and otherwise well looking gun-

metal hubs. The wheels have U rims, and ⅞in. and ¾in. rubbers. Bown's ball bearings are to be found on both wheels; those on the "driver" are knuckle jointed to the hollow forks. Detachable cranks are used in this class, and a neat lever front brake. A 22in. handle bar and ordinary Stanley head, with a small opening, gives less room for the ingress of dirt or grit. The backbone and rear forks are all in one piece, the spine being split up and forced asunder to form the forks—as made by the Surrey Machinists' Company. The other details are as usual, and the machine is finished painted. Weight of a 53in., 46½lb.

14. The Molineaux Roadster (F. Agnew and Son, Townwell Fold Bicycle Works, Wolverhampton).—Agnew is one of the oldest established makers in the capital of the Black Country, and he is now devoting his attention to produce a machine which will rival that of any of his compeers for low price and cheapness, and embrace the much sought after "modern improvements." Eighty spokes of 11in. gauge, direct action, secured into large good gun-metal hubs, are put in the driving wheel. The tyres are of the usual sizes, and are cemented into the steel crescent rims. Bown's ball bearings are employed for both wheels, those on the front being put pretty well into the hub, so that the tread is kept down. Neat light pedals are used with cone bearings, but so arranged that they cannot lock; the cranks are fixed, and have the usual sliding slot; hollow front forks are adopted. The Stanley head surmounting them is straight, and has the handle bar—22in. long—in front; the latter has white bone knobs, giving it the appearance of ivory. The neck is short, thus bringing the backbone (hollow steel) close up to the head. The small wheel is generally 17in., and, as we before said, has ball bearings. A shackle hinge is put to the tail of the spring, and the front lever brake is of gun-metal. The spokes are subjected to a "tinning" process that gives their surface a silvered appearance, and keeps them from rusting. The Molineaux is wonderfully cheap, and the maker guarantees it for two years. It is sent out all bright, painted if desired, at the very low price of, 50in., £8 10s.; above that size, £9. A 58in. weighs from about 44lb. to 45lb.

15. The Special Britannia Roadster.—Expensive ball bearings are discarded, and their place taken by rollers in front and cones behind. Solid forks also are used in lieu of hollow. The wheels have rather fewer spokes, but still direct action and large gun-metal hubs. They

are also anti-rust coated. The brake and trouser guard are retained, while the price falls to £5 10s. for under 50in.; over that, £6.

16. The Britannia Roadster.—But little different from above. It has seventy-two direct spokes, the same hubs and rims, but a commoner class of tyre. The solid forks are bolted to the case of the roller bearings, the trailing wheel running on cones. The handle bar has wooden knobs, and is of much the same dimensions as the others. The spring has a single slide on the tubular backbone. This machine is also finished painted or all bright. Price—up to 50in., £4 10s.; above that £5; weight, about 46lb. for a 50in.

17. The Red Rover Roadster (A. Blackwell, 20, Hockley-hill, Birmingham).—Although this maker is only in a small way he turns out a machine that is by no means to be despised, and, as each receives his individual attention, he can bestow more care to special ideas and alterations than is the case where "standard" patterns are in vogue. There are no striking novelties in the construction, but it is built on popular lines. The driving wheel has sixty spokes screwed direct into large recessed gun-metal hubs, 6in. wide, crescent rims, red rubber tyres, &c. Double ball bearings (*à la* Humber) are put to the front, and single to the hind wheel. A knuckle joint secures the hollow forks to the case, this allowing enough play to prevent the bearings getting a twisted strain. Plain bearings are put to the pedals (rattrap), so that "locking" need not be feared. The cranks have the usual adjustable slot, and are fixed. The handle bar is made of any length to suit special tastes; it goes slightly in front of the Stanley head, and has the front lever brake attached. A slot is cut in the end of the spring through which a screw passes into the hollow steel backbone, this forming a simple slide. The small wheel is 17in. high, has twenty direct spokes, and the "spine," turning into it with a good curve, gives a neat outline to the whole machine. Irrespective of size, only £10 10s. is charged for the Red Rover, and it is also finished all bright at the same figure, which is exceedingly cheap. In weight it is also remarkable, as we found a 53in. to weigh only 40¼lb.

18. The Connaught Roadster (Bowers and Cook, 25, Bilston-road, Wolverhampton).—This is the lowest priced of the many types of cycles sold by Messrs. Bowers and Co. It has sixty direct (11 gauge) spokes, plain straight gun-metal hubs, solid forks forged to the case containing

the roller bearings, fixed cranks, rubber pedals, &c. The Stanley head has a ball top and 19½in. bar, the front brake has a flat portion for the spoon, but the point only acts on the rubber. The wire used for the spokes is of a very fine quality, and almost unbreakable. The machine does not boast of any speciality. The spring works on a brass slot fixed to the taper backbone, which gives a rather curious bend to the rear wheel. Cone bearings are put to the last-named. The tyres are cemented into U rims, and the price of the whole, painted, &c., is £5 10s. for a 50in. or any other size, and the weight is about 46lb. It will be found a strong roadster for first year purposes.

19. The Royal Mail Roadster (The Royal Sewing Machine Company, Limited. Works: Herbert-road, Small Heath. Offices: Bull-street, Birmingham).—Handle bars of a fixed height are not pleasing to all minds, and do not conform to various sized limbs; especially is this the case when a man rides an undersized machine, for the legs have not sufficient room to work freely beneath the bar. This objection is obviated by an ingenious plan, extremely simple in application, introduced by the makers of the Royal Mail. As will be seen from Fig. 5, a slot is cut in front of the Stanley head, into which a portion of the central support of the steering rod fits; a screw bolt passes through this, and by simply slackening the nut (A) the bar (22in. long) can be raised or lowered over 2in., or removed entirely. This is readily accomplished, and will often be of service. In order that the varied height of the head shall not interfere with the working of the front brake, the central arm is made to slide through the top bar or lever. Fine large handsome gun-

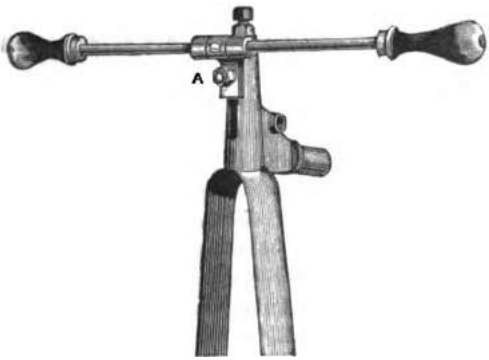

FIG. 5. THE ROYAL MAIL PATENT ADJUSTABLE STEERING ROD.

metal hubs are used. They are well recessed, and add greatly to the neat appearance of the machine. Bearings of the Humber type, i.e., a double row of well-hardened balls, held apart by a perforated collar, and adjusted at the side. The top case of these is welded and brazed to the legs of the hollow forks. The fixed cranks are kept close to the forks, so that that important item, the width of the "tread," does not exceed 14in. Ordinary rubber pedals, working on a plain pin, have been adopted, or rattrap are supplied instead, if preferred. The spring has a slide tail (working in a brass slot), and is bolted to the neck in front; the latter is short, as the weldless steel backbone is brought close up to the head. Extra good red tyres, very soft, are cemented into the steel crescent rims, and sixty steel spokes, 10 gauge, screw direct into the hubs. Seventeen inches is the general size of the small wheel; it has a "three-quarter" tyre, one-eighth less than the front, and also runs on balls, for which, by the way, only 7s. 6d. deduction is made if cones are taken instead. A step, two spanners, suspension saddle, &c., are supplied to the Royal Mail, which will be found a capital machine. A 50in. costs, all complete (balls both wheels, &c.), £15 7s. 6d. painted, or £16 2s. 6d. if bright, rising 5s. per inch.

20. The Royal Mail Racer.—Generally lighter, no brake, smaller tyre, &c., otherwise the same; 50in., £17.

21. The Coventry Star Roadster (W. Hosier, Midland Bicycle Depôt, Smithford-street, Coventry).—This machine is not of the Coventry type, but has seventy-two direct spokes, large and broad (5⅛in.) gun-metal hubs, a head and neck of superior design to the ordinary shape used in the town. The handle bar is 22in. to 24in. in length. The tyres of the general size, ⅞in. and ¾in., crescent rims, fixed cranks and rattrap pedals. A short and close spring works on the backbone by means of a slide. Single ball bearings are applied to both wheels, and hollow forks to the front. There is no special new feature. The machine is finished half bright, and a front wheel brake is, of course, added. It will be found a good machine, and worth the price asked—£12 12s. for a 52in.; weight 41½lb.

22. The Hanover, No. 1, Roadster (Gribben Brothers, Hanover Works, Collyhurst-street, Miles Platting, Manchester).—The original virtues which belonged to hollow forks, lightness and rigidity, have in some quarters departed from them owing to the hollowness being overdone

by substituting very thin material for the "walls" of the tube. They are further weakened by some makers going too far in getting up the bayonet shape, by drawing the edges very fine or sharp. To obviate the evil results of such a procedure, more than one firm has adopted the use of a central bracket or support within the tube; we have seen several attempts to gain the desired end, but that carried out by the Messrs.

Fig. 6. The Hanover Bicycle, No. 1.

Gribben appears to be about the most successful, so far as acquisition of strength is concerned. They carry out the principle of tube within tube; the outer is oval, with sharp edges, and made of slightly varying thickness, one side being thinner than the other. The dimensions of a portion cut from near the top of the tube, being length (or rather breadth), 1¼in., thickness ⅛in., the metal itself being ⅛in.; inside this centrally a round tube is firmly fixed, its outer diameter is ⅛in., and the inner ⅛in.;

this effectually prevents any collapse of the sides, and gives enormous strength; but it is quite as heavy, if not heavier, than a solid fork. It will be readily understood from the annexed illustration (Fig. 7).

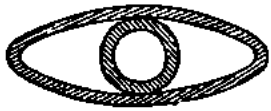

Fig. 7. The Hanover Double Hollow Fork.

Rims of a decided U shape—not half-moon—are used, and the front wheel has sixty-six spokes, a couple of degrees finer than the general rule, i.e., twelve gauge; they screw direct into large dark gun-metal hubs, recessed, so that there is a flange round the edge about ⅛in. deep. By this plan the broken stump of a spoke can be more easily removed. The hubs are 5⅛in. broad. Bown's bearings are fitted to both wheels, the front being bolted to the forks. Detachable cranks and rubber clothed pedals are fitted in the usual manner, but closely, so that there is not an undue distance between the feet. A straight Stanley head has the steering rod 4¾in. above the tyre, 20¼in. being the length. The front brake is of the almost universal lever pattern. A leg guard keeps the rider's lower garments from "scraping" acquaintance with the front wheel. The spring tail slides in a boss, simple and easy. As a rule, the tyres are ⅞in. and ¾in., but occasionally full inch are used. They were on the one we inspected, and, therefore, handicapped the weight rather severely, and made the 50in. only just under 40lb. Each machine has suspension saddle, valise, oilcan, wrench, &c., supplied gratis, for £16 10s. for a 50in., half bright—i.e., head, neck, spokes, &c., polished; if all bright, £17 10s., or £18 10s. if with inch tyres. It is a fine strong machine and well made.

23. The Hanover, No. 2, Roadster—Round or oval backbones have become so general, that any departure from the rule at once rivets the attention. Few will, therefore, pass the machine under notice without being struck by a peculiarity in the spine. On examination it will be found to be an octagon, and apparently solid—to the eye at least—but it is as hollow as the rest, except at the tail end, where the rear forks are welded on. Its odd look is the only thing for or against the shape; some riders who court notoriety would doubtless relish the novelty. The wheels are much the same as in the No. 1, but the spokes are rather fewer. Roller bearings replace the balls. They are made at the works, and consist of twelve small rollers, which fit close round the axle; these are held in a

hardened box, which is capable of adjustment at the sides, and is knuckle jointed to the hollow (plain pattern) forks. A 21in. handle bar, 5½in. above the wheel, is fixed a little in front of the Stanley head. Other details are the same, save that cones only are used for the hind wheel; step, leg guard, valise, spanner, &c., are included in the outfit, but a web saddle is given instead of the suspension. The cranks are fixed (5s. extra if detachable) and the same brake is used, either rattrap or rubber pedals, but not so closely fitted, as the tread is 15½in. The ordinary price of a 54in. is £14 10s.; all bright, £15 10s.; inch tyres, £16; with patent forks, £16 10s.; balls front wheel, £17 10s.; detachable cranks, £17 15s.; suspension saddle, £18; balls back wheel, £19; thus virtually making it equal to No. 1. We found that a 54in. scaled just 42lb., complete for the road.

24. The Hollow Spoke Roadster (James Carver, Alfred-street Mills, Nottingham).—Although this remarkable machine is well known to most club riders, there are doubtless many readers who know it by name only, and are, therefore, not well versed in its component parts, and so a recapitulation of them will not be uninteresting. First and foremost the hollow spokes demand attention. Their large size was formerly an objection, but this has been considerably reduced, and the spokes, which were formerly of 8 gauge, or ·166 of an inch outward diameter, are now reduced to 12 gauge, or ·125in., the change effecting a great improvement in the appearance. The spokes themselves are formed from fine sheet steel, which is by powerful pressure rolled up into the form of a tube; the edges being brought into close juxtaposition, but scarcely touching. Some riders fancied that moisture would percolate through this narrow slit and cause the spoke to rust away inside. Such is not the case; the insides are coated with the natural "scale" of the metal, which effectually prevents it becoming oxydised. As the thin metal of the spoke would not bear a thread being cut on it, a taper plug is brazed into either end for a couple of inches; this is thicker—in fact, of 8 gauge—so that the portion screwing into the hub has abundant strength; the same remark applies to the other end, which is headed into the rim. The spokes are unusually strong, and will withstand almost any strain that can be thrown on them—it is almost impossible to bend a short section by means of the hands alone—and they are also very light. When subjected to various mechanical tests, they

pass through the ordeal successfully. A dead weight of half a ton can be supported by a single spoke, and when one end is held fast and the other bent away, it flies back, and regains its former (straight) position. From sixty to eighty of these spokes go to make up the front wheel, so its total strength is enormous.

Three-quarter inch best rubber tyres are cemented into steel crescent felloes. The hubs are now made 5in. deep by 6in. broad, but light in weight and dark in colour—two great advantages; their size gives a "centre" to the wheel, and imparts an air of completeness and rigidity to the whole machine quite absent in those miserable little hubs some makers delight in. These hubs are both sweated and keyed on, so that they cannot get loose; they are also recessed to allow the bearing case to go well into them, and reduce the tread to less than 14in. The total length of the axle is only 9¾in., and it is made rather thicker in order to allow a double groove to be cut near either end for the balls, which number ten each, ⅜in. in diameter, divided into two rows, kept apart by a collar; the grooves in the case are also hardened, and the case is welded on to the fork leg. These bearings run splendidly, and last a long time, and no one should ever think of having a Carver without them to both wheels, or they will never do the machine justice. We have examined bearings that had run nearly 2000 miles, and they did not exhibit any perceptible signs of wear. The back wheel has a single row of "naked" balls, *i.e.*, without collar; they work between coned grooves in the hub, the required adjustment being made by a loose (but non-locking) cone on the axle. A disc fits over each end, and is again overlapped by a brass guard, thus forbidding entrance to grit and dust; the nuts are on the outside of the fork ends and easily got at; as to their freedom of running we have seen a wheel "spun," and timed it to run over six minutes.

In order to effectually prevent any accidents or annoyance from a loose pedal, a capital plan has been carried out: the cranks are detachable, and in the face of each a series of notches or grooves is cut; on the boss or corresponding end of the pedal there are several raised ridges, which, fitting the notches (when the usual nut is screwed up), make it impossible for the pedal to slip. The treadle runs on a plain pin, and is rubber clothed. A somewhat similar system is applied to the spring, by putting ten raised ridges on it, ¼in. apart, and slots in a plate attached

to the bottom of the suspension saddle. This adds a considerable degree of safety to either racing or touring. The spring works on a shackle arrangement, which mitigates the "bumps" in passing over a rough road. A neat and ornamental dust cap folds round the entire opening of the Stanley head, and clasping tightly round the neck effectually prevents the entrance of dust and grit, and adds considerably to the appearance of the head. The latter, although of the Stanley type, has an individuality of its own, the shape being different from others, and very taking. A 21in. handle bar (or longer) is fitted, 5in. high, and with real horn knobs, which can be removed; a small cap, part of the horn itself, is unscrewed, and then the nut inside got at if the knobs have to be removed, therefore there are no nuts or sharp ends to hurt the hands. A front lever brake also forms part of the head gear.

In order to make the forks additionally strong, a cross piece or thin steel flat rod runs down the interior, and being brazed to both sides, offers a very strong support, but the forks are of such dimensions that they do not seem to need it; however, it makes security doubly secure. Lubrication is easily accomplished; the rear pin has a corkscrew-like groove cut in it, by which means the oil is carried to all parts requiring it, but balls do not call for much attention in that way. Of the whole machine we must speak in terms of high praise, and all are sent out burnished in a manner that is unexcelled in the trade; indeed, whenever exhibited, they are always mistaken for plated machines. If painted, they are the same price, *i.e.*, £16 14s. for a 50in., as described, rising 5s. every 2in.; the size quoted weighs 42lb., or they can be made lighter to special order.

25. The Carver Tourist Roadster.—These are made a little stronger all over, and have ⅞in. and ¾in. rubbers in place of the ⅝in. and ½in. on the hollow spoke; for this the price is raised 10s., and a 50in. becomes £17 4s.

26. The Carver Racer.—Several of these are in use on the path, mostly in the North of England. A finer gauge spoke is used, and the whole wheel is very light; the size of the tyre is also less, and the price of a 54in. is £16 19s.

27. The Solid Spoke Roadster.—Similar in all respects to the hollow spoke machine, only, as the name implies, solid are substituted for hollow spokes. The price of a 54in. amounts to £16 14s. or £17 4s., according to size of rubbers.

28. The Tourist Roadster (Burnett and Farrar, Leeds and County Bicycle Depot, 6 and 11, Tower-buildings, Albion-street, Leeds, also at 8, New Uvegate, Bradford, Yorkshire).—This machine has sixty direct spokes of 10 gauge direct into Birmingham saucer shaped gun-metal hubs, with the projection in the centre, which prevents the recess being made use of. The crescent rims have ⅛in. grey moulded rubbers. Parallel, but adjustable, bearings are put to the front wheel; the upper portion of the cases is welded to the bottom of the solid forks. Fixed cranks are adopted, and ordinary or detachable pedals are put as may be ordered; the tread is 15½in. The steering bar is 5in. above the tyre, and 20in. to 23in. long, and, as usual, is slightly before the top of the Stanley head. A front lever brake is put on all machines without extra charge. The tail of the spring is provided with a shackle in order to assist its elasticity. A welded backbone is used; it is composed of steel, rolled and brazed, thus forming a tube which is difficult, to the unpractised eye, to detect from the weldless tube. Cone bearings form the running surface for the hind wheel, which is 18in. high, and has the gun-metal hubs and axle all in one. A choice is given to the purchaser of either all bright or japanned for the same money, which is £8 10s. for a 52in., that size scaling 44lb.

29. The Yorkshire Roadster.—A commoner class machine without special features. It has sixty direct spokes, plain bearings, spring, &c., and is very similar to the Tourist, though rather heavier, the price being £6 10s. for any moderate size.

30. The Advance, No. 2, Roadster (James Beech, Gladstone Works, Stafford-street, Wolverhampton).—This is the second variety made by the firm; their chief product, the Special, we did not see in a complete state, and therefore could not notice it. Sixty to eighty coated (anti-rust) spokes are put into the driving wheel; their size is 10 gauge, and they are screwed direct into slightly recessed gun-metal hubs; tyres of ⅛in. and ⅜in., U rims, are the general size. The front lever brake is of gun-metal, and the leg guard, under the backbone, is of the same material. A 22in. handle bar is put a little before the (Stanley) head, and it is kept low down. To the tail end of the spring a bar slide is fitted, which makes the action more easy. Adjustable roller bearings are bolted to the solid front forks; cones to the rear wheel. Adjustable step, fixed cranks, and

ordinary rubber pedals complete the machine. There are no special features, but the machine is strongly built, and worth the £7 10s. charged for an all bright 52in., which size weighs 42lb.

31. The Advance, No. 3, Roadster.—Plain adjustable rollers are used, and an iron brake (certainly better looking) supersedes the gun-metal; wood replaces horn for the handles; the spokes are fewer in number and not coated; iron backbone instead of steel; small rear cones, common lubricators (*i.e.*, not spring top), and other details the same. The "tread" is 14½in.; a 50in. weighs 41lb., and costs only £6.

32. The Alert Roadster.—An improvement on either of above; it has a single row of balls to the front wheel, more spokes, and is generally better finished; price £8 for a 50in. With all these machines bell, valise, oilcan, spanner, &c., are given without extra charge.

33. The Special Express Roadster (Jos. Devey, Tower-buildings, Piper's-row, Wolverhampton).—Among many types of machines this maker turns out, the Special is one of the chief. About sixty direct 10 gauge spokes are screwed into recessed gun-metal hubs, and the crescent rims carry ⅞in. red rubber tyres; the hubs are 6in. in width, and of fair size. Roller bearings are fitted to the front wheel and cones to the rear; the axle of the latter is partly hollow, which allows of a good supply of oil being carried therein. Detachable cranks and ordinary pedals are used, and the steering bar is 22in. long and placed slightly before the Stanley head; a gun-metal handle is attached to the front lever brake, which has the lower arm half rounded, so that it will fit the tyre better, and the part acting on the rubber can be easily renewed at a trifling cost. The tail of the spring is bolted to a brass "barrel," which slides in a case on the tubular, but lap welded, steel backbone. By the manner in which the step is secured—by the ends folding round the "spine," and being held together by a double screw bolt—it can be raised to various heights according to the wish of the rider. The forks are solid and are bolted to the roller bearings. The machine is sent out painted or all bright at £7 10s.

34. The Tower Roadster.—This machine has fifty direct spokes (or sixty to big wheels), but this portion is similar to the Special, except that the hubs are somewhat less in size. Plain well hardened parallel bearings are bolted to the solid front forks, cones behind; the shaft of the step passes through the solid junction of the iron

backbone and rear forks; a front lever brake is fitted, or 3s. allowed for its absence; even a leg guard is not forgotten. Fixed cranks, rubber pedals, &c.; the handles are of a comfortable shape, and the steering bar of good average length. A Stanley head is, of course, the shape adopted, and the relative proportions of the wheels are 16in. to 50in.; all sizes up to 50in. only cost £4 13s. (£4 10s. without brake), and up to 60in., or even higher, only £5 3s.; the weight is about 45lb. to a 50in. The machines are strong and safe, and are finished either all bright or are painted at the same price.

35. The Meteor Racer (Starley and Sutton, Meteor Works, West Orchard, Coventry).—The lightest and neatest machine made by the firm. Strong but neatly shaped hollow forks are bolted to a single row of ball bearings, which are placed well inside the hub, in order to reduce the tread and keep the feet close together. The detachable cranks are light, and also fit very closely. The slot is short, and only admits of a half inch difference being made in the length of the stroke; but this is not a tangible objection, as racing men seldom alter the throw of the pedals, unless for an exceptionally heavy course. Extra light pedals (rattrap), with plain bearings—or, at extra cost, balls—are added. Exceptionally neat large saucer-shaped gun-metal hubs form the centre of the wheel. They are 5¼in. broad, while the flanges are 4¾in. deep, and well recessed. Quite a new thing in handles has been introduced by the firm, whereby the length of the "rudder" is alterable from 12in. to 36in., and can be made high or low as wished; if preferred, the old rigid bar (22in. long by 4½in. high) is used. It is carried in a boss in front of the Stanley head, which, by the way, has a rather longer opening than usual. In order to bring the rider near his work the spring is made to fit exceedingly close to the hollow waldless steel backbone; it is bolted in front, and hinged to a simple clip at the tail. Hollow rear forks are now made; they have a good curve and impart a neat outline to the whole machine. 17in. is the general height of the rear wheel, which has a steel hub; it also runs on balls, and has twenty-four spokes to sixty-eight in the front, of 12 gauge, and the rubbers are respectively ⅜in. and ½in. The Meteor will be found a high-class, light, strong, and good machine for use on the path. A 55in. weighs 35lb., and costs £17, finished all bright.

36. A B C, No. 2, Roadster (Acme Bicycle Company, 144, High

Holborn, W.C., and 144, Cheapside, E.C., London).—Among the many A B C varieties this holds second rank. It embraces all the special features of the A B C bearings (descriptions of which will be found at the end of the book), and a new slide to the spring; the last named consists of a gun-metal case fixed to the backbone. Attached to the end of the spring is a bolt, or what the makers term a "cross head," and through this a short steel spindle or roller, with coned ends, is passed; on each end a ball is placed with a hole about three parts through. Inside the case there are two steel grooves, in which the balls work. This imparts an easy motion to the spring, although the case is not an ornamental addition to the backbone. The spring fits closely to the latter, and has a suspension saddle. An open Stanley head—i.e., the aperture right through from back to front—has the short handle bar, only 19½in., a little in front. The brake is curled, and the part acting on the rubber consists of a double wooden cone; the top lever is flat and close to the right handle.

Only fifty-two thick 10 gauge spokes are put to the front wheel; they screw direct into small and slightly recessed gun-metal flanges. A B C bearings are put to the pedals, which are double-sided, one being the ordinary rubber and the other a sort of very mild rattrap or rather rough iron plate; both being of equal weight, they are perfectly balanced. The advantage of ball bearings to the pedals is so manifest that we need not enlarge on their merits. Two objections are their cumbersome appearance and extra weight, but these are but minor faults in comparison with their good points. Solid forks were on the sample machine we inspected, but, according to the price list, hollow are now substituted. They are bolted to the bearings. To suit legs of varied length, the step can be adjusted from 22in. to 25in. from the ground. If desired, Carter's trailing brake can be had without extra charge. The bright parts, head, hubs, and handle bar, are plated, and the spokes "blued." It is a strong, heavy roadster, a 52in. weighing 47½lb., and costs, for any size, £18 18s.

37. The Climax Roadster (W. A. Lloyd and Co., 21, Bath-street, Birmingham).—This is a simple plain machine, containing modern improvements, but no startling novelties. The wheels have sixty spokes, 11 gauge, direct into Birmingham pattern gun-metal hubs, crescent steel rims, and red rubbers of ¾in. and ⅞in. sizes respectively. Solid taper forks are used; they are knuckle-jointed to Bown's bearings. Detachable

cranks and rubber pedals are also to be found; a Stanley head surmounts the forks; the steering rod is 5in. above the tyres, 22in. in length, and goes in front of the head. The tail of the spring slides in a boss brazed to the tubular backbone. A 16in. rear wheel has ball bearings. Among the other details are to be found front wheel brake, a saw step, horn handles, suspension saddle, and the usual extras. The whole machine is neat in appearance, worth its price, more especially as it is finished plated for £11 for a 50in., weight 43½lb., the rise in price being 2s. per inch. To cash customers the cost is reduced to £10.

38. The XL All Roadster.—A lower-priced companion to the above, having only forty-eight spokes lock-nutted into iron hubs, U rims, and a commoner class of rubber, of the same size, i.e., ⅞in. and ¾in. Fixed cranks replace the detachable, and plain rubber pedals are adopted. The front brake and Stanley head are similar. The length of the handle bar is 22½in., and an iron backbone supports the spring already described. Cones are put to the back wheel and parallel to the front one. The machine is finished painted. A 52in. weighs 45lb., and costs £6 5s.

39. The Endurance Roadster (R. and T. Green, 102, Buckingham-street, Birmingham).—The speciality of this machine consists in a safety clamp hub, whereby the strain is taken off that portion of the spoke already weakened by having a thread cut on it, and transferred to the stronger solid part. This desirable result is gained without sacrificing appearance, and by a simple, but thoroughly efficient, method. The hub itself is of gun-metal, a good size and shape; but the flange is cut down the centre for three-quarters of an inch all round, and the outer half taken away. A metal flat ring or clamp replaces the missing bit of gun-metal, and both the clamp and flange have slight half grooves corresponding in number with the spokes, but not so large. The spokes screw down into the solid body of the hub, and the clamp—held by several screws to the flange—presses tightly against the spokes for over half an inch, and not only makes them additionally secure, but, as already mentioned, takes the strain off the portion that actually screws into the hub. For a short distance near the edge of the clamp the spokes, to allow sufficient play, are not nipped. Yet another advantage is gained—should a spoke break it is more easily renewed. When spokes do require tightening the clamp is slightly slackened, the spoke adjusted, and the clamp again fixed firmly. Spokes last better, and the wheel remains truer

for a much longer period by this process; the principle will be readily understood without the aid of a sketch.

Not content with the various patterns of bearings now before the public, the makers of the Endurance seem determined to prove that the title of their machine has been rightly applied, and a very strong description of double balls is made specially; they consist of two rows, which work in a collar on the axle; the case has two deep grooves or divisions, to keep the rows apart, but the balls are not individually separated. Adjustment is made sideways, by a nut, on the end of the axle, by pushing in the boss of the crank. Owing to the shape of the hub and case, dirt is thrown off it instead of working down into the bearings. Solid forks are usually adopted, and a straight Stanley head. The sizes of the grey rubbers are ⅛in. and ¼in., crescent rims, and about a spoke per inch make up the wheels. The smaller has twenty spokes, and is generally only 16in. in height. It also runs on balls, a single row placed in an ungrooved case in the hub, but the pin has a rounded groove acting against them by the latter. They are easily adjusted. A long but easy spring is hinged to a gun-metal clip at the tail. The neck is kept short, bringing the weldless steel backbone close up to the head. The width of "tread" is 15in.; other details not mentioned do not differ from the ordinary routine. The whole machine is well made, strong, and nicely finished, painted or all bright. As it is meant for a reliable roadster, the weight is not very low—44lb. for a 52in.; price £14 15s.

40. The Lynn Express Roadster (James Plowright, Purfleet Bridge Works, King's Lynn, Norfolk).—This maker, after holding out for a long time, has adopted direct instead of nipple spokes, although Lynn riders still prefer the lock nuts, but the new departure is a decided advance in the right direction. One leading feature of the machine is its excellent registered dust-proof anti-friction roller bearings—the best of their kind. They are simple in construction, but have several extra good points. The rollers, inner case, and part of the axle on which they work are all well hardened; a steel collar at each end keeps the rollers in position, and the outer case fits into the recess cut into the hub on the one side, and the other goes well over the boss of the crank, fitting close up against the shaft; by these means it is next to impossible for any grit or even dust to enter. This is one secret of their extraordinary lasting and free running powers, but the ready means of

cleaning them is also a great advantage. Almost on the top the lubricator is placed, and at the bottom a screw is to be found which can be removed to allow of the easy cleansing of the bearing. The case, or shoulder of the case, is screwed to the bottom of the strong tubular steel forks.

Ball bearings after Humber, but made dust-proof, like the rollers, are supplied without extra charge. They are made on the premises, and are thoroughly good. A knuckle joint attaches them to the fork ends. Fine large hubs, 6in. broad, with flanges 4½in. deep, are secured to a steel axle. The pedals are either fixed or detachable; they are of a neat taper shape, and have rubber or rattrap pedals working on a plain pin. The tread is 15in. Genuine horn knobs cap the ends of the 23in. handle bar; it is in two pieces, which screw independently into each side of the pyramid Stanley head. In order to make the centres perfectly dust-proof, a cover of thin sheet steel fits completely over the aperture, and a small cross piece is put at the bottom and held by two screws, which effectually shuts out the mud and grit thrown up by the wheel. This is really a most important addition, as the centres, being so well protected, remain firm and do not wear shaky like others, so that the steering gear requires but little attention; it is also a considerable improvement to the appearance of the machine, and keeps the head much cleaner. A comfortable handle is fitted to the lever front brake, the spoon of which comes out farther than usual; it is hollowed to fit the tyre. No novelty is apparent in the spring, which is bolted to the neck in front, and slides on a barrel attachment at the tail end.

For some years Plowright fitted an oval backbone, and now the pattern made by the Surrey Machinists' Company—hollow bone and rear forks combined in one piece—is used, which adds still further to the strength and rigidity of the machine, and is extremely light. A 17in. trailing wheel, with ¾in. tyres, crescent rims, &c., runs on ball bearings, which work in a hardened steel collar in the hub, and are adjusted in the usual manner. A word as to the mud guard shown in the engraving. All riders know the disagreeable result of riding in muddy weather, and how the small wheel throws up the dirt on the back. By means of a light and handy guard, which can be attached in a few seconds to any machine, this evil is counteracted; it secures itself without any bolts or screws, and is neatly painted to match the machine. The price, additional to the

machine or separately, is 6s. 6d.; it will prove of great value to any cyclist. The size of the back wheel must be given when ordering. The Express is a long-lasting and trusty steed, essentially a roadster, or very strong grass course racer. The weight of a 52in. is 47lb., and price,

FIG. 8. THE LYNN EXPRESS ROADSTER.

painted, £15 15s. It was on one of these machines that Coston and Smythe rode 206 miles in one day, and later, Smythe 218 in the same period on the high road.

41. The Express, No. 2, Roadster.—This variety has lock-nutted spokes, plain roller bearings, solid forks, cones to rear wheel, ordinary backbone, fixed cranks, and no special features, but is a good strong

machine; balls can be had behind for 15s. extra. A 50in. costs £11 10s., rising 5s. per inch.

42. The Interchangeable Roadster (Messrs. Palmer and Holland, Victoria Works, Victoria-road, Aston, Birmingham.)—A new kind of ball bearing, different from anything before brought out, has been introduced by this firm. By using a double row of balls additional steadiness is imparted, and their peculiar construction may be best described as a satisfactory solution of "squaring the circle," the balls being enclosed in a square chamber, as will be seen from a glance at Fig. 9. Round the axle there is placed a hardened steel collar, with an upright division in the centre; by this means a tough iron axle can be employed, and its strength is not endangered by cutting or case hardening; the latter process tends to make it brittle, but the collar receives all the wear. The case has a hardened interior, and in place of the ordinary rounded grooves there is merely an oblong recess, which, being divided midway by the before-mentioned flange, becomes two square boxes. In these the balls work loosely in two rows of seven each, the balls being ¼in. in diameter. On the outside—i.e., next the crank boss—there is a cap which screws into the case, the inner case pressing against the balls. Adjustment can be made with ease and to the greatest nicety by simply screwing round the outer cap, which has fifty notches cut on its outer face, or rather edge; into these a small spring clip fits, preventing any slipping. The screw of this cap has a fine "pitch" or thread, twenty to the inch, so that every notch it is slackened or tightened represents adjustment to the one-thousandth part of an inch, fine enough for anything, and by careful attention the wheel can always be firm and true, without either side shake or stiffness. In order to make allowance for "up and down" play, in the lower part of the case there is a recess in which is placed a ball. This nearly touches the central flange. By turning the screw at the

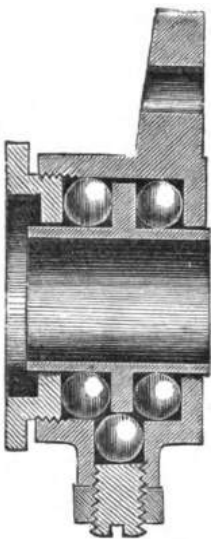

FIG 9. "THE INTERCHANGEABLE" BALL BEARINGS.

bottom the top of the case and the balls are tightened in both directions. The outer cap is also well recessed, the boss or head of the crank fitting well into it, and the inner side goes close up against the hub, so that dust and grit are excluded. The top shoulder is secured by a single bolt to the fork end. These bearings we may say, in conclusion, are splendidly made and carefully finished; each part will bear the most minute examination. We hope they may achieve the success they deserve. They can be fitted to any machine, racer or roadster, and are long will doubtless be in common use.

A somewhat similar arrangement is carried out in the rear wheel (generally 16in. high), only there is a single row of balls, each of which has only three frictional points, being adjusted by a coned pin, grooved spirally to let the oil flow from the centre. Quite a finished and greatly improved appearance is given to the trailing wheel by substituting for the usually ridiculously small hubs larger sized flanges. The centre of the wheel is of steel, and twenty 11 gauge spokes are adopted. To the front wheel of the racer eighty 12 gauge spokes screw direct into large gun-metal hubs; light crescent felloes, and Beck and Warwick's patent tyres are used; the latter are ⅛in. and ¼in., or a shade smaller, for a pure racer. A partly square, but very neat, form of Stanley head surmounts the hollow forks, and the 22in. handle bar is 5in. above the wheel. The neck is short and compact, bringing the butt end of the spine close up to the head; it also follows the curve of the wheel nicely. The simple short slide spring fits close. Light detachable cranks are fitted with rat-trap pedals.

We can speak in terms of the highest praise of every part of this really excellent machine; each portion is beautifully made and finished to an exact gauge, so that whatever piece is picked up fits it exactly. This saves endless trouble should any part want renewing. On the roadster the capital universal joint to the single ball bearing is fitted. The racer will be found a thorough good steed to all who buy it. We found a 53½in. (racer) to scale just 29lb. The price with balls, &c., as described, is £14—a decidedly cheap machine.

43. The Skinner Roadster (H. A. Skinner and Co., 63, Alexandra-road, Manchester).—This machine has only very recently been introduced. Like many other firms, the makers have wisely called to their aid, in constructing the wheels, the excellent light and strong hollow felloes

made by the Surrey Machinists' Company. The number of spokes varies, according to order, from sixty-four to eighty, and the size of wire is 11 gauge. They screw direct into large gun-metal hubs, 6in. by 5in.; at the bottom of each spoke hole a space of ⅛in. is left to allow room to tighten up, and about the same space at the top, free of "thread," so that the spoke has a little side play.

Rudge's or Bown's bearings are fitted, and as the hubs are well recessed they fit close in, and the tread averages about 13⅛in. to 13⅜in. Extra strong pedal pins are employed; they are ⅜in. thick, consequently they are not so liable to bends and fractures, and the rattrap or rubber pedals, running on parallel bearings, cannot lock or jam, as so often occurs with cones. Hollow front forks, flat, but broad and strong, are bolted to the bearing case. In the top screw that comes down upon the upper centre a change is made, it being constructed in two sizes; the lower half, larger than usual, screws firmly into the head, and the bottom, being coned, fits over the centre and holds it securely. The upper half is smaller, and a flat nut screws down over it on to the Stanley head, and the extra lock nut is not required. This system does not seem so liable to shake loose as the ordinary. A 22½in. handle bar, all in one solid piece, is carried in front of the head, 4½in. above the tyre. By using a sort of partly hollow rear fork, the side legs being like half a tube, flattened, with the edges curled inwards, lightness and strength are gained; it is brazed into the termination of the weldless steel backbone.

Balls are put to the small wheel, gun-metal hubs, and twenty spokes. Size of tyre ⅞in., against ¾in. in front. A simple, short, and easy spring is bolted to the neck, which, being compact, brings the butt-end of the spine close up to the head. The tail end is hinged to a sliding clip. Fixed cranks are used in preference to detachable, and the pin is additionally secured by a small neat cap screwing over the end of the axle. The Skinner will be found a good sound machine, and each is finished half bright and furnished with pouch and bell, besides the usual spanner and oilcan. We found a 53in. light roadster or semi-racer to scale just 41lb. Price £15 5s., rising 5s. per inch.

44. The Manchester Excelsior Roadster (Wm. Robertson, 324, Ashton Old-road, Openshaw, Manchester).—There are several varieties of this machine, but at the same time the standard pattern is not too rigidly adhered to, and the orders of customers are obeyed as regards

special details. Large well shaped gun-metal hubs, 5¼in. broad by 4¼in. deep, of a good dark colour, give a centre to the wheel, and into these screw sixty spokes, of 11½ gauge. On roadsters inch rubber is generally used, the little larger size being much more comfortable on rough roads; they are both cemented and wired into the crescent steel rims. Of course, the almost universal ¾in. rubber will be substituted if desired. Full command is obtained in steering by using a long handle bar, each side of which screws independently into a small central boss in front of the head, 4½in. above the rubber—total length 24in. The hollow front forks are both bolted and brazed to the Stanley head. Steel hand-forged (not stamped) fixed cranks are fitted; the pedals run on plain pins. The spring is kept very close, and has a simple slide at the tail, working on the hollow steel weldless backbone. A ring step with roughened edges is affixed at a convenient height. The small wheel is generally 18in., with ¾in. tyre for the heavy roadsters, or ½in. for general roadsters. As regards bearings, it is quite enough to say that Rudge's are used to both wheels; these, with good fitting, bring the "tread" to about 13¾in.—under the average. A 51in. weighs 38lb. and costs, painted, £12 10s., or bright for 15s. extra. It will be found a very fair machine.

45. The London Roadster (Messrs. Hickling and Co.; works, London-road, Maidenhead, Berks; show rooms, 30, Queen Victoria-street, London, E.C.; Birmingham, 31, Colmore-row).—No great changes have been introduced in this machine, but it is thoroughly well made. Sixty direct spokes is the average number, but this may be increased; the gun-metal hubs are flat, light, and only slightly recessed; they are 5½in. apart by 4in. deep. Humber bearings (or ones like them) are used for the driving wheel; the upper "lugs" of the cases are slipped up the ends of the hollow forks and secured to them, this making a very neat-looking joint. The forks are extra wide and strong. In conformity with modern ideas, 24in. handle bars are now adopted; they screw into a boss slightly in front of the head, Stanley pattern, with a rather large opening. A flat spoon—spade would be a more appropriate term—is put at the end of the brake to act on the rubber.

The spring is extra long, which gives increased pliability; but it is neat in shape and the tail slides freely, by means of a screw clip,

on the tubular weldless steel backbone. Either rattrap or rubber pedals can be had, and can be adjusted for about an inch, and the cranks are detachable on an improved plan. The usual leg-guard is fitted, and tyres of ⅛in. and ¼in. are used as a rule, but either larger or smaller, to suit special cases, are put on. The rear wheel is generally 18in., and has ball bearings. The whole machine is finely finished and is a splendid roadster, reliable, strong, and easy running. A 53in. weighs 46lb.,

Fig. 10. The London Roadster.

and the cost of a 54in., painted, is £17 10s.; if Rudge's or Bown's bearings are put to the front wheel as well, £18 10s.; if polished also, £20 10s.; or plated, £23 10s. A deduction of £1 is made if the rider has cones to the rear wheel, and another 10s. if fixed cranks replace the detachable.

46. The Timberlake Roadster. — This is, in principle, the same as the London; the solid forks are bolted to a capital description of roller

bearings (balls 10s. extra); the cranks are fixed. The head is of a special stamp, being open; i.e., the opening in the Stanley head is cut right through, not a mere recess. The centres are 3¼in. long, giving increased steadiness, and the bar 5¼in. high by 24in. long. We have frequently described the noted Timberlake brake. It works by means of a rack and pinion directly up and down, bringing a roller to bear upon the rubber, and, owing to the rack, the arms are not tired by keeping the brake continually on. A dust cap keeps the dust and dirt out

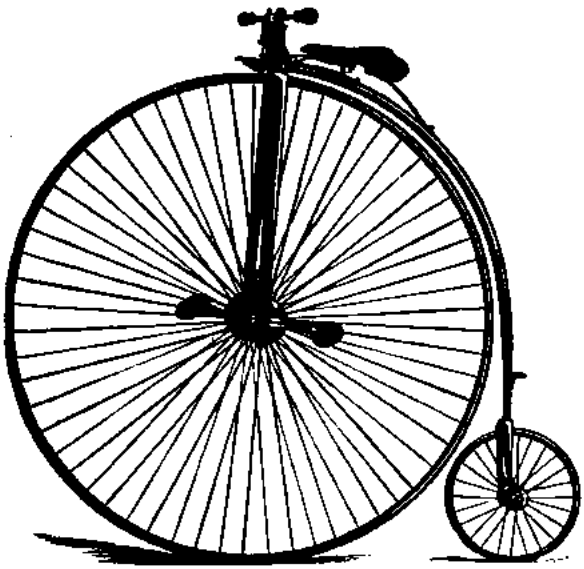

FIG. 11. THE TIMBERLAKE ROADSTER.

efficiently. It is in all a first-class machine, almost a *fac-simile* of the London, both in weight and other details. The list price of a 54in. is £15, but the extras run this figure up considerably, the following being the charges for modern improvements, in addition to the £15: all bright, £3; plated, £5; hollow forks, 10s.; balls to both wheels, £2 5s.; detachable cranks, 10s. So that the £15 becomes £20 5s. for a complete polished machine.

47. The Berkshire Roadster.—This machine has angle (V) iron rims, forty-eight direct spokes, small gun-metal hubs, and red rubbers. Solid forks are forged to the upper half of the bearing cases. These are of the parallel type, with the central portion partly cut away, and adjustment is made at the sides. Cones are put to the small wheel. The same length, 24in., handle bar is used, and a closed Stanley head, with a front lever brake. The backbone is of a good shape, and the tail of the spring slides on it, held by a screw passing through a short slot. The

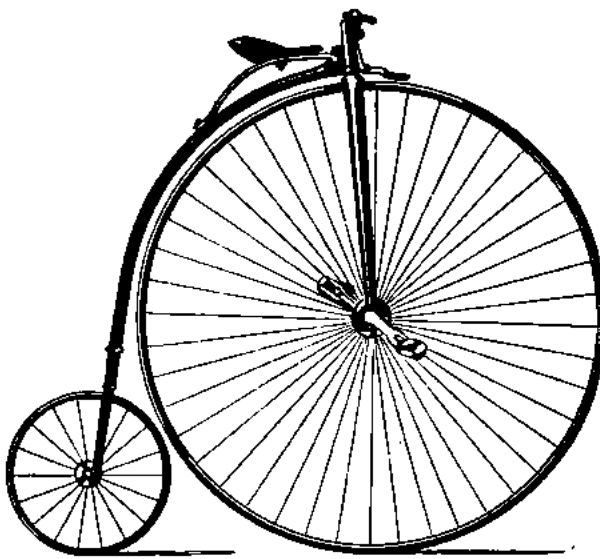

FIG. 12. THE BERKSHIRE ROADSTER.

price for a plain painted machine is £11 for a 54in., but the extras, if required, are 5s. more than those of the Timberlake. A 48in. (cost £10 10s.) weighs 44lb., increase in weight *pro rata*.

48. The Pilot Roadster.—Profiting by the success of the London, Timberlake, and Berkshire machines, this firm has introduced yet another variety—the Pilot—which they term their speciality for 1881, and which will soon work itself into favour. The wheels have unusually

well-shaped hubs, of a good deep colour, well bellied out inside, recessed outside, and with straight edges; they are nearly the full width, 5⅛in. by 5in. deep.

Seventy-two spokes of 11 gauge, and screwed direct, ⅛in. and ⅜in. for the respective wheels, are, in addition to cement, wired into the crescent steel felloes. This process is very carefully carried out, and the wire is not likely to cut upwards through the rubber, an objection that used to be urged against this principle of securing tyres. With so firm an

FIG. 13. THE PILOT.

attachment no fear need ever be felt about loose rubbers. Double ball bearings are put to the front wheel; they are adjusted at the side, and the bearing case, instead of having the shank, or upright portion, in the middle, has it on the outside; this allows the bearing to be put right inside the hub and the forks brought close down beside it. The cranks are generally fixed, and rattrap pedals used. Fine broad forks, of course hollow, instead of seeking a line of beauty in a finely drawn taper,

keep very nearly the same width all the way to the bearings, the shank of which is slipped inside, and a neat attachment secured. They possess great strength and rigidity. The head is a good pattern of the straight Stanley, and an excellent dust cap is fitted over the opening. We must not forget the handles, which have about the prettiest curve we have yet met with. Instead of being straight or of the "crumpled horn" type, they bend down, more than an inch, at the ends, but in a flowing curve rather than with a sudden twist, and the appearance is decidedly improved.

A good strong brake is used, and the lever brought well out towards the horn knobs, so that it can be grasped without removing the right hand from the end of the steering rod. A steel backbone, kept hollow all the way down, and the new semi-hollow back forks are in every case adopted. Bown's bearings are fitted to the 17in. rear wheel. Lastly, with this machine is introduced a new, simple, but efficacious spring; the tail is joined to the backbone by a hinge bolt, and is a fixture, so far as any up and down movement is concerned. The front end is free, and passes under a shackle, joined to the neck, but rests on a small plate, which is supported by a block of rubber. The spring is thus free to slide forwards; but it has another and more important motion, only to be discovered by getting into the saddle.

We have frequently spoken of the advantages derived from the "roll" imparted by the rolling saddle; they are to a great extent produced by the Pilot spring, and, besides breaking the vibration, the rubber pad is sufficiently elastic to allow the spring to dip down sideways at each stroke of the foot, not to any great extent, but enough to allow extra weight to be thrown into each leg thrust, and, consequently, greater power to be developed. These results are scarcely noticeable when the rider has grown accustomed to the motion, but they nevertheless exist. In short, the whole machine is made in the firm's best style, and is decidedly the foremost of the several varieties they turn out; it is a thorough roadster, about 43lb. or 44lb. for a 54in., and costs £17; finished half bright, or burnished, £2 extra; detachable cranks 10s. additional.

49. The Sandringham Roadster (J. Cox and Sons, Railway-road, King's Lynn).—We have before alluded to how the popular Norfolk taste still clings fondly to that fast-becoming relic of antiquity, the lock

nut. Here it reigns in all its glory, and seems to revel in being the means used to secure the fifty steel 11 gauge spokes into fair-sized gun-metal hubs, a combination that is not pleasing to the eye, and which mars an otherwise excellent machine. But this is only from one point of view. There are riders who prefer lock nuts; to them we can safely commend the Sandringham. The crescent rims hold ⅝in. and ¾in. rubbers. The shank of the bearing case runs up and is welded to the ends of the neat hollow forks. Bearings after the Humber form are adopted, and the head is also moulded on similar lines, but with the necessary addition of a dust cap, to keep grit from the centres; it also has the little cross piece at the bottom, the vital point, which, although needing protection more than any other portion, is so often neglected.

The handle bar is tapered, and 23in. long by 5½in. high, and has horn knobs. A neat close neck is also employed, giving a "natty" look to the machine. Fixed cranks, another tribute to local taste, and either rubber or rattrap pedals are used; they, however, might be closer, as the tread is 16in. The spring works on a simple form of barrel slide. Tubular weldless steel is the material of the backbone, and by reducing the solid portions as much as possible the weight is kept well down. For the 17in. rear wheel twenty spokes, 12 gauge, are put, and it runs on ball bearings. The Sandringham is a staunch roadster that will bear the jolts and jars of a macadam road, although light—under 41lb. for a strong 52in., which size costs, painted, £12 10s.

50. The Sandringham, No. 2, Roadster—A lower priced variety, with iron hubs, 5¾in. wide, lock-nutted spokes, one to the inch; solid forks, cone bearings to both wheels, fixed cranks, second quality rubber for tyres, no dust cap to Stanley head. A leg guard is added, and the spring has a steady but free-sliding clip that works on the backbone—an ordinary steel one. The machine is strongly built, and is naturally heavier than its stable companion. A 50in. costs £9.

51. The Derby Roadster (E. C. Clarke and Co., 1, Friar Gate, Derby).—A comparatively unknown, but nevertheless good machine. The steering rod is of fair length, only 4½in. above the tyre, and placed in front of the Stanley head. The hollow forks are at the bottom welded to cases of the bearings, which consist of a single row of balls, affording simple but extremely easy running. They are made on the spot, and great care is taken to ensure accurate fitting. They are adjusted in the

Sheffield fashion. Sixty spokes of 11 gauge screw direct into handsome large recessed gun-metal hubs. They are 5⅛in. broad by about 4¼in. deep. The spring is elastic, and the clip tail end slides easily on the steel backbone. The pedals are rather large in size, and oval. They can be adjusted as usual, and the cranks are either detachable or fixed. All parts are well fitted, the tread being below the average, 13⅜in. Sixteen inches is the ordinary height of the trailing wheel, which has ball bearings if ordered. Lubricators are put to all parts that require oil. The machine is well worth notice, being neat, well made, and light—36¼lb. for a 50in. roadster, which size costs £12 10s., or, with cones behind, £12.

52. The American Star Roadster (G. W. Pressey, of Hammerton, New Jersey, United States).—The appearance of this bicycle is very striking, and seems very queer to riders of the ordinary machine, as the small wheel is here placed in front of the driver, and therefore the ordinary pedal action is impossible of application; but, by an ingenious arrangement—like the motive power adopted in the Omnicycle—the fixed length of stroke, which has to be given in a bicycle with crank action, is not required, and any length can be applied—that is to say, the feet have not to follow the everlasting and changeless motion of the pedals, for not only can the stroke be varied at will, but the feet may be kept at rest while the machine runs on. Down-hill this is a great advantage, as none of the awkward positions, such as "legs over," have to be resorted to. On the level there is said to be a still greater gain, as the wheel over-runs the speed of the feet and increases the velocity, so that, on a good road, continual work is not necessary, but the machine will run on a considerable distance with the momentum already developed without the rider contributing his usual quota of work. This is an immense benefit on a long run, especially as every bit of falling ground can be fully utilised for the lessening of labour.

Regarded as a safety machine it is also said to be a decided success, as the pilot wheel readily surmounts obstructions, unless, of course, in cases where they are of too great a size; and, like the 'Xtra, it may be ridden over rough roads with impunity where another two-wheeler could hardly venture without fear of a cropper.

As to the actual construction of the machine itself, the driving wheel is as usual, though in this particular instance evidently constructed

Tangent wise; but there is a sort of double hub or extra frame for the spokes to screw (or link) into, and on the outer faces of the hubs there is a deep groove cut, into which fit "dogs"; these (sometimes known as "silent cogs") are apparently attached to a bent bar, which is, in turn, linked to the end of a bent lever hinged to the

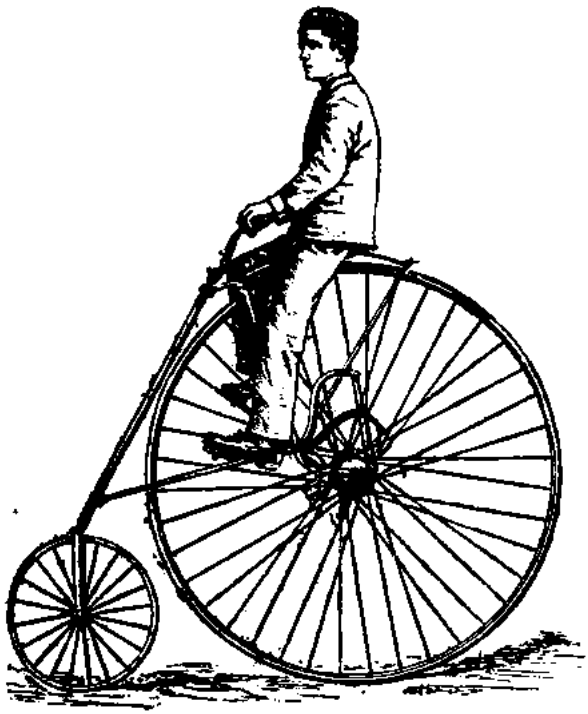

FIG. 14. THE AMERICAN STAR ROADSTER.

main frame, and having the pedal attached to the front arm. The pedals have thus a somewhat up and down motion, but in actual practice the difference is not so marked. The framework is of a rather curious nature, and consists of, first, the forks: These run from the axle,

and are immediately bent forwards, then upwards; slanting forwards they join, and form one side of the triangular frame which supports the saddle. In front, at the top, they are joined to what we suppose must be termed the front bone; to the upper end of this is attached the handle bar which guides the small wheel. As a means of securing additional steadiness, bars run from the forks and are joined to a movable ring, which encircles the front bone; this, in turn, rests on a coil spring, which removes the greater part of the jolting.

Certainly the palm for novelty must be awarded to this machine. On paper it appears a success, and we look forward to putting its apparent merits to full test when the first of its kind arrives in this country, which we confidently hope may be at no distant date.

There are a whole host of "points" that require practical demonstration before being finally accepted. Mounting seems rather difficult, as performed in the ordinary manner; there does not seem enough weight in front to counterbalance the necessary "pull" to elevate oneself into the saddle without lifting up the pilot wheel. Owing to the weight being so far forward, there would not, we presume, be much inclination to tilt over backwards, while leaning over in front may be carried out to any extent. Once more we repeat that speculation as to its merits or demerits will be comparatively useless until it arrives on our shores, when, doubtless, its advent will be hailed with acclamation, especially by disciples of the "Safety" school.

53. The Otto Roadster (The Otto Bicycle Company, 118, Newgate-street, E.C.).—A glance at Fig. 15, p. 51, shows the design of this machine to be very singular, the wheels being side by side without any back or front support, the whole framework being balanced between them, the rod, coming down the centre and projecting, being to prevent tipping over backward. Taking the framework first, the centre rod or main support to keep the wheels apart is a steel tube, 1¼in. in diameter by 24in. long, and placed 5½in. behind and below the centre of the wheels; the ends just escape the large driving hubs; midway the "tail" is joined to it; this consists of a steel taper backbone gracefully curved backwards and downwards, having at its extremity a small roller in order to prevent back somersaults should the rider lean too far back; the tail is also of great assistance in other ways. In mounting, when seated in the saddle, the machine tilts backwards, and the guard rests on the ground, so that

the cyclist can "fix" himself or herself (it being quite adapted to the fair sex), before the start, by putting the feet through the stirrups on the pedals, &c. Then, by pressing down with the uppermost pedal (should neither be in position they can be spun round so as to obtain the best position of the feet for the down stroke by slackening the cords as hereafter described) and leaning gently forwards, the tail is raised and the rider starts off. In the street, descending or going up a steep hill, stopping for any cause suddenly, &c., by simply leaning back, the

FIG. 15. THE OTTO BICYCLE.

balance is, so to speak, lost and thrown rearward, which brings the guard to the ground, and, combined with the brake, makes a dead halt at once, without fear of being pitched out forwards. The hollow crossbar also supports the seat. This is a marvel of comfort; it consists of a thin steel plate hollowed out, and covered by a soft and handsome cushion, shaped so as to yield to the motion of legs and allow full play to the limbs. It rests on what may be described as a couple of "turn-over" springs, steadied by two rods in front, but resting on coil springs.

The main springs are held by lock nuts on two bars, tapped for the screw. The ends of the springs are horizontal, and have three or four holes, which admit of its being moved in a forward or backward direction about three inches, so that the same machine can be readily adjusted to persons of almost any height, as the seat can also be raised or lowered to the extent of some 5in. Even the "cant" of the saddle can be changed and the front may be made high, in relation to the general level of the seat. The driving power is communicated by two endless steel bands, each of which passes round two deeply grooved wheels, the upper of which form the inner hubs of the driving wheels. They are 12in. in diameter, the groove being ¼in. in depth. The inner spokes screw direct into the outer side of the large hubs, and being thus considerably shortened, they make the wheel firmer and more rigid. The lower "drums" or wheels are only 9¼in. in diameter, with them another novelty is introduced with the lower drum wheels. They are made from two pieces of metal, the felloes, spokes, and hubs being one, and the sides being joined, they form a light and very rigid wheel. It is in the framework which joins the pedals to the machine and the accompanying parts that the beauty and originality of design are chiefly manifest.

The pedals are attached to a cranked steel axle, hexagon in shape, and bent so that the treadles have a 5¼in. throw, and are 9½in. apart from centre to centre. Over each pedal there is fixed a leather strap guard, to prevent the feet slipping off and to keep them in position. These straps do not hold the feet, as might be expected, but naturally release them by the very action of falling forwards, so that the rider only comes down on his or her feet. The axle is from end to end 27in. long, having (as already described) the smaller wheels at the ends. The main connection is two rods on each side. The outer ones (i.e., next the wheels) are the chief support. The lower end is left free, and works through a slot attached to the collar, which goes round the axle and contains the bearings; these are of a peculiar pattern, and may be described as double parallel with variations. Coil springs are wound round the larger rods, top and bottom; the lower being much stronger, it forces the treadle downwards, thus keeping the bands always in tension.

When in action the bands are drawn still tighter, and the pedals and axle are entirely supported by them, the rods acting more as guides; the

slides through which they pass are made rather oval at each side, so that the rods cannot jamb, as would be the case were they cut true, owing to the angle of the rods varying according to position. The smaller rods are for the brakes, steering and slackening either or both bands, the operation of guiding being performed on quite different principles from those carried out in other machines. Lately several important alterations have been made, especially in the methods of steering and applying brake power. A strong spade handle is placed at either side; these have each attached to the rod, on which they are fixed, a conical cog, which works against a corresponding bevel section. By turning the handles outwards the pedal stage is slightly raised, and consequently the bands on that side slackened. This permits the wheel to run free on the axle, and form the pivot round which the other runs in turning corners. If the outer handle be slightly turned inwards, it adds to the effect, but is hardly necessary. For hill work both handles may be turned inwards, when the bands, being tightened, great extra power can be put forth. The brake also acts on a capital principle, it consists of a large wooden tooth or clip, attached to a bracket sliding on the larger bar, fitting the groove of the hub on each side, and so stops its revolving. When not in action a couple of small coil springs keep it off the hub. Instead of having to push down a lever, a small cross piece inside each handle has merely to be raised by the fingers, when full power is instantly put on, or it can be applied with treble force—first, as described; secondly, by tightening the bands; thirdly, by back pedalling, and, as a last resource, by leaning backwards. Under these conditions no one need fear losing control of the machine, even on the most precipitous decline. In turning, say, to the left, the left handle is turned outwards; this blocks the left hand and also pulls up the small rod, drawing with it the left lower axle wheel. By this means a very sudden turn can be taken and a square corner negotiated with ease, as no sweeping curve is required. By turning out both handles all strain is taken off the bands, and the pedals can be turned without affecting the progressive action. "Back pedalling" can be resorted to as in the ordinary two-wheeler, and should a hill be too great to be conquered in one effort, the rider can lean back and take a rest before proceeding with his task. Plain bearings are used for the large wheels and the "Otto" ditto for the axle. The wheels have crescent steel rims, ⅞in. rubbers, and direct

spokes, screwing into iron hubs on the outer side. These are recessed, so that the nut which holds the wheels on their axle does not protrude in the ugly manner common to many tricycles. Should the bands require adjustment, not because they stretch, but on account of any special road, it being advisable to have them tighter in a hilly country than is necessary on the flat, all that is required is to slacken the lock nuts on the shorter bars, which, being provided with a right and left screw, can be turned, and the distance between the grooved drums increased accordingly. As to learning to ride, cyclists are as much at sea as outsiders, and when on for the first time there seems a strong inclination to pitch forward on applying pressure to the treadles, but this is overcome with practice, and riders discover that they have a "joint" in their bodies capable of bending to the action of the vehicle; after this passes away the motion is delightful, there being an entire absence of the back wheel vibration, while it is very hard to upset sideways, and the rider can readily jump out forwards should a dismount be compulsory.

A large quantity of luggage can be carried in a special round case, 14in. long by 10in. deep; it will hold a complete change. No one can be unaware of the approach of the Otto, if the extraordinary horn is sounded. This is done by squeezing a rubber ball attached to the mouth of the trumpet.

The Otto promises to make cycling more popular among the fair sex than any other machine. We know of one young lady who has frequently ridden thirty, forty, and fifty miles per diem with great ease, ascending hills without trouble, and passing through the most crowded traffic, including London Bridge, without inconvenience. Somehow ladies seem to learn quicker than men, and it is very much easier to drive than a three-wheeler; they can also be taught by one of their own sex at the offices. Persons who buy the machine for the sake of curiosity and fail to become proficient in three minutes must not run away with the idea that it cannot be learned. We can personally ride it easily, and although it takes a little time to master, the trouble of doing so is well repaid. The company have already large numbers of orders, and we anticipate a prosperous career for this novel, but practical, cycle. We may add, a lady's machine weighs 70lb., a gentleman's 82lb., but the weight, being so well balanced, is not felt in the least when riding. Price £21.

54. The Atlas (T. Handcock, Unsclipsed Bicycle Works, Bishopsgate-street Without, London, E.C.).—At the last two Stanley exhibitions the machines shown by Handcock have not been without admirers, but although this year is Handcock's fifth season as a maker, he is not so well known among London riders as he deserves. This machine has Campbell's steel rims and ⅞in. moulded rubber tyres, secured by Rockhill's cement. The average number of spokes used is seventy-two, of 12 gauge; they screw direct into large and neat lacquered gun-metal hubs, 5⅜in. broad by 4in. deep. For bearings, a double row of ¼in. balls, ten in each row or twenty a side, are used for the front wheel; they are adjusted from the sides, and run very well. Gribben's patent double tubular forks have been adopted. They possess, in addition to the ordinary oval, a round tube running down inside it, thus adding greatly to the strength. The head has centres of a good length (3½in.), a dust cap protects the opening, and the butt end of the backbone is brought close up to the head. Either oval or round backbones are used, but in the absence of special instructions, round are generally employed; semi-hollow sheet steel rear forks, with curled edges, are brazed to the end of the backbone, which is kept hollow all the way down, which, besides looking very well, are exceedingly strong.

Seventeen inches is the general size of the small wheel, which also runs on ball bearings, eight balls on each side; they are adjusted very easily. Two prominent points that first catch the eye in the Atlas are the handles and spring. Taking the former first, we find them of a very pronounced "cow-horn" type. Their total length is 24½in., and on either side of the head they are bent into a rounded arch and brought low at each end. This shape possesses two advantages: First, being bent upwards, they allow more room for the legs to work under them, especially if the rider be on too small a machine. Secondly, the ends, horn knobs, are brought very low, hardly 3in. above the wheel. This allows the arms to be well extended and used in a less tiring position than with a short straight bar. The other special feature is the new spring. It is in two portions: the rear one consists of a triple curl, the lower end being carried forwards and attached to the backbone; the centre supports the end of the ordinary spring. This is crowned by one of Wooley's excellent spring saddles, and the whole appears easy and comfortable. A good lever front wheel brake is added, and the entire machine is well made and

neat in appearance. A 54in. strong roadster weighs 42lb., and costs £16, or 20s. more if all bright and burnished. Details not mentioned are as usual.

55. The City (W. O. Aves, City Bicycle Works, 46, Barbican, London, E.C.).—This machine, having passed through three or four seasons, has now become established as a high-class roadster that will stand the rough usage incidental to touring and general knocking about. Among the chief points are the new rear wheel bearings; they consist of hollow converse cones, one of which projects from each side of the hub, being joined firmly to it; through these the pin passes, and on it are two concave cones. These are held in gun-metal cases, which overlap the hub, or rather fit into a groove cut in its face; one of these outer cones is a fixture, the other slides on the central pin for adjustment, but cannot lock. Compensation for wear is effected in the ordinary way, and the whole forms a simple, effective, and easy running bearing that will stand a lot of wear. It is not to be confounded with ordinary back cones, being much steadier, owing to the bearing points being wider instead of narrower than the hub, while it works almost as freely as any balls.

The framework is very strong, with extra large forks and backbone, the latter hollow down to the joint, where it meets the solid rear forks. The spring is rather longer than usual; it has a simple tail slide, and balls to the well shaped neck in front. Two male cones are put to the centres, and a case, with convex cone, screws down over the top one. This plan gives extra length and steadiness. A 24in. handle bar is made either straight or cow-horn shape and kept well down. Direct spokes, eighty in number, and of 12 gauge, screw direct into large, partly recessed, gun-metal hubs from steel crescent felloes. Detachable cranks are fitted, and either rat-trap or ball pedals; average tread, 15in. Double (caged) ball bearings are put to the driving wheel. The City machine further possesses a good strong brake and the ordinary points looked for in a good machine, and it still bears out the high opinion we expressed when we last reviewed it. A 54in. half bright weighs 43½lb., and costs £16 10s.

56. The Florentine (Thos. Hough, Florentine Works, Ablow-street, Wolverhampton).—This machine puts forward no special features, having the Birmingham hub with fifty-four direct spokes, and crescent rims, with rubbers of the general size. Either single ball or roller bearings are put to the large wheel, with Bown's to the rear; the former are bolted to solid

forks, which are surmounted by a Stanley head with a straight handle bar, 21in. long, and a front lever brake. The cranks are adjusted by nuts on the end of the axle. A barrel slide terminates the tail end of the spring; it works on a rather small tubular backbone. An ordinary saddle completes the machine, which costs £7 10s. for a 50in.; weight about 44lb. or 45lb. It seems strongly made.

57. **The Boys' Emperor** (R. Edlin, Frog Island, Leicester).—Hitherto our juniors have had very inferior machines thrust upon them, seemingly with the idea that "anything is good enough for boys." Edlin is not, however, of that opinion, and his machine is decidedly the best boys' bicycle before the public. It is, in nearly every point, the same as his well-known and justly-popular Emperor, which alone is sufficient to guarantee its being high class. Instead of angle iron rims and cone bearings we find ball bearings to both wheels, light and elegant crescent-steel felloes, gun-metal hubs (4½in. wide), fifty direct spokes, ½in. tyres, 12in. rear wheel, and a very neat clip spring. Hollow forks are not forgotten, and a 41in. only weighs 20lb. The price is £10 10s.

58. **The Hollow Fork Britannia** (W. G. Lewis and Co., Speedwell Works, Romford, Essex).—This quiet little town, which is chiefly noted for the famous brewery of Inde, Coope, and Co., boasts of one bicycle maker who turns out several varieties of bicycles and one tricycle. The machine now under notice is his No. 2, and would do many firms credit as their "special." There are no startling innovations to be found in the H.F.B., the general and most popular being followed. The wheels have seventy-two direct spokes of 11in. guage screwing into large gun-metal hubs of a fine deep colour and good shape, the measurements being 5½in. wide by 4½in. deep. Three-quarter inch rubbers are cemented into light steel crescent rims. Bown's noted ball bearings are put to the driving wheel, and, fitting well into the recessed hub, help to diminish the tread. They are secured by a knuckle joint to the legs of the hollow forks, the latter are extra broad and strong. The Stanley head, which surmounts the shoulders of the forks, has a capital dust cap, which half encircles it, and therefore keeps the centres free from intrusive grit, besides adding considerably to the appearance of the machine. The steering rod is 5in. high by 2ft. long, and the grasp handle of the brake—the various portions of which are neater in detail than usual—comes out the same length as the bar itself, and being fitted

with a comfortable knob, it can be grasped and held firmly without any undue strain on the fingers. This is a most important point, and should always be carefully noted by riders when examining a machine; the spoon, or portion acting on the rubber, is so made that it cannot dig into the rubber, but acts smoothly upon it.

A small barrel slide, which works on the oval backbone, is affixed to the tail end of the spring, the front terminating in a double curl, the extreme end being affixed to the bolt which passes through the neck, the last named is short and compact, bringing the butt end of the backbone close to the head. It is easy, pliable, and has a neat, but not too high, arch. An ordinary pigskin saddle is added. Bown's bearings are also put to the 17in. rear wheel. Either rat-trap or rubber pedals, with plain bearings, according to choice, can be had. The cranks are detachable, being secured in a simple but efficacious manner. The whole machine is burnished very brightly—indeed, the polish is so good that we thought the one we examined was, at the first look, plated. It will be found a good roadster. Price of a 54in., £15 10s.; weight, 43lb.

TRICYCLES.

1. **The Broad Arrow** (E. A. Tranter, Yerbury Factory, Trowbridge, Wilts).—In outline this is one of the most "taking" machines in the market. The arrangement of the wheels is to place two of equal diameter side by side, and the rear one behind; but in several points it is different from others, notably in the finish of the hubs, which, without undue praise, we must class as the neatest we have yet seen. In the general run of machines makers apparently strive to make this important portion as ugly as possible, of iron, with nippled spokes and a large clumsy nut sticking out. The Broad Arrow entirely does away with this "obstruction," and direct action spokes are adopted, with gun-metal hubs 4½in. deep by 6½in. broad. They are finished off flush on the outside, and quite light up the centre of the wheel, but the absence of the usual nut leaves their form of attachment to the axle a mystery. This is accomplished by making the outer hubs deeply recessed, and within this the nut and axle end are to be found; but a thin plate fits over the recess and is held by four screws, all being of the same hue as the hub, therefore not readily noticed. Sixty spokes of 12 gauge is the number used; they are headed into the U rim; tyres of the usual size to the front wheel (⅝in.), but only ½in. to the rear are employed.

Luggage-carrying on a tricycle is much more readily accomplished than with a bicycle, but even then there is generally a decided scarcity of room. In the Broad Arrow this objection is removed, owing to the peculiar shape of the frame. The main portion consists of a steel tube, carried a short way behind the axles and bent down vertically in front; the lower end is flat and solid, with a slot for adjustment. The legs of this frame are 20½in. apart, and between them the axle is placed; it is 23in. long (over all) and runs on ball bearings at either end. The pedals have a 5½in. throw, and from centre to centre are 9in. apart; outside the

frame, on the left, the driving chain winds round a 7in. pin wheel; the other is of similar size and placed between the left wheel and frame; they are almost directly above each other, and their respective axles are 16in. apart. The actual backbone is 27in. long, and runs out straight from the centre of the frame to the Stanley head of the back wheel; the latter is 25in. high, ¾in. rubber, and is also provided with ball bearings, gun-metal hubs, 28in. spokes, and supporting the backbone are two bracket rods, running from each side of the steel tube, at a point 16in. apart, to near the neck of the backbone; this forms a > frame. The "spine"

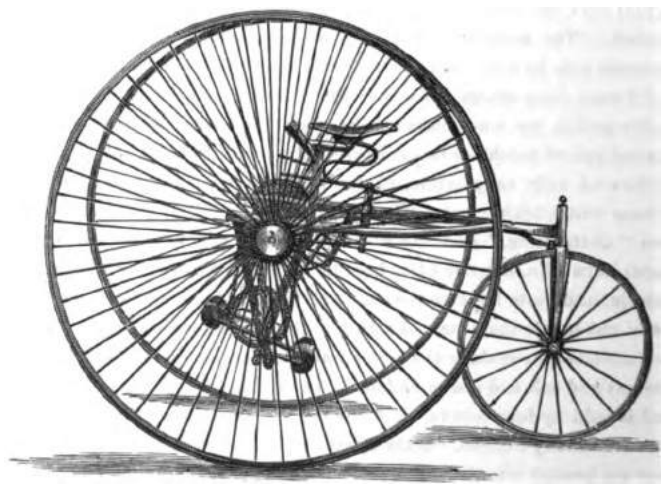

FIG. 1. THE BROAD ARROW.

forms a central division; on this a large amount of luggage or packages may be stowed away; at the same time it affords a most simple, yet rigid "body" to the machine. Brakes are fitted so that equal power is brought to bear on both wheels simultaneously, the method of applying it being as follows: On the inside of each hub, next to the frame, there is placed a light skeleton wheel 6½in. in diameter, with broad flange; round this a steel ribbon is wound. A rod crosses the machine under the tube frame, and is attached to this band by short bent levers; this is turned

by means of a small "grasp" lever within easy reach of the fingers, just beneath the left handle; by pulling this up the rod is turned, and both bands compressed tightly round the flanges, thus stopping speed at will. It is clearly one of the best tricycle brakes brought out, and the equal power it exerts is a considerable improvement on those which act on one side only.

Steering is effected from the right handle by the usual rack and pinion method, the left handle being a fixture; they are 21½in. apart, and well situated with regard to the rider's position. Ball bearings are applied to all wearing parts, and, as may be expected, make an immense difference in the running of the machine. The saddle can be raised or lowered some inches, and is supported on a curled spring regulated in strength to the weight of the rider—an important item which should always be divulged to the maker, or the consequences will not be pleasant if a heavy rider gets a machine with a spring meant for a light weight. It is fitted with a Lamplugh and Brown's roller suspension saddle. In details, a good mud guard is fitted to the rear wheel, to prevent the rider becoming bespattered. The rear forks are of a good shape, and turn into the wheel, which produces a steadier motion, and makes it obey the helm more readily than if straight.

The total width of the machine is 38in. If this were increased two or three inches it would be a marked improvement, and allow more elbow room. The distance between the front wheel tracks is 30½in., the rear being just a yard behind. In turning, we found that, with a driving wheel inside, a space 11ft. 5½in. wide sufficed to get completely round, while with the same wheel outside 12ft. 10½in. were required; thus reversing the order of things. The whole machine is one to be highly commended, and the position of the rider is very like that on a bicycle, while he (or she) can dismount freely; it is also capable of high speed, and will generally prove a useful machine. We found a 54in. to scale 94½lb., but, with coming improvements, this will be considerably reduced. The price, with ball bearings to four parts, is £20; but with plain bearings, and all other parts the same, the cost is reduced to £16. Foot rests are added if required.

2. The Excelsior (Bayliss and Thomas, Excelsior Works, Lower Ford-street, Coventry).—On ordinary tricycles the chain proves often a source of trouble, as it is apt to stretch slightly, mayhap breaks (a very rare occurrence, however), and anyhow, all will admit the great

additional friction it causes. A simple way of manifesting this is to lift the machine and try to "spin" the driving wheel. The result is that it stops almost dead as soon as the hand is taken off the pedals. Messrs. Bayliss and Thomas determined to make a radical change, and entirely do away with the chain. This is accomplished by placing a fixed wheel, revolving on its own axis, and communicating the power from the axle to the driving wheel. An ordinary "cog" would not answer at all, and a special wheel has been designed. In place of teeth it has a series of small cross pieces, which turn freely and act as rollers. These take off an immense amount of friction, as, when put through the ordeal mentioned above, the wheel will run almost as long as that of a bicycle—working the pedals all the time—and afterwards oscillate. On the inner side of the driving wheel a skeleton cog is fixed to the hub. This is acted on by the "pin" wheel, which is worked by the lower cog.

The framework of the machine consists of steel tubing, bent in a round form and carried some distance behind the centre of the wheel. The backbone bends down and runs straight to the rear wheel; the legs of the frame are on the right bent down, the end forming a support to the medium-sized wheel; on the left the "leg" is carried more forward and downward; to it are fixed, by bolts passing through bosses on the lower side, the two cogs and pin wheel already enlarged upon. The cranked axle is not bent, but forged, so that it may be perfectly relied on for strength; the ends of the shaft work on ball bearings in the end of the "legs" of the frame; rubber pedals are used. Ball bearings form one of the great charms of the machine; they are put everywhere—eight places in all. All three wheels have them, they being on each side of both larger ones and on the back—like the rear wheel of a two wheeler; also at each end of the (crank) axle and to the "pin" wheel. No less than seventy-eight balls are used. They are of the best make, and the difference they effect in the running must be felt to be understood.

As to the general details:—The wheels are of three sizes, the left, or driver, ranging from 50in. to 54in. It has sixty direct action spokes, gun-metal hubs (lock-nutted if preferred), ¾in. rubber, and steel crescent rim. The other wheels are similar in construction, but 38in. and 20in. respectively. Brake power is applied by the "strap"; a steel band encircles a drum inside the cog (i.e., next wheel) of driving wheel, and this is tightened by pulling (not pushing) the left handle; but, as this causes

a machine to wriggle when suddenly applied to one side only, a small rod, connected with the left handle by short arms, crosses the machine, and, by means of a spoon, acts on the right wheel at the same time, so that power is not only equally distributed, but doubled. Steering is managed by a rod connecting the rear wheel with a pinion, which is moved by turning the right handle; even this is much strengthened and made more rigid. The saddle or seat is supported on a comfortable spring, and can be raised or lowered some 6in. Lamplugh and Bown's new tricycle seat is now fitted.

The Excelsior is sure to be one of the most popular steeds of the day; it is very light—80lb.—and the freest running machine we have yet met with. On the latter account it will make a valuable machine for ladies' use and for those who wish to gain the maximum progressive power with the minimum of exertion. The extreme width is 39in., but by taking off the right wheel this can be reduced to 20in., so that it will pass through a door. In regard to price it is about the cheapest machine in the market, being only £16 16s. up to 50in.; above, £17 6s. (this includes all the ball bearings, &c.). It is not only a thoroughly good, well built, and easy going machine, but also an exceedingly attractive one.

3. The Hand Lever Excelsior.—We have frequently been asked for a good machine that is driven by the hands alone, for the benefit of unfortunate beings who have lost the use of their lower limbs, and who, retaining the strength and vigour of their arms, wish for some more independent mode of travelling than having to rely on others to pull them about in a Bath chair. Most of the vehicles at present in vogue, such as are occasionally met in the street, are of very crude form, fearfully laborious, made of wood, extremely heavy (about 150lb. to 200lb.), and the proverbial snail's pace is a comparatively quick movement compared with the rate at which they crawl along. Fortunately, Messrs. Bayliss and Thomas have taken the matter in hand, and produced the machine now illustrated (Fig. 2). All three wheels are of different sizes: the largest and driving wheel is small itself—40in., the right wheel 30in., and the rear wheel 20in. The framework consists of weldless steel tubing in two portions; the front is one piece bent round at the back, with the legs carried down in front. The "feet" being solid, and turning outwards, support a comfortable platform, which is provided for the pedal extremities of the rider; the front edge slants upwards and outwards, to afford

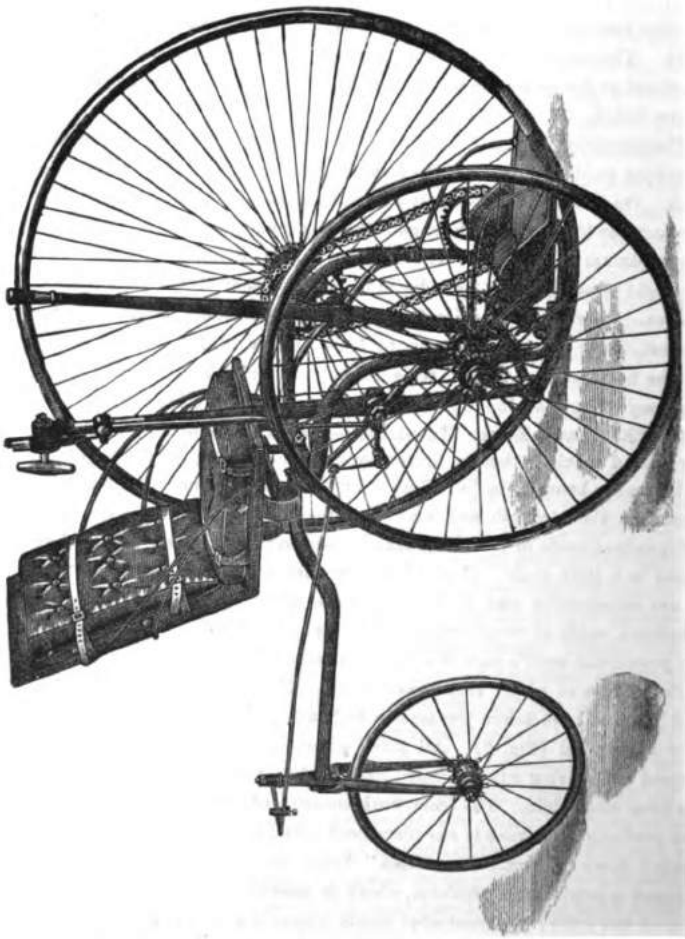

FIG. 2. THE HARD LEVER EXCELSIOR.

a purchase and to prevent the feet slipping. To the centre of the rounded portion, at the rear, is joined the backbone; this curves slightly downwards, and then runs straight into the head of the trailing wheel. Driving power is exerted entirely by the arms and hands, and is applied by long levers placed on each side of the machine; they take their fulcrum from a short rod at an angle across the rounded bend of the tubular legs. The levers are themselves tubes; the lower ends are joined by means of a bar which crosses the machine. To the left side a short arm is hinged; this is also attached to the cranked axle (which takes its right hand bearing on a case on the right foot or projecting shoulder from the right leg). To the outer (left) end of the axle there is attached a cog wheel, and mid-way between this and the cog on the inner side of the "driver" there is placed a pin wheel, having, instead of cog teeth, a series of rollers. These save an immense amount of friction, and communicate the power rapidly and easily to the large wheel. The chain is shown in the block, but it is now superseded. Steering, when both hands are at work, is apparently a difficulty, but it is effectually overcome. On the top of the right bar a handle is fixed, with a rack and pinion arrangement. This is attached by a short rod to a boss, which slides up and down a portion of the lever; another rod runs from this, and in its turn, by two joints, is joined to a long light rod running to the rear wheel, where an arm projects and is fastened to it. Some little practice is required before a full mastery over the steering is obtained. A most comfortable seat is provided; it is very low, and so near the ground that it can be reached without any climbing. It is supported on easy springs, and the seat itself consists of soft padded cushions, with a high support for the back, and side guards for the arms. Either lock-nutted or direct spokes are used, and, indeed, the other points are similar to those of the Excelsior. The machine is finished, neatly painted, ball bearings put to most parts, all at an extra charge, the ordinary price being £18 18s. up to 48in.; but a smaller size will be found generally more convenient and useful. Indeed, we must caution those who use this machine not to be led away by their own fancy or aspirations; the pace must always be slow, say, four or five miles an hour, but that is a great thing for a cripple. In weight it averages from 85lb. to 90lb.

4. **The Cambridge** (A. T. Burton, Regent-street, Cambridge).—In appearance this machine resembles the "Two Track Swing Lever,"

its chief characteristic being the principle of having only two tracks. This desirable end is accomplished by placing the small—or steering—wheel exactly before the right large wheel. The frame is 28in. above the ground, and consists of steel tubing, and is 19½in. long by 10in. broad; the tube is carried out for 4in. on the left side—beyond the cross piece—to form a support for the handle of the brake; on the right side the tube is continued out, descending in a curve and turning outwards to be attached to the socket head of the pilot wheel. From the centre of the frame a stout tube runs downwards, supporting at its lower end a horizontal bar 15½in. in length; the ends of this are additionally strengthened by light rods, running bracket wise, to the main frame, front and back. On this bar the ends of the levers work; their length is 17in., and they consist of double bars, spreading out from 4½in. into a prong 6in. wide, in order to hold the pedals. At 9½in. from the latter they are joined to light bars, which transmit the power to the cranked axle, the total length of which is 34in.; it works in plain bearings, Sheffield adjustment at the two parts which support the frame.

The throw of the pedals can be changed 5in. This accomplished by their being in two parts, a double loop joining the upper and lower portions; it has a double handled screw, so that, by simply turning it, the lever, and, consequently, the pedal, is raised or lowered. Steering is effected from the right by a handle with ratchet arrangement, connected with a rod 27in. long, affixed to an arm projecting from the front wheel. The power of the "rudder" can be adjusted by putting the end of the rod into a shorter and closer hole in the "arm." On the right a similar handle is attached by a short lever to the steel band, which passes round a drum on the hub of the left wheel; it is applied by pushing out the handle, and a spring keeps it off when not wanted. The pair afford a capital leverage for the arms, and are about 2in. above the seat by 18in. apart; 50in. is the general height of the wheels. They have the combination U and V rims, ¾in. grey rubber tyre, fifty spokes, lock-nutted into iron hubs; the nuts which keep the wheels on the axle are placed outside the small hubs. The small wheel is 20in. high, runs on ball bearings, and has ¾in. tyre. A comfortable seat is provided; it is 17½in. long by 9in. deep, fitted with a soft cushion and back rest; it rests on four elastic steel springs, which are fixed to the frame; its height from the ground, with 50in. wheels, is 35in.; to mount, the lowest pedal is

made use of as a step. In turning, it describes a circle 10ft. 5in. in diameter—its total length being 6ft. 2½in., rather more than one half. The wheel tracks are 29½in. apart, the front wheel touching the ground 37½in. in front of the axle. Placed on the scales, a Cambridge will be found to weigh exactly 99lb. Painted all over—hubs, spokes, frame, the price, with balls to front wheel, is £17 16s. It is a good strong machine.

5. **The Flying Dutchman** (Hillman, Herbert, and Cooper, Premier Works, Coventry).—Most readers will doubtless remember the Fifty Miles Tricycle Race which was held in September, 1879, and the remarkable feat performed by the winner, A. E. Derkinderin, who managed to cover the two score and ten miles of indifferent roads in less than five hours. The machine he rode was then quite new to the London market, and the name we then gave it has been retained, *i.e.*, the *sobriquet* its rider obtained on the racing path. It may be considered the pioneer of what is at present the most popular form of tricycle. The three different sized wheels were then considered a novelty, but are now allowed to be a success. The illustration, Fig. 3, p. 65, explains the arrangement of the wheels. The respective sizes are 50in., 40in., and 18in.; they are the same as the bicycle wheels—direct action spokes, crescent rims, red rubbers, &c., or look-nutted spokes and iron hubs to meet the wishes of riders with old-fashioned ideas. Both front wheels work on independent axles, which are supported by bosses on the under side of the frame. The latter consists, as in other cases, of steel tubing, bent into a rather square form with the legs coming down in front. These support the wheels, as stated, and the cranked axle at the ends. It has rubber pedals, and the power is communicated by means of a cog and an endless chain passing over a similar one affixed to the driving wheel. Both being of equal diameter, there is neither gain nor loss of power. The machine may be run backwards, or in going down hill back pedalling may be resorted to. Should a further check on the speed be required, by pushing out the left handle the brake is brought into play; it is of the strap order, and acts round a drum on the axle of the largest wheel. This pushing is a decided improvement on pulling, which is the ordinary action, in order to obtain great leverage for the arms, with a view to putting extra force into the feet. In descending hills this is not wanted, and, therefore, when pushing with the left hand it does

not interfere with the working of the machine. The right hand is, of course, reserved for steering, and a light rod connects it with the back wheel. The tracks of the front wheels are 31½in. apart, and the rear wheel touches the ground 39in. behind them. Either saddle or seat can be used. It is held by a couple of bow springs and has an easy motion. It can be raised or lowered 4in. The backbone runs straight from the back of the frame to the small wheel. The latter has either an open or a Stanley head. If preferred the brake can be made to act on this or the middle (sized) wheel, but it is best as described. Ordinarily the

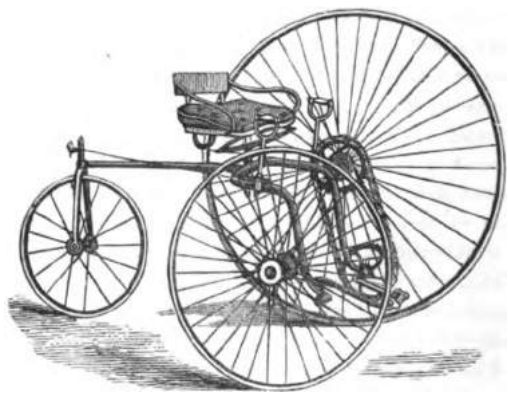

FIG. 3. THE FLYING DUTCHMAN.

machine runs on plain bearings and cones behind, but a double row of balls is put to either wheel or to the axle, at an extra charge of £1 each. We have frequently spoken well of this machine, and can now only repeat that in our opinion it is a first class mount for either lady or gentleman; its workmanship may be thoroughly relied on, it runs easily, and the appearance is attractive. It is of the average weight, 84lb. for a 50in. machine, which costs £16 16s., or with balls to all four parts—a great improvement—about £20.

6. The Young Dutchman.—This machine, which was introduced for use by children, is quite different from anything else we have seen, as may be gathered from the illustration given. The driving wheels are

only 22in., and the front 12in.; the construction is very simple, but light and strong. The axle is cranked, and the levers are long and curved; the tail ends are jointed to a swinging bar by short arms, which gives a peculiar motion to the pedals, but nothing that interferes with the working of the machine. The tubular rod is only carried out on the right side to where it supports the little wheel. Steering is effected in a novel

FIG. 4. THE YOUNG DUTCHMAN.

manner by reason of the way the Bath chair-like handle is fixed to the "pilot." Ease and comfort have been studied in the seat, which is held up by an arrangement of springs, which can be raised or lowered. Direct action spokes are put to the wheels, which have ¼in. tyres. The price is only £23 3s., and the weight 25lb. Very little labour is required to drive it; plain bearings are used, but it is so light that it runs extremely freely.

7. The Salvo Quadricycle, No. 2 (Starley Brothers, St. John's Works, Fleet-street, Coventry).—In its original form the great weight of this machine (120lb. to 125lb. or more) was a serious objection, so to combat that drawback No. 2 was brought out, and this, being made considerably less heavy than its prototype, is recommended to ladies, but we trust the maker will be able still further to reduce the weight. As the No. 2 will, in all probability, cut out the No. 1, we will describe it. The ingenious method resorted to to obtain double, single, or independent driving power is deserving of all praise, and bespeaks great mechanical skill on the part of the inventor. By the patented arrangement the full power exerted by the pedals may be utilised by both wheels, or on lifting

the machine either may be held while the other is worked, or both "spun" in opposite directions. Suffice, therefore, to give the results of the combination.

FIG. 5. THE SALVO QUADRICYCLE.

As will be seen from the illustration the outline of the machine consists of two large wheels, side by side, and a small wheel in front,

with a tiny one behind. The side wheels are 46in. in height, have fifty-four direct spokes, small wide (6½in.) iron hubs, crescent rims, and ¾in. rubber. They work on the ends of a straight and apparently continuous axle. The total breadth is about 3ft. 2in. The frame, after the complication of cross bars, levers, &c., in the No. 1, is exceedingly simple. The seat (or saddle) is supported by a bent rod and easy low spring, from which a rod runs down. This is in turn held by a cross bar and by means of a screw (fitting into a series of notches) the seat is capable of being raised fully 6in. or moved backward or forward, so that various members of the one family can enjoy healthful exercise on the same machine without either elongating or cramping the limbs.

A curved wire guide is placed on each side to prevent the rider's elbows getting entangled amongst the spokes. The handles are within easy reach and 18in. apart; the right is for steering, and, by the assistance of a ratchet and rod, is connected with the front wheel; the machine obeys the helm in a remarkable manner, and a circle of extremely small diameter can be described by the wheels; indeed, by exercising a little power, the machine can be fairly spun round on its own axis. We have seen it turned in this manner, when the wheel tracks only measured 6ft. 2in. across. The left hand is merely for holding, and thereby exerting an equal pressure and gaining additional power by pulling against it. Brake power is applied by pulling forward a long lever on the left side. This is so made that, when full on, both it and the ordinary handle can be held together, thus saving any tiring position of the hand. The force exerted is considerable, and will cause the machine to stop dead in four or five yards—when going full speed. The brake is of the strap order, a steel band working round a drum on the axle or box.

As we already remarked, the framework is considerably reduced and simplified. It consists mainly of two strong flat iron supports running down at the sides; these are bolted to the front cross piece, a steel tube; in the centre another short tube arches over the front wheel and holds it in position by means of the almost forgotten Socket head; an arm branching out at right angles with the fork is attached to the steering rod. The whole frame in front is kept very low, so as not to inconvenience the rider when gaining the seat. A stout and broad mud guard partly covers the 16in. pilot wheel. The crank axle is bent so that the pedals have an

average throw and rotary action; the ends work in brackets or bosses on the side supports, and the left is continued out, and has a small cog wheel. Round this passes an endless chain by which the machine is driven, and it can be backed readily in descending unknown hills where a turn in the road may suddenly reveal a gradient of unexpected steepness—it is not safe to always place entire reliance on the brake—and in such cases back pedalling is of valuable assistance. In turning corners the full benefit of the independent action of the wheels is felt, for these act automatically, allowing the machine to turn either way with equal facility.

We have not yet explained the title, taking the second part first. It is, and yet is not, a quadricycle. There are four wheels, but only three are called into play for practical purposes; the fourth is merely a nominal auxiliary to qualify for the prefix to its name—Salvo. The weight is placed so far back that it rests almost entirely on the main wheels, and the "pilot" supports only a very small proportion of the burden; in this there is an element of danger, for on leaning back the weight would overbalance, and a compound rear "cropper" of the worst description be the result. In order to obviate such a result, a small metal wheel, about 4in. high, is placed behind. This is held by an arrangement of rods, which run triangle wise from the frame and top cross bars, and is very firm; its ordinary position is 4in. or 5in. above the ground, but on any tendency of the rider to tilt over backwards, the front wheel rises up and the "salvo" comes down, thus effectually preventing any catastrophe; by leaning forward the normal position is at once regained, without any inconvenient result. With two good lamps it is a fine machine for night work, and it is coming into use among ladies, but the weight is rather a drawback for such riders, as, although supposed to be extra light, we found a 46in. to scale 95lb. This weight, however, is not so much felt, owing to the balance of the rider, as in the case where it rests "dead" on all three wheels. The side wheels touch the ground 30in. apart, and front at a point 31½in. before them, thus forming almost a trihedron. The ordinary price is £18 10s., painted; part plated, £19 10s.; or all plated £21 10s. Aprons, for ladies, are charged 10s.; and a pair of King of the Road large head lamps ought to be added to the outfit.

8. The Salvo Quadricycle, No. 3.—This is made with only 40in. wheels, and will therefore be lighter; but we cannot give its exact

weight, as we have not seen one in a complete state. The price is only 10s. less.

2. The Flying Eagle (The Cycle Company, 28, Charlotte-street, Birmingham; London office, 51, New Kent-road, S.E.).—This machine is somewhat like a later edition of the Wilmington tricycle introduced by Mr. John Tremper of Wilmington, United States, in the year 1868, but the sizes of the wheels have been reversed, and the driving wheel, instead of being the smaller, is larger, whilst the assistance of levers is called into play instead of direct action. The appended cut of the machine is sadly "mixed," and scarcely conveys an idea of the machine. It is

FIG. 6. THE FLYING EAGLE.

essentially for the use of the male sex, and is ridden very much like an ordinary bicycle. The front wheel is 47in., or any other height, and of ordinary construction; gun-metal hubs, direct spokes, crescent rims, red rubbers, &c. The forks are hollow, and rake back some 3in., and in the steering gear the extinct Socket head has been revived; it works on cones.

A short arm projects at each side from the shoulders of the forks; to these are attached rods, which run behind to between the small rear wheels, where they are joined by bolting to another double arm which has an adjustable slot; through this a short bolt and nut project from a lower and light cross rod. This acts on both wheels, which simul-

taneously turn as required. These wheels are 20in. apart and 17in. high. They run on a common axle—a stout tube that forms the main-stay of the frame. They are provided with ball bearings, and are of similar construction to the front, as regards spokes, hubs, rims, &c., only, of course, the sizes of the tyres are smaller. From this axle two tubes run out almost horizontally, and are joined to the bearing case of the front wheel, the backbone being further strengthened by a strong rod, which runs halfway between the centre of the back axle and the wheels up to a joint just below the tail of the spring, whence it returns to the other side of the axle, thus making a strong V-shaped support, which greatly strengthens the whole framework. At first sight the driving power looks very complicated, and is so to a certain extent, as the force the rider exerts is not applied direct to the cranks, but has to pass through two or three stages before it reaches the point where it has to be expended. Very short actual cranks are used; they are of a fixed length, but detachable; rods (26in. long) are jointed to them and run backward for that distance, where they are joined to arms (9in. long) that run down at right angles from the actual levers. The latter are 20in. in length, and the tails work on the axle; the fore ends branch out into prongs which hold the pedals. The last named are of the kind common to bicycles.

With a 47in. machine the saddle is only 41in. from the ground. The spring, as compared with others, looks as if it had slipped down the backbone, as it is not fastened to the head, but is secured some distance lower to the spine, and the tail is considerably curled. By its position the rider is well above his work, and he can therefore put forth considerable power. The pedals are 15in. apart. A very fair speed can be got up and maintained, but the machine will commend itself more to the ex-bicyclists than to the class from which the ranks of tricyclists are generally augmented.

Either the maker's patent double ball bearings, or the better known Bown's Æolus single balls, are fitted to the driving wheel, and greatly facilitate its easy going qualities. We have already stated that ball bearings are put to the small wheel, except where the customer prefers to cut down the expense and go in for the old cones, in which case his invoice will show a sum less by £2 than he would have been charged for the machine in its more perfect state. Mounting is very easy, the

saddle being so low, and a good quantity of luggage can be carried; but, of course, any addition to the already not light rear hamper becomes a great drag at hill climbing. A powerful brake is provided—acting on the large wheel—and, although the actual width of the machine is 34in., it can be "navigated" through a door 30in. or even less. A suspension saddle accompanies each machine sent out, or an extra 5s. gains the great advantage of a "rolling" saddle. The machines are finished all painted, and cost (with balls behind) £17 any size; if part bright, £18 10s.; all bright, £20 10s.; or plated, £22. We found a 47in. to weigh 68½lb.

10. The Omnicycle (T. Butler, Wokingham, Berks).—In this machine levers, chains, connecting wheels, or a rotary action of the feet are conspicuous by their absence, their place being taken by two segments to which the driving strap is attached, and which rock seesaw-wise, but never revolve with the axle. The method by which this is accomplished can only be properly understood by comparing the machine itself with the present article. In the centre of the axle, and fixed to it, there are placed two bosses, about five inches apart. These are in the form of an irregular circle, with indentations in the form of shoulders or teeth, facing in opposite directions. The bosses are about three inches long. Outside of each, next wheels, there is a large drum 6in. in diameter, with a flange 1½in. broad, making the inside diameter 4½in.; the central portion is well recessed, allowing the boss to fit partly into it; a deep groove is cut in the face of the flange. A small piece of metal, to which the singular appellation of "dog" is given, forms the actual "key-note" of the method that is used to communicate the driving power to the axle. This dog has a square head, which projects, and the other end is slightly turned, having a slanting face cut on it which fits against the shoulder of the boss already spoken of. The projecting head of the dog is nearly a cube, and is 7-16in. square; it fits into the groove in the flange of the drum, and the latter being 10-16in., the head is loose, and the dog is not fastened in any way, but merely held in position by two clips secured to the central collar inside the boss, and a spring which keeps the lower end down on the shoulder of the boss. As the head is smaller than the groove, its natural tendency is to fall down, and in doing so it jambs corner-wise, and so locks the drum to the axle in a firm and unslipping grip, but one which is instantly released by any move of the collar in the

opposite direction. Two of these dogs are used to each side, four in all, so that if anything should happen to one the other will act quite well alone. Attached to the drum there is an extended collar, which goes around the axle (and is quite free upon it); to the extremity of this there is a strong raised arm, forming a solid support for the rest on which the sliding frame of the segment works. These segments are the main features of the Omnicycle, which only those who actually put it to the practical test can appreciate.

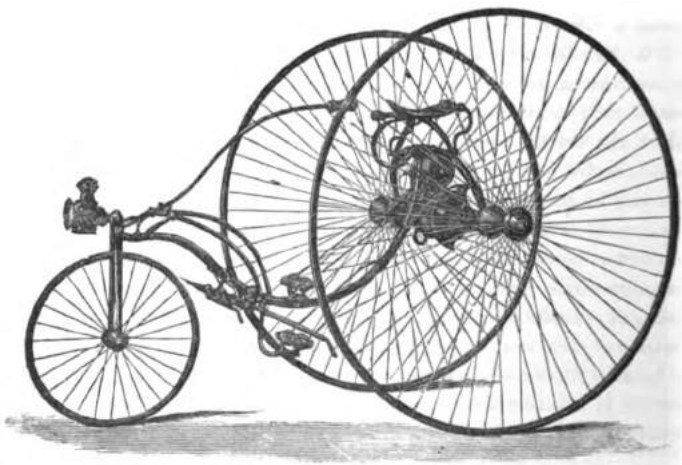

FIG. 7. THE OMNICYCLE.

The central portion of the segment frame is something in the form of a hollow T, to each side of which a triangular bracket shaped arm is hinged; to the elbow of these the ends of a flat spring are jointed. This lies across the top of the T, and both holds together the parts and forms the bed on which the driving strap rests. A short arm is hinged at one end to the lower corner of the triangle, and to the top centre of the fixed support at the other. In the central top of the T slide a small handle is placed. This is attached to the "trigger," and the head fits clutch-wise into three notches cut into the side of the fixed support; the trigger is held firmly in its place by a powerful spring. By means of this

the segments are expanded or contracted, but the effect is very different from merely lengthening a lever, as, although an immense increase of power is obtained, no corresponding change in the length of tread takes place, and, therefore, the legs are not strained by an unduly long thrust at each stroke, but a stroke of any length may be taken as under ordinary circumstances.

The secret of the successful action of the segments lies in the fact that the peripherical surface on which the strap lever works is always exactly the same, no matter what size it is regulated to; thus in Fig. 8, when in the usual working position, the arc of the segment forms the arc of a true 8in. (diameter) circle, so that with each pressure of each foot the driving wheels are advanced one half revolution. When at half power the segment still preserves its periphery of an 11in. (diameter) circle, and while at its greatest extent, for hill work, it forms part of a true circle 14in. in diameter, and increases the power put on the axle to an enormous extent. It is easily altered from the seat without dismounting or, indeed, stopping, when one is accustomed to the machine. The change is best made when the pedals are level, as the handle is then easiest reached and can be readily slid up or down, but care must be taken that the trigger is securely in the notch before applying power, or it will slip out. In order to obtain the rocking motion of the segments, and to raise them after they have been pulled down, the drums, already described, have a deep wide groove round their edge, in which two steel link chains are fastened to a common bolt; they pass round, in opposite directions, a double drum, which is considerably smaller than the lower ones, but directly above them; it is suspended from the frame beneath and behind the seat. Each drum has two grooves; the chains have both guards to prevent the possibility of their slipping off the ends, and are secured to the drum. The action of these drums is merely to wind and unwind the chains, and, so to speak, lift the pedals; or rather the drum acts on the segment, this on the strap, and the latter on the pedal. The action, owing to the crossing of the chains, being reverse, the one is not raised until the other is depressed, and as no part revolves, the beat of the feet may be long or short. There is no strain upon these chains, (and consequently no friction), except when the machine is travelling uphill and the rider ceases his exertions; in such a case the laws of gravity make it try to run backward, but the action of these chains

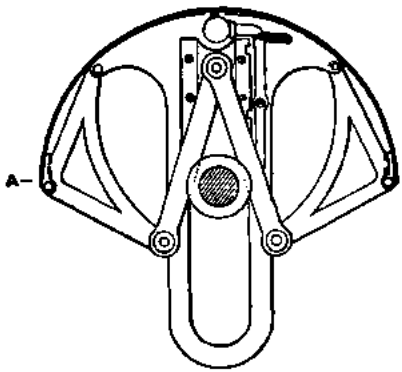

Fig. 8.

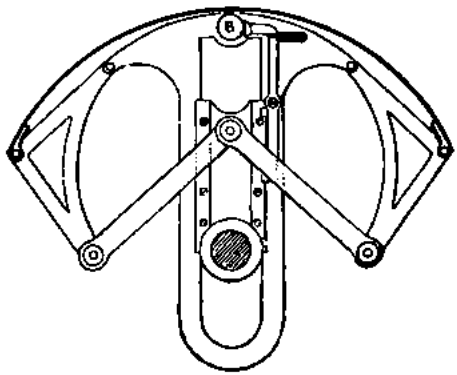

Fig. 9.

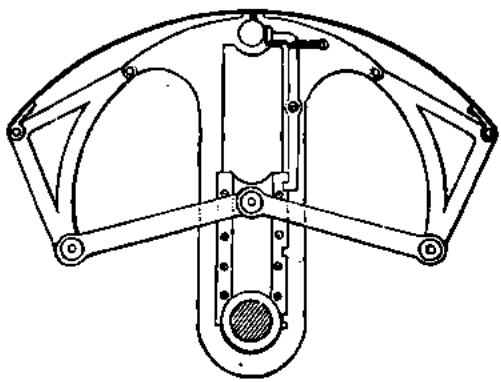

Fig. 10.

SIDE ELEVATIONS OF SEGMENTS AT DIFFERENT POWERS.

prevents it, and the machine remains at a standstill without any brake or other power being required. Back pedalling can never be resorted to, which is rather awkward in moving the machine, or when a sudden retrograde action is required, but it must be remembered that another highly popular machine suffers from the same cause and without a corresponding gain.

Owing to the construction of the machine, levers or steel bands cannot be resorted to in order to attach the pedals to the driving power, but the maker has used leather for that purpose. Each strap is highly tested, and stretched at the same time by hanging heavy weights to it. There would appear to be friction between the collar which supports the segments and the axle, but such is not the case, for when in action the "dogs" lock the segments to the axle; it is only in the return or upward movement that they work at all upon it. The strap is taken down in front and fastened to a sort of elongated stirrup, part of which forms the pedal, but the latter has to be further supported by guide rods, which are fixed to, or rather work on, a cross piece, 10in. long, placed behind the head of the front wheel and held by the branching arm brackets. (See Fig. 7.) Each rod has independent action, and is curved over the brake bar and downwards, the end being in the form of a prong; the pedal is held at the bottom of the "stirrup." These guide arms merely fulfil their name, and very little strain is thrown on them, in fact they neither give nor receive power. No matter what the position of the wheels, on pressing down the highest pedal the machine advances at once without having to grip the wheels and push them round with the hands, as so often has to be done.

Of course, without back pedalling, and with free running wheels, great brake force is an absolute necessity, or otherwise the element of danger would override all advantages. Mr. Butler has proved himself equal to the occasion in this as well as in other points, and the brake used is a patent. A bar crosses the machine in front, held by very strong double bracket arms underneath the main tube of the frame; the ends of the bar are turned downwards and shaped into spoons which are opposite and close to the large wheels; it is also provided with springs, which keep it out of action, and has, at a convenient distance from the pedals, comfortable foot rests. These may be used for their ordinary purpose, or for putting on the brake. The brake bar also serves as a check to the

fall of the guide rods, for if, by any unforeseen chance, the strap should give way, the pedal, instead of plunging down to the ground and throwing the rider forward on his face among the machinery, is brought to a halt at a point only an inch or so below where it descends in ordinary cases. A very simple framework is used, and mainly consists of weldless steel tube of 14in. gauge, not the tube itself, but the thickness of the metal, or ·083 of an inch; the front bone is bowed downwards and runs with an upward curve to the front wheel.

Another piece of tube is bent in a semicircular form, and is attached to the axle (with plain narrow and hardened bearings) at a point near the hubs of each wheel, and joins the front bone in the centre. It (the semicircle) is tilted forwards, and over it again the spring, which carries the saddle, is placed. On either side of the seat there is a handle; these are merely to hold, and have nothing to do with the working of the machine.

All working parts, drums, segments, dogs, &c., are in a compact position and small compass beneath the rider and out of the way of a lady's dress. The pilot wheel is 20in. high, has twenty-eight spokes, ⅜in. rubber in 4-16in. rims, open head, and runs on double cone bearings (balls are put at an extra charge). It has a good deal of rough work to do, and therefore is very strongly built. Ordinary wheels are provided, the general size being 50in.; they have gun-metal hubs, fifty direct 10 gauge spokes, crescent rims, ⅜in. rubbers. Both wheels run quite freely on the axle, and either or both may be spun independently of the pedals, yet more than full power can be used to drive them. This is accomplished by making the hub deeply recessed, and a collar screws over the axle and goes quite inside the recess; attached to this are two short picks, and inside the hub a stout notched ring with teeth into which the picks fall. By this means, when the segments are rigid with the axle, the picks work into the notches, and so drive the machine forwards. In turning corners, the wheel automatically frees itself and runs round the other, when a slight clicking sound is heard. A small cap or cover goes over the recess, and the nut is placed outside. This mainly holds on the wheel, and in order to prevent the nuts becoming loose by the action of the axle, the screw cut on it (the axle) has a right handed thread on the right side, and a left hand thread on the left side; the natural consequence being that they are always getting tighter.

We have now specified all the important points of this remarkable

machine, and have little to add save measurements and general details. The axle is 36in. long—the width of the machine—while the wheel tracks are 29in. apart, and it is 40in. from the axle to the head of the small wheel. The machine turns with equal facility to either side, and can be put completely round in less than twice its own length, which, by the by, is 76in., while the circle described by the outer wheel measures 11ft. 10in. in diameter, and the inner just 7ft. Good workmanship is shown in all parts, especially in the more important portions, and the whole machine can be thoroughly depended on. The rider who can do twelve miles an hour on a bicycle will find no difficulty in doing nine or even ten on the Omnicycle, while uphill, under fair conditions, we believe it, so far as personal experiments go, to be superior. The price is £20, all complete, painted; and it certainly is not dear.

11. **The Gnat** (Messrs. Garrard and Mortimer, Alliance Works, Uxbridge, Middlesex).—The main arrangement of this tricycle consists of two small wheels in front, with one, a shade larger, behind; the latter is the driver, and the pair guide. Owing to the fact that the driving wheel is so small (27in.), multiplying power has to be resorted to in order to make it do enough work. On the left side of the rear wheel a second flange, or rather toothed wheel, is placed outside, but rigid with the hub; round this passes a link (endless) chain, which also fits over a similar but larger wheel, the relative proportion of the sizes being 4½in. to 8in. The axles of these two wheels are 27½in. apart, and to that of the latter are attached the cranks and pedals. To prevent a lady's dress getting mixed up with the "machinery," a metal case protects the chain and cogs, but it is not an ornamental addition, as it gives a heavy look to the body of the machine. Chains, however well made, will stretch, and to obviate this, a simple plan is adopted, by which any slackness can be taken up. The shaft in which the axle of the pedals works is carried in a groove formed by a rod, which runs from either side of the back wheel for about 32in. in front, where it is bent, and the two sides are kept close together till they branch out on the different sides of the wheel; in this space a boss or solid bit of metal—to which the cranks, &c., are attached—is held by means of screw-bolts passing through the end of the bent portion, and secured by a lock nut; it is also attached to the cover; by turning this bolt the pedals, cranks, and chain wheel are drawn forwards and farther away from the back wheel, consequently the chain is

tightened. The bent rod is held up by two strong supports, which come down from the frame above. Both cranks are detachable, similar in every respect to those on a bicycle, the pedals are rubber clothed, and the length of stroke can be adjusted to a small extent—1in. to 1¼in.; the tread is wider than is usually found on a tricycle, being 13½in. This might with advantage be considerably reduced. Of course, as the wheel connected with the crank axle is nearly twice the size of the one attached to the actual driving wheel, there is multiplied power, and the 27in. wheel becomes equal to one of nearly 52in., but the feet and legs have consequently harder work to do; although the action is not so rapid it is more laborious.

The main portion of the framework consists of a tube bent into a semi-circle, at the back nearly touching the wheel, and in front coming out to a joint just over the centre of the front wheels, which are 22in. high; a single fork runs down on the inside of the wheel, and is continued below the pin—on which the wheel runs—for a few inches, and the arm (10½in. long) of a rod (30½in. in length), which crosses the machine in front, and is joined to the other wheel in the same manner. The back wheel is held fast by the rod already spoken of. Two light rods, running from the wheel pin and slanting slightly backwards, project just beyond the rubber, and hold a light mud guard—an absolute necessity, as the wheel would lift considerable quantities of mud in wet weather and deposit it on the back of the rider. When a saddle is required it is placed on a doubly curled spring, attached to a sliding bolt, which passes through a strong boss fastened to the middle of the curved frame. A Lamplugh and Brown's tricycle saddle, with back rest, is always used, unless the machine is intended for a lady, in which case a comfortable seat is pinned on, which, like the saddle, can be raised from 20in. to 35in.

As the extreme width of the machine is 39in., it is precluded from passing through ordinary doors in its normal state, but by the arrangement of single forks to the front wheels, undoing a nut on the cross-bar, and slacking the nut on the (conical socket) heads, the wheels can be turned from the outside of the frame to the inside, so that the width is reduced to that of the main tube (31in.); it is, we might also state, 23in. from the ground. In this position the machine is quite manageable for moving, but cannot, of course, be ridden. On each side of the seat there is placed a handle. That on the right is for steering, and by

means of a ratchet and short rod, which can be adjusted, it is connected with the front wheels, so that both act in perfect unison. The handle to the left is for putting on the brake. The handle-bar is jointed to a short arm, which is hinged to a bent rod, working on the rear wheel supports, and terminating with a powerful spoon, which comes down firmly on the rear wheel. One special feature in connection with the brake is that power is applied, not by pulling the handle towards the rider, but by pushing it out. The reason is obvious: when working hard, the rider naturally pulls at the handles to obtain greater force, but in going down slopes such exertion is not required, and the falling-forward propensities are not only checked, but the brake put on by leaning forward on the left handle. No change is made in the wheels, save that larger spokes are used; the spoke wire itself is 13 gauge, with solid head that screws direct into phosphor-bronze hubs. The rubbers are both wired and cemented, so liability to loosen is reduced to a minimum. Single-row adjustable ball bearings—made by the firm—are put to all parts requiring them; to each side of all three wheels and the crank shaft, in all sixty-eight hardened steel balls. These made a marvellous difference in the running of the machine. Paint prevails instead of bright work, and rust removing is thereby obviated, but the handle mounts, &c., are plated. In turning, it requires a space of 16ft. wide to get completely round, and the pilot wheels are 34½in. apart, but rest on the ground at a point only 29in. before their larger companion. The machine described turned the scale at 84lb. The price, all complete, is £16 18s.

12. The Gnat, No. 2.—About the only alteration is to leave out the costly ball bearings, and use instead parallel to the rear and cones to the front wheels. This brings the price down to £14 14s. When going on the flat it is steady in action, fairly easy to drive, readily guided, and capable of going at a good pace. It can be ridden for short distances, if the steering is stiff, without employing the hands. As regards its ascending capabilities, we found it was hard work to master a certainly steep, but not very lengthy, hill. In this respect ladies would find it all toil and no pleasure, and the enjoyment derived from a delightful run on the flat would be militated against by having to encounter rising ground. Makers of this and all other machines meant for ladies would do well to adopt some looking action, whereby the machine might be

brought to a stand when going up hill and retrograde movement prevented. The small compass and compactness of this tricycle cause it to be thoroughly under the control of the rider.

13. The Triumph (Warnan and Lazon, Victoria Works, West Orchard, Coventry).—The outline of this machine is familiar to all interested in tricycles, as the one most generally adopted by makers, and what has been termed the "One, Two, Three" arrangement of wheels, the largest or driving wheel being to the left, and the smallest behind. Simplicity is aimed at in the framework, and it may be said to consist of the back-

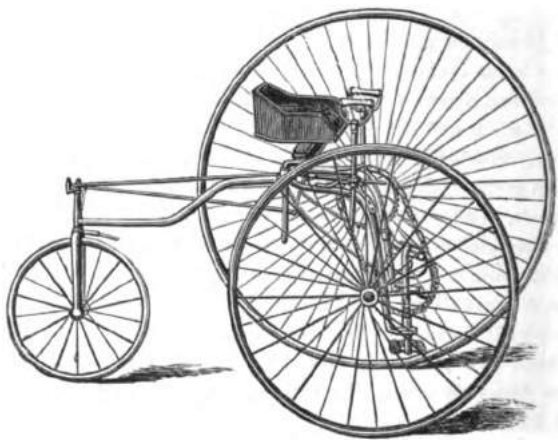

FIG. 11. THE TRIUMPH.

bone and front legs, all of steel tube; the latter are in a single piece, bent round at the back, with the "legs" carried almost straight down in front; the ends or "feet" of these are bent outwards horizontally, and hold the case of the ball bearings in which the ends of the cranked axle work. Rubber pedals of a light pattern are fitted, and the left end of the axle, going beyond the leg, has the cog-wheel attached to it; round this and the one connected with the inner hub of the driving wheel the chain works in the manner we have so often described. All tastes and heights of riders can be suited in the almost universally adjustable seat

or saddle. When a seat is employed it has safe sides and low back, and is very comfortable (Fig. 11, p. 84). It is supported on the centre of a double bow spring, secured in turn by a nut to a slot—like that of a crank—cut in the arm, that projects at right angles from the bolt or rod that passes through a boss in the middle of the frame, where it is held by a nut, which admits of its being raised and lowered 7in. or 8in., and it is also capable of adjustment to almost the same extent, backwards and forwards.

For steering and brake purposes the handles are placed in a convenient position. The left, by means of hinge-joints and short arms, is connected with the rear wheel lever spoon brake, so that on pulling the handle the long rod acts on the brake and presses it firmly on the rubber. On the right the rudder is easily managed, and the back wheel is very sensitive. Both these handle-rods are additionally strengthened by brackets, so that they cannot get loose and shaky, as is sometimes the case. Original spider wheels are used, angle iron or V felloes, grey rubbers, rather few lock-nutted iron wire spokes, iron hubs. The respective sizes of the wheels are 50in., 34in., and 20in. The pin-wheel is cast with the hub of the driving wheel, so that it cannot shake loose. The two larger wheels are supported by balls held by the frame; they have parallel bearings. A socket head—relic of the past—is put to the back wheel; ball bearings are also fitted here. The extreme width is 41in., the length 66½in.; the back wheel touches the ground 31½in. behind the driver. Toe-rests are added to the "legs," and they can be pushed out at will and afford a welcome relief from pedalling in running down hills. The Triumph tricycle will fully uphold the reputation of its makers. In weight it may be classed as average, as it scales 85lb. The price, finished, painted any colour to order, is £16. Should anyone care to sacrifice ease of running, by doing without ball bearings, the machine can be had for £14 10s.

14. The Tom-tit (Starley and Sutton, Meteor Works, West Orchard, Coventry).—It will be at once seen from the illustration (Fig. 12, p. 86) that the Tom-tit is built on a unique plan and quite different from anything else in the way of a three-wheeler. It has no body, and is best described as a skeleton. The framework is very meagre; we do not speak in a depreciatory sense, but simplicity and the absence of all superfluous or merely ornamental additions are the ruling features. Three small wheels are used; the two side ones are but 18in. high and 35in. apart; the front

34in., thus reversing the usual order of things; it is 43in. before its followers—i.e., from centre to centre. Direct spokes screw into iron or gun-metal hubs; it has crescent rims, ⅛in. tyres to the sides, and ¼in. to the front, as the leader has a lot of work to do. The frame is of light

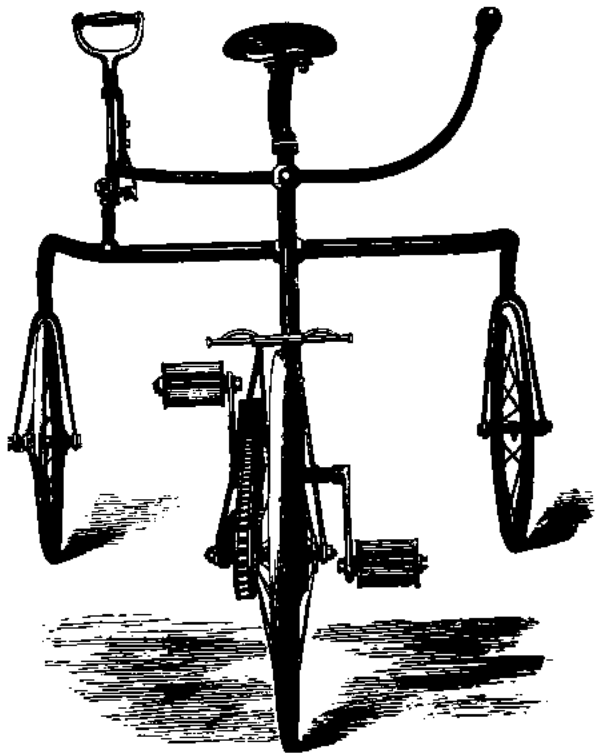

FIG. 12. THE TOM-TIT.

steel tube, and mainly consists of two portions. The cross piece is straight for 30in., when it curves outwards and backwards, and then descends to the forks. The front bone starts out from the centre, and, bending down, supports the front wheel and pedals. For steering purposes

the bent rod, which has a remarkable appearance, both supports the steering rod and affords leverage for the left hand. On the right of the saddle there is a handle connected with a ratchet below. This works, rack and pinion style, against a notched arm on a raised arm fixed to the frame. The rod is joined to a long bar—which passes across the machine—above the main bar, and reaches up to the left of the saddle. By the action of the steering handle the two wheels are turned, but the machine requires a good breadth to get completely round. Multiplying driving power has, of course, to be resorted to, or progress would indeed be slow with so small a driving wheel. On the right side of the front bone there is a pin wheel with axle (9in. long) and bicycle pedals (13in. tread), which work with the usual rotary action. Attached to the front wheel there is another pin wheel one half the size; around both these the endless chain passes. By this means two turns of the front wheel are obtained to one of the pedals, so that the 24in. wheel becomes equal to a 48in.; but, of course, there is a considerable friction by this arrangement.

The frame shown over the front wheel is a combined foot rest and brake; the latter acts on the rubber by pressure of the feet. In the centre of the main cross piece is a boss, to which is attached the upper rod, having fixed on the top the half-curled spring which supports the saddle. The front bone is attached to this top rod, the bottom of which works in the boss spoken of, to allow the frame to turn, and it works on a long centre, so that it is quite firm and strong. Cone bearings are generally put to the side wheels and parallel to the front, but by an extra expenditure of £1 16s. balls can be had to all three. At first the action and steering of the machine feel odd, but a little practice sets that right, and it can be put along at a good pace; it is said to be facile at hills, but we have not yet tried it in that respect. The Tom-tit claims to be the lightest (adult's) tricycle made, which it certainly is, but still it is not so light as supposed, the weight being 58½lb. by the scales against 49lb. in the price list. The extreme length is about 5ft. 6in. and the width 42in.; but the frame is readily separated, when the two parts can be stowed away in a very small compass. The ordinary cost is £12 12s., with ball bearings £14 18s., or with a further addition of an upholstered cushion £15 8s. The name of the makers is a sufficient guarantee for the workmanship. To be candid, this machine must be regarded rather as a fancy vehicle

than a comfortable conveyance, but its light weight and handy stowage capacity will commend it to many, and its appearance will excite curiosity wherever it goes.

15. The Imperial (W. Smith and Son, Crocus-street, Nottingham).—This machine has been made for the last three seasons, but has improved of late, though it still retains the levers instead of the rotary action. Many, however, prefer the former, and consider such application of power more in accord with the exercise of tricycling than the latter; be that as it may, we are not going to discuss the pro and con of the matter here, but to describe the Imperial. Two large wheels, side by side, and a smaller in front, is the arrangement adopted. The former are generally 50in. high, and have crescent steel rims, ⅞in. rubber tyres, fifty direct action, strong (10 gauge) spokes, large gun-metal hubs, generally painted. Differing from similar machines, both wheels are employed as "drivers," consequently the fullest power possible is utilised. This is managed by fixing the left wheel to the axle, while the right runs freely upon it, but the inside face of the hub has a clutch fixed to it; facing this there is a similar one—sliding on the axle; it is connected with a handle placed on the right side of the seat. By means of this handle the two clutches can be brought together, by which process the right wheel is "locked" to the axle with the left, and works with it.

When turning, the right wheel is easily thrown out of gear; a strong spring holds the clutch securely either in or out of position. The total length of the levers is 20in. over all; they consist of two parallel flat rods kept close together, which support the pedals in front, and the rear ends work on a cross bar at the back of the machine. The actual leverage is 16in., as at 4in. from the end they are attached to the cranked axle by means of chains, and hooked, top and bottom, by short arms and clasps (secured by a bolt for safety), which go round the axle and bolt through the lever rods. This chain can be lengthened or shortened, and the rods, which branch out into a prong, have three holes, by which the position of the pedal (an ordinary bicycle one) can be further changed, so that the length of stroke can be made to suit almost any length of leg. The framework is rather extensive, and mainly consists of tubing. The right side runs out level with the centre of the wheel, and then bends downwards and inwards to the small wheel. The tube is carried behind the axle and along the left side, where it dips down very low, to enable the

rider to gain the seat easily, and turns into the front wheel. The frame is additionally strengthened by a solid flat bar, which crosses in front of the axle and forms part support of the seat. A strong V shaped bracket runs down from the frame at either side; the lower ends form the rest, wherein the back cross bar which holds the ends of the pedals works.

The seat, a wood and cane affair, is held by two bow springs, which rest on the cross pieces and offer an easy and pleasant support. The handles are placed a convenient distance apart, and the left is used ordinarily to pull at in order to obtain extra leverage, but by pushing it brake power is put on. The right works on a projecting boss of the frame and is connected with the front or pilot wheel. The last named is 23in. high and made very strong; it runs on cone bearings, has a socket head, and a large broad mud guard to protect the rider, as, in its absence, he would carry away a good supply of the top surface of the road in wet weather. Taking the general measurements, the extreme outside width is 43in., inside the wheel 30in., from centre to centre 35½in.; this gives 34in. to 35in. "elbow room." The pedals rise and fall 17in. and are well under the seat. The Imperial is well made and runs pretty easily, but the chief objection is its great weight, which is no less than 120lb.; if this were reduced 35 per cent. it would then be in a better position to compete with its rivals, but it answers capitally on a rough road or where hills have to be ascended, the double driving power making up, to a great extent, for excess of weight. It runs on roller bearings and is finished painted; cost, £16 10s.

16. The Double Imperial.—As its name signifies, it is intended for two riders, who sit *dos à dos*. A double set of levers (or rather, the levers themselves are double) are provided, as well as speed gear to gain extra power at hill work; the gear can be used or not at will. Handles are, of course, afforded for both, and the front rider steers while the rear puts on brake, &c. The price rises to £25, and the weight to something like 150lb.

17. The Velocité (J. Richer and Sons, Twickenham, Middlesex).—This machine now has the front wheel placed directly before the "free" wheel, thereby having only two wheel tracks. With a 50in. driving wheel its opposite neighbour is only 34in. and the pilot only 22in. The frame is exceedingly simple. The main feature—indeed, the "key-note"—of the patent is the parallel axles; the upper is cranked—for

driving—and on its extremity the large wheel is fixed; its length is 17½in. between the bearings; this may be taken as the width of the frame. The lower axle (that on which the free wheel runs) also crosses the machine, like the main one, 8in. above. The opposite ends of the top axle work in a plain bearing case; the lower axle is of course fixed. At the back the frame comes 9in. lower (than axle No. 2) and narrows to 12in., where a cross rod serves to carry the ends of the levers. Behind the lower axle a light rod projects a few inches—it is serviceable for carrying luggage or to lift the machine by. As to the actual levers, their total length is 21in., but 7½in. from the pedal they are secured to the connecting rods, the other ends of which link over the cranked driving axle. These connections are adjustable in the centre by 3in., to vary the length of stroke. Rubber pedals are used, and, being kept near the body of the machine, the rider's work is well under him. Steering is managed by the well-known rack and pinion arrangement, save that in this case the teeth are made larger in both, so that increased steadiness is insured, and it is, moreover, very direct and sure in its application, as the rod that connects it with the arm projecting from the head of the small wheel is perfectly straight and quite short.

Owing to the small size of the front wheel and the amount of quick work it has to do, the rider would receive more than his share of the flying mud, but that evil is guarded against by placing a large dirt guard over the wheel, which effectually prevents unpleasantness arising from such a cause. Brake power is worked from the left side by means of pushing out a handle used ordinarily as a grasp lever; it is fixed to a rod, which, crossing the machine, causes a spoon brake to act very firmly on the middle size wheel. It seems very powerful in application, and enough, combined with back pedalling, for any hill. In order to meet the demand of various sized people, the seat can be raised or lowered some 8in. It is mainly supported by a sort of double C spring and straight frame; a light rod also crosses in front to add extra strength to it. The actual seat has a wooden frame, with neat upholstered cushion and low back. Taking the more general details, we may state gun-metal hubs, direct spokes, and crescent rims, ⅜in. rubber to all wheels which have spoke per inch. Plain bearings to driving wheel, axle, and supports of frame, but cones to the front, where the maker, strange to say, prefers them to balls; but, as others are not of the same opinion, he

gives way to the wish of his customers and fits any kinds desired. Lubricators are fitted to all parts which require frequent oiling. On the whole, the machine may justly be considered a first-class one; neatness, attractive appearance, general handiness and portability will commend it; while, above all in the eyes of many with whom storage space is circumscribed, and whose 36in. wide doors are not sufficiently elastic to admit of a 40in. machine passing through them, the Velocité has the advantage of being only 34in. wide over all, and of medium weight (85½lb.); price only about £15. The wheel tracks are 25½in. apart, and the large wheel outside describes a circle of 11ft. Made a little lighter, with ball bearings, &c., it would be a capital ladies' machine.

13. The Folding Challenge (George Singer and Co., Challenge Bicycle Works, Coventry; London Show Rooms, 17, Holborn Viaduct, E.C.; Liverpool Depôt, 57, Bold-street; Leeds Depôt, 15, Park-row).—We have frequently alluded to the fact that very many persons would adopt the delightful exercise did not the unwieldy character of most tricycles forbid; and, as only a favoured few are lucky enough to possess a coach house or other place which will admit them intact, a machine that will accommodate itself to ordinary portals will be accepted as a boon. Several, it is true, can be reduced in width, but the operation is generally a rather complicated one, and a wheel has most likely to be taken off. With the Challenge there is no such bother or complicated parts to deal with. By a simple but efficacious plan, the two front wheels can be brought close to each other, and the ordinary width of 39in. reduced to only 22in., thus making it very portable. The operation can be performed in less than a minute. A casual glance at the machine suggests that it is very like the defunct Safety reconstructed. In answer to this suspicion we may say it does savour strongly of the Safety, but in appearance only, for the present three-wheeler is in every way superior to its extinct predecessor. Like it, however, the driving wheel is placed directly behind the rider, which allows of a more direct application of power than can be applied to most tricycles. The driving wheel is generally 50in. for gentlemen and 46in. for ladies, it being a very suitable machine for the fair sex. An ordinary bicycle wheel is used; large headed direct spokes, small iron hubs, crescent rims, red ⅞in. rubber. The Challenge "rolling" bearings are employed. They are steady in action and run very freely;

outwardly they look like the cycle, inwardly they consist of rollers of two sizes.

It has ordinary cranks and knuckle-jointed hollow forks; these run up with little or no rake, and are joined by the backbone just above the top of the wheel. A splash guard is fixed here, projecting backwards; the backbone, ordinary bicycle type, only rather stronger, follows the curve of the wheel for more than one quarter the circumference, when it becomes straighter, and the lower end comes down to within 9in. of the ground, where it forms a central support to a bar 12in. long, on which

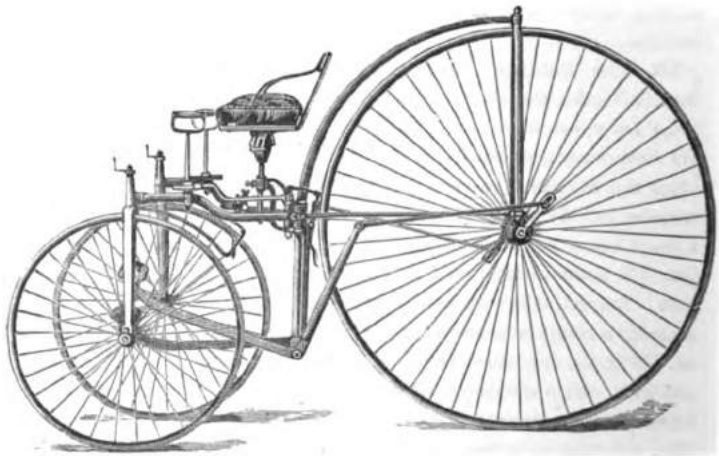

FIG. 13. THE FOLDING CHALLENGE.

the ends of the pedal levers work. The rear wheel is additionally steadied by two light rods, which run horizontally from a point about 4in. above the bearings to the backbone at the junction of the two front bones which support the fore wheels. The latter are 26in. high, have solid forks, socket heads, &c. The connecting tubes, or front bones, are independent of each other, but are joined into a solid headpiece near the driving wheel; through this a bolt passes, and the whole is held by a strong boss with projecting arms, which go round the backbone and are joined firmly to it. By these means the front tubes have a hinge action—

to open and shut. Some 8in. from this end the front bones are joined by a flat crosspiece with long curved slots and holes at the ends. This is to keep them a fixed distance apart, and also to allow them to close.

When in use the wheel tracks of the "pilots" are 32in. apart, or an extreme width of 39in. By simply slackening a thumbscrew at the end of the before-mentioned cross piece, and doing the same with a similar screw on the cross-steering rod (which is bent back), the two front wheels can be pressed towards each other till the width is but 22in. and the wheel tracks only 15in. The advantages of this need no comment—they are manifest—but we must state that this plan in no way affects the steady working of the machine, nor is it in the least shaky. Of course, the thumbscrews must be made tight before riding.

The machine is driven with direct lever action, not communicated to an axle, which can in turn only give power to one wheel, but applied almost immediately to the crank of the wheel. The actual levers, to which the pedals are attached, are 22in. long to where the ends work on the main crosspiece (at bottom of backbone); the arms then run up for 18in., where they are attached to light rods, a little over 22½in. long, which run to the cranks, which are detachable and have the usual adjustable slot. The levers and arms are joined by rods, 22in. long, placed bracket-wise; these, indeed, impart the power of the levers. The crosspiece is also further strengthened by bars coming down from the main framework. In yet another particular it resembles the Safety, that is, the power of the brake. It was the most powerful (safe) brake ever applied to a bicycle, and the present one is about the best we have ever seen on a tricycle. The action of the brake is the same, but it is now put on by an eccentric.

The left handle, the general spade pattern, is attached to a short rod, which has on its lower end an eccentric. To this a light bar is hinged, and it is joined to another which acts on the twisted upper end of the brake. It is of the spoon pattern and wonderfully powerful; with it any hill fit for traffic may be descended with impunity, and, in fact, the wheel may be made to drag. By means of the eccentric the strain is taken off the handle and the rider is not tired by having to apply force all the way down a long decline. A small check might be added to prevent the power coming "off" too suddenly. The right handle controls the helm—double in this case—both front wheels acting, as they are joined

by cross-rods running behind and entirely out of the way of the rider's legs; the handle acts by the ordinary rack and pinion, and, both being simultaneous, the machine is fully under control. It requires a very large space to make a complete circle, but by dodging backwards and forwards it can be got round on a narrow road. It will, of course, readily turn on an ordinary highway.

Lastly, but not least important, we come to the seat; it is very nicely got up, mahogany frame, plated arms, comfortable cushions, &c. The supports are in the form of an S spring at each side, joined by flat steel crosspiece. This gives an easy motion to the seat. It can be raised from 38in. to 44in. above the ground, or any intermediate height. The distance between where the driving wheel and its pioneers touch the ground is 46in. We have already said the latter are 32in. apart; the distance between the handles is 25in., and the whole length of the machine is nearly 90in.—a trifle less when closed. A small drawer is put under the seat, or a saddle can be substituted, if preferred. If both are required an extra charge of 15s. is made. Foot rests are put on the forks of the smaller wheels in order that a good run down hill may be enjoyed; but although every reliance may be placed on the brake, hills should be cautiously dealt with. The pedals rise and fall 11in. Roller bearings are put to the front as well as to the driving wheel.

Messrs. Singer and Co. have certainly scored a great success with this machine, and it is destined to be one of the most popular "Tricycles of the Year." The measurements quoted we took from a 50in. machine, the cost of which was £21; a lady's machine, smaller, being £20. The weight, 98lb., is not felt so much, as the rider is not only well above his work, but he can exert full power, gain a great leverage with the handles, and stand on the pedals, if need be. With such advantages it is not to be wondered at that the Challenge is a good hill climber and a fast traveller on the flat. Another strong point in its favour is that the rider is quite clear in front, and can readily step in or out of the saddle.

19. The Carochc (the Carochc Tricycle Company, Much Park-street and Jordan Well, Coventry; London offices, 53, Hatton-garden, E.C.).—This machine is put before the public with two or three points to specially recommend it. Of these the chief is the new gearing wheel, which takes the place of the usual chain, and by greatly lessening the friction reduces the labour necessary to drive it. The means by which this is accomplished

are by employing three wheels to generate the motive power. On the right side of the pedal crank, and outside the leg of the frame, there is placed a 6in. cog wheel, which, being ridged with the pedal crank, of course turns with it. The teeth have by no means the acuteness of those shown in the cut (see Fig. 14), but are rounded and come almost to a point. The central wheel is of the same size, and has a deep groove in which a number of steel balls are held; these balls, or rather, prolonged ovals, have ends which pass through each side of the groove, holding the "balls" as fixtures. The centre wheel is placed behind the others, so that only one fourth part is placed between the top and bottom wheels. It is supported by a strong short arm coming out from the frame, provided with an adjustable slot, so that the wheel can be tightened should it become shaky. The third or uppermost wheel is the same size as the others, and is fixed on the axle of the driving wheel; power is thus transmitted without perceptible loss.

Fig. 14. New Patent Carocne Steel Conical Ball Gearing Wheel.

Steel tubing forms the framework, which is of a very simple nature, consisting chiefly of two pieces, one being the backbone and the other bent into the form of a duck's merrythought, the upper portion of which holds the seat, &c., and the two legs running down in front support the pedals at the ends; the latter are on a single bar, bent so as to give a 6in. throw. The ends of the bar work in plain bearings at the extremity of the legs, which are, at this point, 20½in. apart. A pair of really serviceable foot rests are fixed to the "legs" of the frame, and at a convenient distance from the saddle. They are electro-plated, neat in appearance, and automatically close up against the fork when not in use, but can be pressed out into position by the toes.

Forty inches is the general height of the driving wheels, but the wishes of customers are followed, and any size put to order. Attached to each of the upper parts of the frame legs there is a strong bracket or boss,

through which the short axle of the wheel passes and is secured by a nut on the inner side; that on the left can be readily removed and the wheel taken off, this operation reducing the width from 37½in. to 30½in., and enabling it to pass through any ordinary doorway. The wheels themselves have gun-metal hubs, direct spokes, crescent steel rims, ¾in. rubber tyres, &c., and run on plain bearings.

Handsome horn handles are provided for the separate purposes of steering and applying the brake. These also evince the improvement that has been carried out. The right handle is attached to a rod, which passes through a firm support, and has a small cog wheel at its extremity. This acts against a flat-toothed rod, which is kept steadily in its place by sliding in a groove, and by means of a light bar communicates with the rear wheel. The steering is very sensitive and steady. On the left, one of the best brake handles we have seen is placed; it remedies the defects common to that very useful part of a tricycle, and instead of a shaky handle that has to be pushed up or down, it is used exactly in the same way as the steering handle, and has a similar support, so that in place of having to work it like a pump handle, or to grasp a second one with the outstretched fingers, a firm hold can always be maintained. At hill work this is especially valuable, as great power can be put into the pedals by pulling against the handles. From the bottom of the steering bar a short arm is linked to a rod which runs slantwise to the commencement of the backbone, where it is in turn hinged to another light rod running rearwards. It, however, is steadied by passing through two brass holders. Immediately over the small wheel the rod is joined to the tail-end of the brake, which bends upwards and turns over the head of the trailing wheel (forming an outline remarkably like the S.T.D. bicycle head). The spoon portion of the brake is before the hind forks, and presses firmly on the rubber. The back wheel is 18in. high, and runs on Bown's or Rudge's bearings.

Lamplugh and Brown's new tricycle seat, which we have fully described under "Accessories," is held on a capital spring, or rather springs, which look, at the first glance, rather weak, but that idea will soon fade away after a practical test. Two fine steel flat springs curl downwards, and, turning upwards in an ornamental curl, they are bolted together by a cross piece, farther strengthened by a C spring from the back. The seat being placed on the top of this, a very easy motion is secured, and

a rocking action imparted which materially assists propulsion, by causing extra weight to be thrown into the leg with each down thrust applied to the pedals. The saddle can be raised and lowered some six inches, thereby allowing persons of different height to use the same machine.

The Carocho is a very handsome vehicle, well made and neatly finished. From a short spin we had on one we were highly pleased with it. It is thoroughly under control, and its good steering is especially valuable in crowded places. It seems well suited for hills, the combined influ-

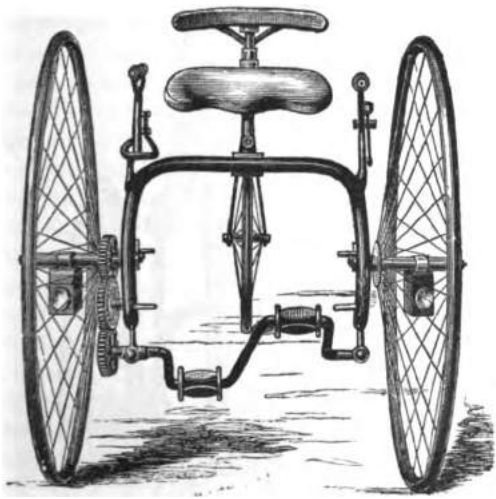

Fig. 15. The Gentleman's Carocho.

ence of firm handles and free running making ascents tolerably easy. The machine is under the average weight; we found a 40in. to weigh 81lb., that size costing £14 14s., larger sizes rising 2s. 6d. per inch. The illustration given (Fig. 15) does not fairly represent the machine, several improvements having been made since it was drawn.

20. The Lady's Carocho.—This is made the same in nearly every detail as the one just described, but is, or rather will be, a good deal

lighter; the one we weighed, a 36in.—the general size—proved to be 78lb. Any kind of ornamental seat can be had, and it is a machine that we can well recommend to our lady readers, who will see from the

FIG. 16. THE LADY'S CAROCHE.

illustration (Fig. 16) that tricycling is certainly an attractive looking exercise. The price of a 36in. machine, neatly painted, and with a pair of

good lamps is £13 13s. Those who wish to test the machines can do so at the London office; or at the City Oval Grounds, Barbican, E.C.

21. The Speedwell (W. G. Lewis and Co., Speedwell Works, Romford, Essex).—Last year public taste seemed in favour of three different sized wheels, but lately, two large, one on either side, and a small one behind, seems to be the most popular pattern. The Speedwell is of the latter type. The general size of the wheels is 48in. or 50in.; a size smaller than usual (¾in.); rubbers are used, with steel crescent felloes. Sixty spokes screw direct into small, but broad and strong, iron hubs. The frame is of the general type, steel tubing bent into a wide curve at the back, with two prolonged legs coming down in front. A solid piece is fixed to the ends of these, with two slots, through which the ends of the crank shaft are passed. The driving power is communicated by means of an endless chain and two cog wheels, one attached to the pedal shaft, and the other to the right wheel, the left being free on the axle; should the chain stretch, adjustment can be made by means of the slots already spoken of. Rattrap pedals are used; they have a 6in. pitch, and a tread of only 8in. The wheels work on independent short axles, which are held by a strong arm projecting from the frame.

A bow spring supports the seat, either a cushioned frame or Lamplugh and Brown's new seat; the spring is in turn held on the top of a rod, which slides through the solid portion, where the backbone joins the frame; by means of a bolt it can be secured at heights varying 6in. Steering is effected from the right side by means of a strong firm handle, slightly canted towards the rider, and the usual rack and rod running to the rear wheel. Brake power is applied from the left, where there is a fixed handle, having below it a grasp lever, which, by means of bent arms and rods, applies a large self-adjusting spoon brake to the rear wheel; the brake itself is provided with a strong spring, to keep it off the rubber when not in use. An open head is put to the back wheel. All working parts have plain hardened bearings. The total width is 39½in. by 75in. extreme length. The whole machine is neatly painted or japanned, and forms an attractive vehicle of the average weight, 84lb., and it is well worth the £16 16s. asked.

22. The Improved Flying Dutchman (Messrs. Hillman, Herbert, and Cooper, Premier Works, Coventry, London; Show Rooms, 97, Cheapside, E.C.).—The original Flying Dutchman having proved so

great a success, they have introduced another machine, built on rather different lines, the principal alteration being that the two main wheels are of equal size, and that slight multiplying power is added to the driving. In place of having a 52in. on the left and a 40in. on the right of the rider, both are 42in. The wheels themselves are of ordinary construction, having ¼in. tyres and spokes, small and narrow gun-metal hubs, only 4½in. wide—sufficient, however, taking into consideration the height of the wheel. A lubricator is placed in the centre, and the wheel is held on the short axle by a couple of lock nuts on the outside. It works on plain

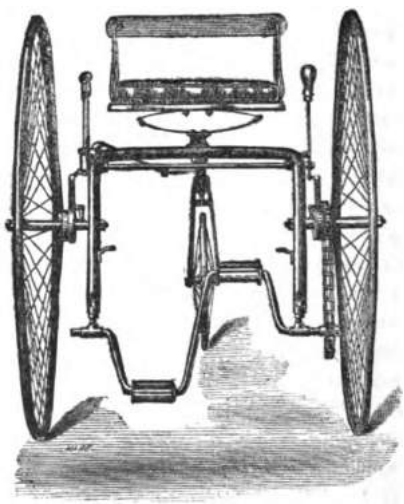

FIG. 17. THE IMPROVED FLYING DUTCHMAN.

bearings, and the inner end of the axle passes through a boss on the leg of the frame, where it is secured by nuts.

Brake power as applied to most tricycles with only one driving wheel causes the machines to slew round and often cause an upset; to obviate this unpleasantness in the I. F. D., the check action is simultaneously

put on both wheels. To achieve this result, there is a broad flange, 1¼in. wide, projecting inwards from each hub; round this is passed a wide strong steel band, with one end attached to a stout arm; the support (of the arm) goes round the axle, and is secured with it to the boss, as already mentioned. The other end (of the band) is carried down, round, and, turning over backwards, is fixed to a stout arm of the rod which crosses the machine below, and slightly in front of the saddle. On the left side the brake lever is placed in a convenient position, below the grasp handle, to which it is attached by a bolt, the lower end, being continued, forms an arm, to which the left strap is fixed; it is also connected with the cross rod, so that, on applying power, both bands are drawn tighter round their respective drums.

The tubular steel frame is of the usual simple description, and the ends of the crank axle work in bosses (plain bearings) projecting from the bottom of the frame legs, and by means of a screw can be slightly raised or lowered, to take up any slackness that may result from wear. On the inner side of the right hub, and cast with it in one solid piece, there is a pin wheel, 4½in. in diameter, having a series of notches rather than cogs; 11in. below this, from axle to axle, there is another, but rather larger, wheel attached to the crank axle. Motive power is generated by means of an open link chain which passes round these wheels, but the lower being the larger, of course the upper turns oftener, and consequently the wheels move faster, gaining about 20 per cent. on the pedals, or making it equal to a 50in. driven in the ordinary way. Hitherto multiplying power has not been a success, and it remains to be proved if this can be an exception to the rule. The pedals have a small safety clip on each side to prevent the feet slipping off, and the throw is 6in., while the tread is but 9in., thus allowing a more natural action of the legs. Foot rests are added to the forks. The cushioned seat, or the suspension, if preferred, is supported by an easy bow string, which is in turn attached to a sliding rod, which allows of the seat being raised or lowered some 5in., and also permits of slight horizontal adjustment.

Steering is effected from the right side by means of a sliding bar and ratchet so often described. The backbone, starting from the middle of the frame, curves down to the rear wheel, which is 18in. high, with Bown's bearings, ⅜in. rubber, and an open head. As to general measure-

ments, the front wheel tracks are 32in. apart, and they touch the ground 41in. before the back wheel; the extreme width is 39in., and the total length 71in. In order to economise space, the right wheel can be readily unshipped by undoing the nuts that hold it to the boss on the fork leg, and also unscrewing the nut on the extremity of the brake bar, reducing the width by about 10in., thus permitting it to pass through any ordinary door.

We did not scale the machine we examined, there being no convenient place to do so, but we should estimate it at 78lb. The name of the firm is a sufficient guarantee of excellent workmanship, and the machine will be found a capital one, but for ladies it will be much better without the speed gearing. The price, painted in two colours, is £15 15s.; or, if ball bearings be added—a great improvement—£3 3s. is charged extra, and £1 more if the new roller detachable pedals are included. If the machine is finished all bright—most unadvisable—it raises the price £3, and nickel plating double that amount. The firm are just about to introduce a new tricycle for which they claim great things; we look forward to its advent with pleasure. The London depôt is under the management of the junior partner, Mr. Cooper (inventor of the noted bicycle lamp), from whom visitors will receive every courtesy.

23. The Humber (Messrs. Humber, Marriott, and Cooper, Beeston, Nottingham, and 78, Richmond-road, West Brompton, London, S.W.).—This machine has been out for about a year, but it was not brought prominently before the public until the 6th November, 1880, when, in the Fifty Miles Amateur Tricycle Championship, G. L. Hellier (of several clubs) rode it into second place, or virtually first, as the actual winner bestrode a rather doubtful tricycle; the time occupied for traversing fifty miles on rough hilly roads was about four and a quarter hours, a fine performance for a tricycle. The style of construction is rather selfish, inasmuch as it can only be used by the sterner sex. In appearance, also, the Humber (or Marriott, as it was frequently called at first) does not seem to possess those evident signs of comfort and ease apparent in most tricycles, but seems to be more of a racing man's vehicle, or used for active riders who wish to travel fast, but in safety. The action, steering, &c., is almost identical with that of a bicycle. Taking the main outline, we have two large wheels of equal size; the particular machine we examined had 60in. wheels, the general size is 52in. or 54in., inclining

to the former size; the extreme width is 45½in. (with 53in. wheels it will be 42in. or 43in.). The well known Humber wheels are employed; they have all the usual features, fine large gun-metal hubs, direct spokes, crescent rims, ¾in. rubbers, &c. The hubs are extra wide, to gain the requisite strength for the strain thrown upon them, being from 7in. in the smaller sizes to 7½in. in the larger. The space between the wheels is 30½in., thus allowing plenty of elbow room.

By a novel arrangement of a double axle, there being two hollow axles, sliding telescopically within each other, and a "mysterious box," like that of the Salvo, but we believe rather different in principle—both wheels may be used for driving purposes, which is of course an immense advantage; moreover, while the driving power is imparted to both wheels, each turns with equal facility, or, on lifting the machine either may be spun separately or in opposite directions. Midway in the axle there is a cog or pin wheel, and arched over this a strong support, which holds the front portion of the framework; from the centre of this, the backbone, working with a Stanley head, runs out rearward for some distance horizontally, when it bends down to the back wheel, which it joins with semi-hollow forks; this wheel is 18in. high, and works on ball bearings. On the upper horizontal portion a capital spring is placed, the tail of which works on a curled clip; in front there is an ordinary bicycle steering rod, 24in. to 26in. long, extra length being required, as by it both wheels are turned, one forward, the other backwards; a very small circle can thus be described.

Running down from the centre of the axle, and slanting backwards, there is a strong hollow rod, which, by means of a small stout frame, supports the cranks and pedals; midway between these there is another cog wheel similar to the one above, and round these an endless chain passes. Should the chain slacken, a link can be taken out and the frame slid a little way up the support until the chain is of the required tightness. For brake power there is a drum and strap—applied by a front lever, *à la* bicycle; it is powerful in action. Ball bearings are put to the supports of the frame on the axle, and below to the crank shaft of the pedals. A foot rest coming out in front is now added; it is decidedly an acquisition, as, owing to the build of the machine, there was no place to put the feet in running down hill. The machine is a fine one for an ex-bicyclist; it is capable of high speed, and, despite its weight (101lb.), runs very freely.

We need say nothing of the workmanship—the maker's name is a guarantee for that. It is difficult to overturn, and is already becoming a considerable favourite. Londoners can both see and try the machine at the depôt in West Brompton, where the courteous junior partner, Frederick Cooper, champion bicyclist, will afford every information.

ACCESSORIES.

Lamps.

Speaking generally, we would say, Avoid low priced hub lamps as a delusion and snare. Never buy a lamp unless the various parts are strongly joined together with stout rivets; see that the glass is of good width, and has a powerful reflector, that the bolts of clasp, door, &c., are firm, and cannot come undone of their own accord. There are many other little details that will suggest themselves, and lastly, if the slightest doubt exists as to the stability of the lamp, adopt the simple expedient now taken by most riders who do not possess one of the best brands of lamps. Get a long leather strap, with buckle, about an inch wide, thin and pliable, cut a long slit in it at a distance from the buckle to allow of its being forced apart and passed round on each side of the glass; the spare part is then cut off so that enough is left for it to buckle over the hub, and by passing it round the bottom and up the back of the lamp, all danger of the lamp falling into the wheel is obviated. Part of the strap at the back must also be slit, and something put in to keep it apart, so that the little red light will not be hid.

Head lamps have, to a great extent, gone out, both metaphorically and actually, hub lamps having taken their place. However, to those who can afford it and do not mind the extra trouble, we strongly recommend both; we have seen machines so fitted giving forth a perfect blaze of light. We have inspected all the principal brands of lamps, and have had several practically tested. We hope, therefore, the following may be of some use to those who have not already chosen a lamp, and if any riding readers are without one we must strongly urge them to get a good light distributor without loss of time. Winter riding is quite possible in the dark, with caution, and although the fancy advertisements

of lamps showing the road for "80 yards" are mere boasts, yet with a good head and hub, the former "canted" so as to show the road just in front of where the hub fails to reach, a stretch of ten to fifteen yards of the highway may be illuminated, whereas, with a hub only, but four yards at the outside are clearly seen. By altering the slant of the head lamp, light may be thrown to a greater distance, but, of course, the rays become feeble and the objects indistinct.

1. The Salsbury, No. 3 (J. Salsbury, 125 and 126, Long Acre, London, W.C.).—This old firm, which has been established for three quarters of a century as carriage lamp makers, has been closely identified with bicycle lamps since riders began to seriously take to them. As

FIG. 1.
BARREL CLOSED.

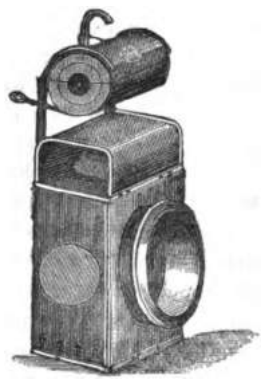

FIG. 2
THE SALSBURY HUB LAMP.

FIG. 3.
BARREL OPEN.

their use became general, their defects were apparent, but Salsbury quickly recognised the evil and successfully grappled with it; we refer to the joining together of the lamp and the method of securing it to the hub. Recent improvements have perfected both these important details, and the lamp now is quite safe. What is known as the barrel fastening is adopted; it is clearly shown in the annexed engravings. Two strong wire rods run along the bottom and up the back of the lamp, to which they are stoutly secured, so that it cannot fall to pieces, even if made red hot. The guards project above the dome of the lamp and bend over

the upper half of the "barrel," which consists of a tube having leather ends, leaving an orifice just large enough to fit round the hub; if too tight, it can be easily enlarged. To the lower half there is attached a flat brass angle, and to the upper a brass handle passing through a slide; when "up," the barrel is easily forced apart, but when closed round the axle, the handle is pushed down, and, acting against the angle, the halves are pressed firmly together, making it impossible for them to come loose.

The actual body of the lamp is wedge shaped, being 4½in. wide at the top, by 3in. at the bottom, 5⅜in. high, or 8in. to the top of the barrel. There is a treble dome, first the inner small one, then a larger crosswise, and, lastly, the main outer one; a down draught is thus prevented. A good glass, 3½in. broad, is used; this has a very deep plated cone reflector inside, which goes back almost to the flame, and, catching all the light from the circular reflector at the back, throws its multiplied force in the direction wanted. In order to allow it to pass more readily through the spokes, the face of the lamp opens downwards, being secured at the top by means of a brass slide. When closed, the outward depth of the lamp is 3½in., but, when open, it is only 2½in. Inside a large oil reservoir is provided, and all parts are highly polished. On the right there is a red window or side light, and on the left, or near side, plain glass; the latter is a capital plan, as by rule of road, the rider must keep to the left, and, having a clear glass on that side, he can distinguish the curb and other objects. The whole lamp is neatly finished in black japan, and the price is 11s. 6d., or 1 guinea if plated all over. We much prefer the black, as the nickel has a "tinny" look.

2. The Salsbury Hub, No. 2.—Merely a smaller edition, glass 3½in. wide, lamp body 3½in. broad, 2½in. deep (closed), height (body) 4in., dome 5½in., to top of barrel 7in. Otherwise the same as the foregoing; ventilation holes are placed all round the bottom. Price 10s. 9d.

3. The Salsbury Hub, No. 1. — The least of the trio. The door opens upwards, but has a very strong safety clasp at the bottom. The body is oblong, not wedge shaped, 3in. broad, 4½in. high, dome 5½in. to top, 7in. by 1½in. deep. The cone reflector is shallower, and the glass reduced to 2in. wide; all have a small red light at the back, and are provided with tweezers to raise the wick. Price 10s.

4. The Salsbury Head.—A capital companion to the hub, or it may, with less advantage, be used separately. The general details are

similar to those already described: Oblong body, 4in. high, to dome 5in., 2in. deep, 3¼in. wide, 3in. glass. The door opens sideways, and is held by a stiff brass slide. The side lights are round. At the back a rubber buffer is fitted to a hinged frame, which in turn goes over a clip

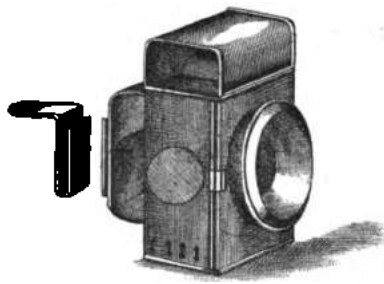

FIG. 4. THE SALSBURY HEAD LAMP.

fastened on the head of the machine; the clip can be bent as desired, in order to throw the ray of light at the required angle. Price 10s. 6d.; or it can be had in smaller sizes down to 7s. 6d. They are noiseless in action, which is a great saving of annoyance to the rider.

5. The Salsbury Tricycle. — Befitting the importance of its mission, this is an enormous lantern, with a 4in. glass, body 4¼in. wide by 5in. high, dome over an inch more. The plated cone for the glass is 1¼in. deep, giving a grand light aided by the fine reflector, unspoiled by having the centre cut out, this variety being fitted as a head lamp on a convenient part of the tricycle. The side lights are 3in. long by 1¼in. wide. Provided with so serviceable a companion as this, tricyclists may venture forth at all times. We need hardly say every part of all these lamps contains the very best workmanship, and may be thoroughly relied on. The price of No. 5 is 14s. It depends on the make of tricycles as to the amount of light required; with a Coventry, for instance, a small head lamp ought to be put on the front small wheel, and a large one at the side.

6. The Albion Hub, No. 599 (Albion Lamp Company, show rooms and offices, 118, Holborn, E.C.; manufactory, Aston Brook Lamp Works, Birmingham).— This firm turns out a large variety of lamps of divers patterns, shapes, and forms. This type (No. 599 in list) is small in size,

round and compact in form, the internal dimensions being 3¼in. in diameter, by about 1¼in. deep. Outside, the glass has a deep electro ring to increase the volume of light, and inside it is well plated. There are no side lights, but 2¼in. red glass is placed at the back. The bottom rests on a small stand. There is ample ventilation. Owing to the shape, only a small reservoir can be used; the door closes by an ordinary clasp. The top of all these lamps is of the same pattern. A species of barrel fastening is adopted; it is riveted to the dome, which is secured in like manner to the body of the lamp; the barrel consists of two halves, hinging from the bottom, the upper half of each being combined so as to form a flat flange; over this a clip, secured to one side,

FIG. 5. THE ALBION HUB LAMP (No. 7).

is pressed down, and so long as it remains stiff it holds the lamp firmly, as the pressure is to open the sides, making them push against the clip, and so care should be taken to see the clip is *tight*. A small hole drilled through it, and the flange for a pin, would be an improvement, and although the present method seems perfectly safe, yet "prevention is better than cure." A brass bar (in all) regulates the lamp to the centre of the wheel; if not long enough, a cork can be put on each end, until it fits the hub exactly. This applies to all the firm's hub lamps. The one in question is very light and handy, price 7s.

7. The Albion Hub, No. 591.—The same as the last-mentioned, only

oval, 8½in. by 2½in., no cover outside—i.e., reflector to glass; inside all bright, but much smaller reflector at back (Fig. 5). Price 6s. 6d.

8. The Peerless Albion Hub, No. 595.—Quite a different shape, oblong body, with rounded top, 3½in. broad by 4½in. high, body all inside bright. A plated bell mouth cone reflector is placed inside the glass; this, aided by the usual back reflector, gives a fine light. The door fastens on the right side by a slide wire; a corrugated spring suspends the lamp from the barrel, thus taking off a good part of the jolting. It is about the best of this group. Price 8s.

9. The Albion Hub, No. 589.—A low-priced variety and miniature lantern, being more suited to a boy's machine. The glass is the whole size and shape, oval, of the body; 3in. high, 2in. deep, by 2½in. broad. It stands on four feet, and the top barrel, &c., is of brass, riveted. In other details it is similar. Price 5s. 6d.

10. The Diamond Albion Hub, No. 593.—Greatest novelty in point of shape, the glass being of diamond form and the body also. A

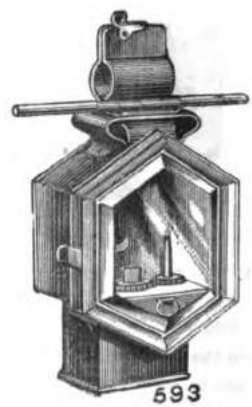

FIG. 6. THE DIAMOND ALBION HUB LAMP (No. 10).

deep well or stand running down to the bottom affords room for a large oil reservoir; a plated rim round glass, but no extra reflector. The barrel is fixed, not hinged, to the dome as in No. 7. Price 7s.

11. The Albion Hub, No. 592.—A similar lamp to No. 9, but without the springs at the top. Price 7s. 6d.

12. The Albion Hub, No. 594.—Oblong front, with a rounded back, very deep, plated bell front reflector inside the glass, and a larger than usual bow-shaped reflector at the back; wire slide fastening. A good light given. Price 6s. 9d.

13. The Albion Hub, No. 593.—Very like No. 6, but with a corrugated spring top. Price 8s.

14. The Albion Hub, No. 592.—Much the same shape as No. 12,

FIG. 7. THE PEERLESS ALBION HUB LAMP (No. 8).

only larger, and an oblong instead of round glass, and without the cone reflector. Price 6s.

15. The Peaked Albion Hub, No. 591.—The actual body is oblong and shallow, but it has a very large arched front of exceedingly thick glass (3in. broad), and the shape gives it the appearance of being very much larger. Over the top a "peak," like that of a cap, projects, and being plated on the underside, shows the light down on the road. The back opens, and a large dome is *soldered* to the body, but the barrel clip is rivsted to the dome, but the strap guard should be used. Price 7s. 6d.

16. The Bell Head.—This is rather an old pattern. An oblong body, large round front light, with good sized side glasses, hinge back,

&c. The novelty lies in the dome, which is more arched than in general, and it encloses a bell, which, owing to the shaking of the lamp, is sure to make himself heard, thus killing two birds with one stone, and fulfilling the lamp and bell clause to the letter. Price, complete, 8s. 6d.

17. The Original Hub.—Introduced a couple of years ago, it became a great favourite. It is a large oblong lamp, with round glass, deep bell reflector, red and green side lights, oblong dome, and a slightly different method of securing the barrel. It has been lately altered so as to burn paraffin. Price 7s. 6d. The firm make several other varieties of lamps, and turn out good work.

18. The King of the Road (Hub), No. 2 (J. H. Dearlove, 39, Arlington-square, Islington, N.).—This is certainly one of the best lamps we have seen; indeed, up to the present time it has no superior as a light giver, either in perfection of detail, power, and—most important of

FIG. 8. THE KING OF THE ROAD HUB LAMP (No. 18).

all—safety. Outwardly the lamp is the largest made for a bicycle, and it would be impossible to put it inside a many spoked wheel were it not that, by an ingenious plan, it opens up in two halves to admit of its going between the spokes. The lamp measures 7in. to the top of the dome, or 9in. to the top of the barrel; the body is larger, and is 4½in. broad at the top, narrowing down to 3½in. at the bottom. From back to front the depth is 2¾in., but as the glass and holder project another ¾in., the actual depth is 3½in. By opening, this is reduced to 2¾in. A good front

glass is used, very thick, and no less than 4in. across. The effect of this is further heightened by having a deep cone reflector inside round the glass, and running back close to the flame at the back. There is a splendid reflector of pure German silver, not merely plated; this is slightly concave, and 3¼in. in diameter. It can be readily removed

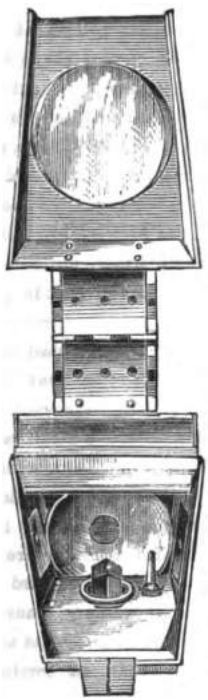

FIG. 9. THE LAMP OPENED FOR PUTTING INTO THE WHEEL

for cleaning, and, unlike ordinary plated reflectors, the silvered front cannot be worn off by polishing, but the metal only made brighter; soft chamois should be used, as scratches, of course, spoil it. At the back the hole is only ¼in., but behind the reflector the red glass, or

warning light, is ⅜in. Thus an ample light is given behind, and the reflector unspoiled by having a large portion cut out of its best part—the centre. A neat little brass frame, bearing the maker's name, goes round the glass on the back of the lamp, and relieves it from bareness.

Rattling reservoirs, besides being noisy, extinguish the light. In the present lamp this detail bears the imprint of the general improvement; the oil holder is 3in. long at top by 2¼in. at bottom, by 1¼in. deep and 1¼in. high (by means of the conical shape free ventilation is obtained from the holes in the side of the lamp, without causing an undue draught). The bottom of the oil reservoir is provided with a projecting flange, the full width of the lamp, which fits closely into a slide at either side, and is thus prevented from any shaking, and is held quite firmly; moreover, it cannot come tumbling out whenever the lamp is opened. Two wicks, each ⅜in., are used; they are held by two tubes placed at a slight angle, edge to edge. Inside each tube there are two springs to prevent the oil-laden wick from slipping back. A pick is provided to pull it up when trimming is required—one other little advantage. It has been proved by experience that even the most trifling detail cannot be left to the instinct of the ordinary bicyclist, and in order that the wicks may not be put in the wrong side foremost, and also to prevent them from twisting round, the under side of the wick plate has a small raised edge, which fits into a notch in the neck of the reservoir. Thus, when the ring is being screwed down, the wicks remain in their proper position.

With such a large flame a magnificent light is given, but also a great heat generated, and if the lamp were merely put together with solder it would soon fall to pieces. To guard against this evil, the parts are riveted together, but in no ordinary manner. We have already said the lamp is in two parts, hinged together at the top of the barrel (after a much simpler and safer plan than was carried out when this lamp was first introduced to the public) by a strong brass rod held by a copper joint, and additionally strengthened by cross pieces. The leather washers are in independent halves on each side, and possess the great advantage of being easily renewed. They go into a metal holder, which slides in a groove quite firmly, but they can be readily removed and altered to fit any sized axle. Spare leathers are sent with every lamp.

Each and every part of the barrel is held together with copper rivets,

that metal being more reliable and less likely to break the tin than iron. The barrel itself is held to the dome of the lamp by a plate, through which are passed several rivets, with copper washers inside to prevent the possibility of their pulling through, or the metal breaking away. Thus no danger is to be apprehended from this part, which, more than any other, is the source of peril by its parting from the body of the lamp.

The top of the lamp is firmly fixed to the body by means of linked edges—the edges of both bent over into each other. A tool then forms a sort of ridge on the joining, making them yet more secure. The door, or, rather, the whole front of the lamp, has overlapping sides which protect the interior from dirt. The double spring at the bottom of the lamp is one of its special features, and consists of two independent springs with large clip heads. These are made of German silver, and on closing the lamp hold it securely. This is a very important feature, as, owing to its peculiar construction, it would be very liable to accident should it go wrong at this point; but the method described is not only very simple but safe, and when put into the wheel the rider has only to press down the front when the loud click will show that it is clasped. There is no fumbling in the dark or uncertainty as to whether the lamp is safe or not.

Guide arms screw out, and are held in one position by a lock nut, to make it fit any hub up to 6in. or 9in. in width. The lamp is neatly finished in black japan at 14s., or made of brass and covered with nickel silver at 25s. The weight of a lamp without oil is 2lb. 2½oz. These lamps are all made at the Tom Bowling Lamp Works, Birmingham, by T. Lucas, who designed the lamp in its original form, but nearly all the improvements are due to the practical experience of Mr. Dearlove. To show the strength of the lamp to a sceptical rider, Mr. Dearlove suspended a lamp by the barrel from a rod, and passing a strap under the dome, over the top, asked the rider to suspend himself by it, which he did. If a lamp will thus bear eleven stone, none of its parts can be weak.

19. The King of the Road (Hub), No. 1.—A reduced size, with a 3½in. glass, the dome being 6in., and the barrel 8in. high, while it is 3½in. wide at the top, lessening down to 2½in. by 3½in. deep. The other parts are reduced *pro rata*. The barrel is placed rather more in front, in order to preserve the balance. The price is 12s. 6d., and the weight

1lb. 11oz. It looks smaller, in proportion, than it really is, but we should advise the larger lamp where the wheel is capable of holding it.

20. The King of the Road (Head), No. 2.—The body is internally and externally the same as the hub, save that it is more oblong, and has merely a large dome head and plated cowl over the 4in. glass to throw the light down upon the road. The back is fixed to a large solid rubber ring, and the case holding it is riveted to the lamp. It has, of course, the usual bracket to attach it to the head. This forms a good companion to the hub lamp, and they in combination affect a brilliant illumination. In both are red and green side lights 1¼in. by 1¼in.; or plain, or any colours, are substituted. Price 13s.; weight about the same as No. 19.

21. The King of the Road (Head), No. 1.—A companion to the No. 1. hub lamp, but the same in all particulars, save size, as the one just described.

22. The Comet (Hub).—Although considerably smaller than the King of the Road, this is of average size. It is attached to the axle by means of the upper dome folding back. The top is leather lined, and on the dome there is a curved spring, the tops of which are coated with

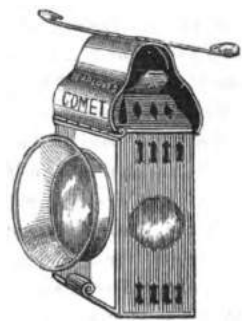

FIG. 10. THE "COMET" HUB LAMP.

leather and press against the axle; they may be bent down to suit one of any thickness. The top is hinged in front by a double brass joint riveted to the body of the lamp, and at the back there is a strong edge with a hole cut through; a strong brass spring with a large head clasps through

this, and holds the top so firmly that it cannot come loose. The door has a single spring like those already described, instead of the one shown in the cut (Fig. 10). In general measurements the body is 4½in. high and the dome 6½in., in breadth 2¾in. by 2in. deep. The inner reflector is rather smaller, and a deep cone is put round the glass (which is 2½in. in diameter) outside. Large red and green side lights, circular, are provided. Inside it is similar to the King of the Road, having the same noiseless oil reservoir, &c. This, japanned black, costs 7s. 6d., or plated, 15s. 6d.

23. The Comet (Head).—Somewhat like the Comet hub, but with a fixed dome and a cowl over the glass to cast the rays of light downward. The body is 4in. high, 1¾in. deep, by 2in. wide, and with a 2in. glass. The plate bearing the rubber is riveted and every part well finished. It forms a fine head piece to the King of the Road hub lamp, and Dearlove has lately introduced a new method of attaching it to the machine. Instead of the supporting bracket being on a level with the

FIG. 11. THE "COMET" HEAD LAMP.

handle bar, it is longer and bent down, so that the bottom of the lamp is within a couple of inches of the tyre, clear of the brake. This puts it out of danger, as in the event of a severe cropper the steering rod strikes the ground first, and the lamp is comparatively uninjured. This system is now applied to most of the head lamps, and is a vast improvement, as it both puts the lamp nearer its work, out of the way of the rider, and also preserves it from harm to a great extent. Altogether it forms a neat and handy lamp. Price, japanned, 7s. 6d.; plated, 17s. 6d.

24. The King (Hub).—This is a smaller and lower-priced edition of

the chief one of the group, and rather larger than the Comet. The barrel is like that of the King of the Road, and opens from the centre, but it has fixed leathers, and an adjusting rod that can be bent to suit any hub. At the bottom a safety spring is placed; it has round side lights; other details the same. It has a 3in. glass, and is a good strong lamp, being riveted. Price 10s. 6d., or plated, 21s.

25. The Pathfinder (Hub).—The body is like the above, but the barrel has to be fastened with a hasp and pin. It has the fine spring to the door, large oblong side lights, ordinary oilcan, and is a fair lamp for the price asked, 6s. 6d.

26. The Five Hundred (Hub).—A by no means poor representative of the "Light Brigade," but its rather fancy form makes it more suited to a tricycle than a bicycle. The body is rounded, and has a high smoke chimney with ornamental top. A good wide wick can be used, and it will be found a very fair lamp. Price 9s. 6d., or plated, 19s. 6d.

27. The Tom Bowling (Hub).—There are many riders whose resources are limited, and who must carry a light to protect themselves from the attentions of the gentlemen in blue, and this lamp, besides being about the lowest-priced one in the market, is better than might be expected. It is a very small affair, being only 4in. high, 1½in. deep, by 2½in. broad. The spring hooks at the top to keep it safe on the axle, and the guide rod can be bent as required. The reflector is outside, and a ½in. wick is burned. Inside there is, of course, the usual reflector, red and green side lights, &c. The door opens upwards, and is held by a hasp at the bottom. The whole is very light, and costs only 3s. 6d.

28. The Tricycle, No. 1 (Hub).—A large, massive lantern, with dome top and a grand 4in. glass; otherwise like No. 2 King of the Road. Price 17s. 6d.

29. The Tricycle, No. 2 (Hub).—Slightly reduced in size; otherwise the same. Price 14s. 6d. There are one or two other varieties, but they are of no consequence.

Bags.

The Cambridge.—To riders who find the ordinary "Multum" not of sufficient capacity to contain their indispensables, the Cambridge bag

(Fig. 12) will recommend itself. It was designed by Mr. A. P. Trotter, of the Cambridge University Bicycle Club. It is made of brown waterproof canvas, the edges being strengthened by leather binding. Although described as a bag, the plural would be more correct, as there are really three bags, or perhaps we ought to say a bag, a satchel, and a valise, all combined in one. The upper, or main bag, has an internal space of 12in. deep, 8in. wide, 4in. thick, but when tightly crammed home, the amount of crushable articles that can be put away in it is astonishing. A flap

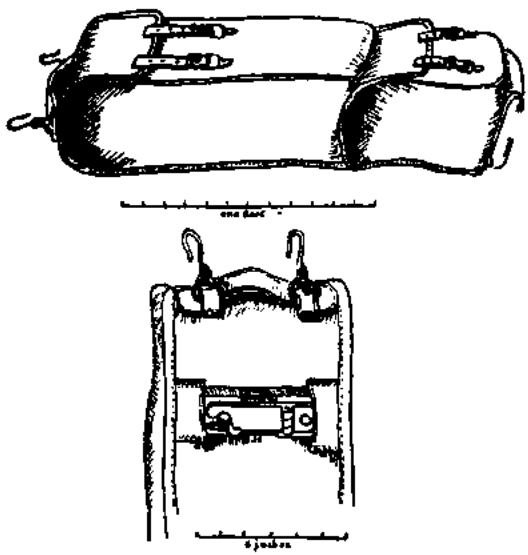

FIG. 12. THE CAMBRIDGE BAG.

comes down from each side, and buckles in the centre; over this the main flap folds, and is doubly secured in front. Below this is the second bag, the dimensions of which are 6in. by 8in. by 4in. Below this again, and turned sideways, is the smallest, but not least important, of the bags; it is 6½in. long, 3½in. deep, by 1in. thick. Its purpose is to carry the wrench, spoke adjuster, and similar articles; outside and beneath, when in position, there is yet another pocket, apparently for that necessary, but dirty

adjunct, the oilcan. The whole bag, not including the oil pocket, gives a stowage room of about 516 cubic inches, or considerably more when extended. To fasten the bag securely to the machine there is placed a wooden brace or crosspiece at the back, about 3in. from the uppermost portion. On this wood there is hinged a brass clasp to fit under the spring, and, passing over a belt, it is made firm by a thumbscrew. A stout piece of leather runs down the back to prevent the spine wearing the cloth, and just above a strong leather stiffening a spray to buckle round the backbone is placed; lower down there is another one for a similar purpose. The whole bag is exceedingly well and strongly made; it is supplied by most bicycle dealers and agents.

Improved Multum in Parvo (Maynard, Harris, and Co., 126, Leadenhall-street, E.C.).—This bag is generally accepted as a thing which every rider must possess, and, owing to the great success that it has met with, various means have been taken to improve it. The latest of these consists in a guard to pass round the backbone to keep it from shifting or sliding off at the lower part. The bag has on the back the usual wooden guard and clasp to go over the spring, and below, near the bottom, a second support; in the centre of this a strong leather covered brass clip is hinged, which folds round the backbone, and is secured by means of a clasp and arrangement to prevent its becoming unfastened. This rests on a rubber buffer, which takes off the jarring, and is an immense improvement on the old strap fastening. The whole bag is better finished, and has an outer pocket as well as one at the bottom, the latter for oilcan, spanner, &c. It is also more strongly bound with leather.

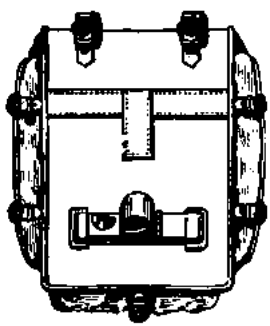

FIG. 13. THE IMPROVED M.I.P.

The Cyclist's Wallet (Lamplugh and Brown, 135, Great Colmore-street, Birmingham).—There are plenty of large bags in use, but riders often require a small handy satchel or a receptacle in which things may be placed without being crushed and broken. The wallets here described are of the latter class. They are made of a deep but bright chocolate-

coloured leather, very strong and firm, with solid ends, which are formed of stout leather, with the centre punched outwards, so as to give greater strength and prevent the sides collapsing in case of undue pressure. They are made in three sizes: No. 1, 3s.; No. 2, 3s. 9d.; No. 3, 4s. 6d.;

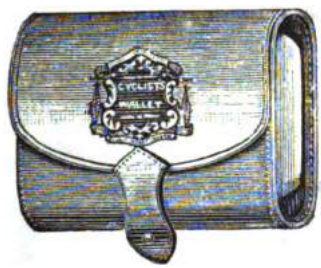

FIG. 14. CYCLIST'S WALLET.

and will be found an extremely useful as well as elegant appendage to the rider's outfit. No. 2 is the most useful size, weighing only a few ounces. Sold by all bicycle agents and dealers.

The Clytie Bag (M. D. Rücker, jun., Letchford-buildings, Bethnal Green Junction).—This is decidedly the best bag yet introduced for cyclists. The material of which the Clytie Bag is formed is known as black enamel roan hide, a strong firm substance that would be dubbed by most riders as "patent leather." The internal dimensions are 13in. long, by 7½in. broad; the depth varies, as the sides and ends are collapsible. A very strong frame of steel band goes round the mouth of each half, making it firm and rigid. The great point of the Clytie is the ready manner in which the contents can be got at; this desirable end is achieved by hinging the bottom to the stout rod which connects the two halves (see fig. 15, page 122). By this plan the bag opens out its full length, and no time is lost in getting whatever may be required from within. The interior is very neatly fitted up, the under side having a cover which folds over whatever may be packed in that portion, and buckles to the top; outside there is a flap pocket for notepaper, &c. The other half is partly covered and has a strap to prevent the contents falling out. All the inside is neatly lined, and shirts can be easily carried without tossing or crumpling, to say nothing of cuffs and collars, besides more or less bulky

articles. No matter what condition, whether full or empty, the bag always retains its good shape. Whatever metal work there is about it—the lock on the top, the ends of the bolt, and the spring clasp—are plated. A small pocket is put outside the bag to carry oilcan, spanner, &c., so that those necessary auxiliaries are kept quite separate from the bag itself. A new method of securing the bag to the machine backbone has just been registered by the same ingenious inventor. It consists of a

FIG. 15. THE CLYTIE BAG.

thin band which goes round the "perch" with a cross piece at the top, and the latter fits into a slot in the back of the bag, which is then turned round in its regular (upright) position, and hooked to the saddle. The Clytie is thoroughly well made throughout, and, considering its advantages, is cheap at £1 1s.

Bearings.

The Patent Æolus Ball Bearing (Wm. Bown, 308, Summer-lane, Birmingham).—On examining the Æolus, it will be seen that the outer case is formed of gun-metal, inside which there is placed a steel grooved ring affixed firmly to the case; in this the balls lie. They do not, however, touch each other all the way round, as it is claimed that by leaving a certain amount of "play" friction is reduced. The position is shown

in Fig. 16. A steel (hardened) collar slips over the axle, to which it is screwed. This has double cones projecting from it, forming a groove in the centre, into which the balls fit; the collar exactly fits the steel rings, so that dust is kept out. On the outer side, *i.e.*, next the crank, a loose steel cap, grooved exactly similar to the inner one, fits over the balls, and is kept from revolving by two guards; over this again the outer gun-metal case comes, which has a screw of a very fine "pitch," so that it can be very gradually screwed into the body of the bearing and adjust-

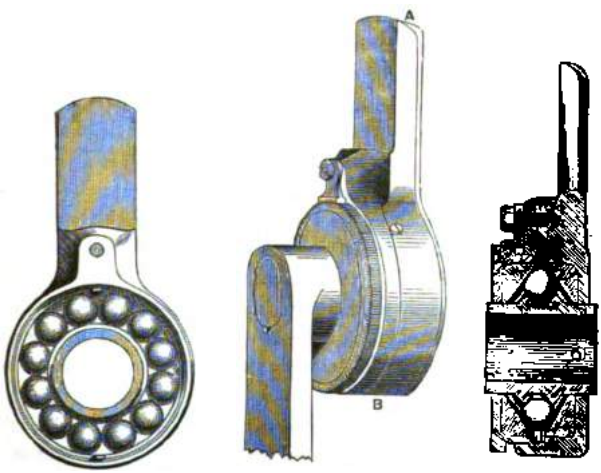

FIG. 16. THE ÆOLUS PATENT BALL BEARING.

ment made to a nicety, equal pressure being brought to bear on all parts. The edge of the outside case is milled, and a small clip with corresponding ends is held firmly down on it by means of a screw, partly shown in Fig. 16. When the bearing requires to be tightened, all that has to be done is to unscrew the nut, lift off the cap, and turn with the fingers until the right degree of tightness is reached. The least move is sufficient, as the case has only to be turned the fractional part of an inch.

There are only four points of friction on each ball, which are shown in Fig. 16. If the balls touched all the way round this would be increased to

six, but the friction is reduced to the lowest possible minimum, and lubricants are scarcely required. All working parts are of steel, thoroughly casehardened, and seem proof against wear. The Æolus bearings can be fitted to almost any machine with but slight alteration. A great proof of their popularity is afforded by the fact that more than half the makers in the country are now fitting them.

The A B C Bearings (the Acme Bicycle Company, St. George's Foundry, Pope-street, Birmingham).—In the A B C we are introduced to a capital combination of balls and cones. First, the *bowls*, as they are here termed, are of hardened steel, and in shape a kind of double cone. These bowls, nine in number, revolve on steel spindles, which are held by a steel cage. The ends of these spindles can be screwed up, thereby tightening the bowls, by means of an ordinary watch key. The body, or bearing surface, is a hood or hardened steel collar, which forms part of the crank head. This has a rounded groove for the bowls to run in, and it fits over the axle. This case goes right up into the hub, and at the outer side is held on by the usual bolt, so that not only the crank, but bearings as well, can be readily removed. A most ingenious plan is adopted for universal adjustment. Similar bearings suffer from the defect of being capable of adjustment from one side only; but in the A B C the inner case—i.e., next hub—is made with a left hand screw; the outer—i.e., next crank—has a right hand screw. Both these have steel cups, or rings, with rounded grooves, which press against the bowls. The outer edges are milled, and a small steel pin passes through a projection in the case, having at each extremity a small cogged or milled wheel. On loosening the lock nut and turning the little wheel, both cases are twisted round in opposite directions, and so brought nearer together, exerting an equal pressure on the bowls from both sides. The great advantages of this system will be readily understood, especially by those who have some practical knowledge of the subject. We should add that the edge of the bowl does not touch, but the top slides, or of course adjustment could not be accomplished as described.

The same principle is carried out in the back wheel, but only four bowls are used on either side. These go right inside the hub. Two steel rings fixed inside the hub offer one bearing surface on each side, while the others are adjustable. The latter consist of the cones for taking up near the case and cups. The cups fit one over the other, and make it

perfectly dustproof. To tighten, the outer lock nuts are screwed up, which press the fork ends nearer together, and consequently the bearings are drawn closer. The axle has one loose cone, kept from turning by a D hole; it is strong and lasting, while it runs splendidly.

An almost exactly similiar plan is carried out for the pedals, and therefore these do not need a detailed description. The A B C bearing is one of the best introduced, all parts being beautifully made from standard patterns, so that they are interchangeable in case of wear or kindred cause for renewal. The bearing runs smoothly, and friction is brought to a very low degree, but there is one great fault, and that is the fitting, which, although perfect in itself, is not carried out with a regard to reducing the "tread," as at present it makes any machine with a 6in. hub 17in. in the tread, but this has also been reduced.

Seats and Saddles.

Suspension Tricycle Seat (Lamplugh and Brown, 135, Great Colmore-street, Birmingham).—This firm, following up the excellent principle of their bicycle suspension saddle, have elaborated it and produced the present seat for tricycles, which, without doubt, is the

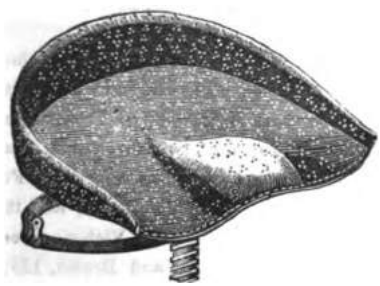

FIG. 17. SUSPENSION TRICYCLE SEAT (Top View).

best in the market. The construction is shown in Figs. 17 and 18. The saddle itself is large and roomy, and is made of handsome dark-coloured leather. On the under side the framework consists of a

light piece of corrugated sheet iron, bent so that only the outer rim is fastened to the leather. This edge is turned over so that there is no cutting or sharpness. Down the centre another fluted piece extends, supporting the middle of the front only; the whole seat is thus suspended, and over the point in front a pad is placed, so that it cannot possibly hurt anyone. Round the top there is a raised rim, gradually rising from the front to about 2¼in. or 3in. behind. This is also extensively padded, and forms a pleasant purchase for the back. The whole saddle is the very acme of ease and comfort, and, as it "gives" with

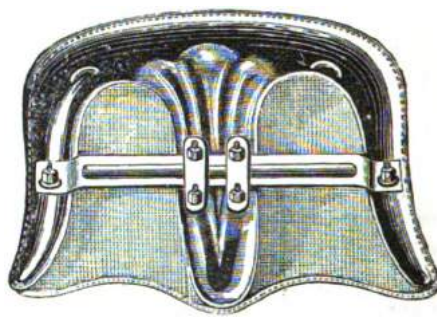

FIG. 18. SUSPENSION TRICYCLE SEAT (*Bottom View*).

each stroke of the legs, there is no chafing or straining. Those who desire a farther support for the back can have an additional rest fitted. We should have added that it is strengthened underneath by a cross-piece. It can be fitted to any machine. The seat is extensively ventilated, and when complete it weighs only 4lb. For this, the most perfect of seats, the price is only 15s. to £1, and it can be seen in London at Moir and Hickling's, 30, Queen Victoria-street, E.C.

The Rolling Saddle (Lamplugh and Brown, 135, Great Colmore-street, Birmingham).—The construction of this suspension saddle is sufficiently well known, but, for the benefit of any readers who may not have seen it, we may briefly state that the framework consists of thin metal plate, something in the shape of a scallop shell. The leather is supported by the rounded and turned down edges of this and the narrower front portion or pommel, so that where the fork rests the leather is

merely suspended, so there are no hard sides to chafe the legs. Even with this, there was still something wanted, and observant riders noted that the connection between the rider and machine was too rigid, and that something like the sliding seat in a boat was required, to form, as it were, a "joint" between the two. This end has been achieved by the saddle now under notice, and it is gained by placing—in addition to the necessary cross bar—one 3in. in length, held at the ends by a support, resting on the main spring, midway. The round bar rests on a block of rubber, and as the bar is not fast at the ends, a "rolling" motion is given to the saddle with the least side pressure, ensuring an absence of friction.

With an ordinary saddle, the rider does not gain the due advantage of his weight to aid in propulsion; but in this invention, with each down stroke his weight is, so to speak, rolled over to the side and brought partly to bear on the descending pedal, putting additional force into it. This great advantage is performed unconsciously, and without any exertion of the rider, but nevertheless exists. On mounting for the first time the saddle feels unsteady, but this is almost immediately quite overcome, and there is little *perceptible* difference between it and another, as it does most of its good work by stealth, and, although the user may begin to think its good qualities are overrated because not obtrusive, he will find a difference on returning to the old form, for we believe the new to be faster for racing (where every yard tells) and far more comfortable for touring. Those who already possess a suspension saddle can get the fastener and rubber plate separately for 6s.; they are easily attached, and the benefit to be derived we have already described. The fastener makes the saddle a little higher, but the dipping action of the side is an antidote to that. For tricycles a larger saddle is made, and for the latter vehicle it is doubly valuable—more especially to those machines where the action is rotary and placed below the rider. The price for saddle and fastener complete is 15s.

Springs.

Patent Rear Wheel Spring (Jas. Wood, 13, Newcastle-street, Farringdon-street, London, E.C.).—It is a generally acknowledged fact that by far the major portion of the jolting, jarring, and unpleasant vibration

from which bicyclists suffer is generated by the back wheel, and from it transmitted, *viâ* the backbone and spring, to the rider. Attempts have been made, with varied success, to cure the evil by means of springs of endless different patterns; but the root of the evil still remained, the true source of the "bumping" being the too rigid connection between the back forks and wheel. Hitherto, no maker has been found equal to the task of effecting a palpable improvement in this direction, but Mr. Wood has stepped into the breach and given to riders the outcome of his study—an improvement that, unlike several "inventions," is much better in actual practice than on paper.

The idea is to place the small wheel upon a coil or curled spring, which "gives" with each concussion. This is accomplished by attaching to the head of the fork, by means of screws, as welding would spoil the temper of the metal, two flat pieces of steel, placed sideways, so that the weight of the rider is borne by the curl or end, which is turned up and over, the pin passing through its extremity. By this arrangement the "tails" of the fork become luxurious springs; and while elastic in the upward and downward motion, they are immensely strong sideways. The greatest strain that is thrown on them is in mounting, but they are always made equal to that. Although a marked improvement when added to a machine with an ordinary spring, the advantage is a great deal more appreciated when an easy spring is used in addition. In action it is the upper portion of the curl which chiefly works, there being but little movement in the backbone itself; but there is a small extra space purposely left between the top of the rear fork and the wheel, to allow for depression. The invention can be fitted to any machine at a moderate charge, and, pending arrangements with a large maker, those desirous of testing its merits should write to the inventor at the address given.

Miscellaneous.

Brazier's Spoke Tightener (D. Brazier, Temple-street, Wolverhampton).—The total weight of this little instrument is about 2½oz., and it goes easily into the waistcoat pocket. It is made of steel, the body being very strong and solid, having a groove cut in the recess to fit one half the spoke. There is a slot about ¼in. long, through which

passes a slot bolt, holding a piece of steel the breadth of the solid portion. This has a coned edge, and is tightened by turning a long thumb screw, which, on placing the groove over a spoke, presses the coned side against the spoke, which is held in a firm grip; the long arms of the screw act as a lever, by which the spoke is readily twisted, and either tightened or loosened as occasion may require. It can be adjusted

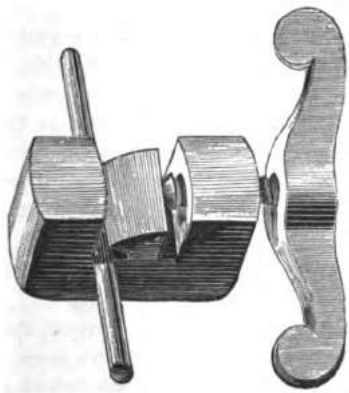

FIG. 19. BRAZIER'S SPOKE TIGHTENER (FULL SIZE).

to suit any spokes of reasonable dimensions by simply altering the little screw which holds the sliding clip. The total dimensions are—length of thumb screw, 1⅛in.; height open to fullest extent, 1¼in.; closed for pocket, 1⅛in.; length of body, 1⅛in.; extreme depth (without nut), ⅜in.; with nut, ⅝in.; breadth, ⅛in. In short, it is one of those indispensable adjuncts to the paraphernalia of a bicycle that no rider should be without. Price by post 3s.

Plowright's Mud Guard (James Plowright, Purfleet Bridge, Lynn).—This mainly consists of two wire arms bent into a hook at the bottom to fit over the bearings on the small wheel; the upper portion between the wires is covered with thin steel neatly painted to match the machine. It has no spring, screw, or bolt, its own elasticity keeping it in position by means of the curved head which slips under the back fork; all the mud is thus deposited on the receiver. It cannot become clogged, but should mud accumulate the guard is removed in something under

2secc., shaken, and replaced. It does not in the least disfigure the machine. Those who ride 'Xtras will find it especially valuable, as the large back wheel "lifts" the mud pretty considerably. The price is very moderate. In ordering, the make, bearings, and size of rear wheel should be stated, also colour desired. Price 6s. 6d.

The Revolver Wrench (Wm. Bown, 308, Summer-lane, Birmingham).—This handy little article is about 6in. long, with a grooved tube for the handle, and as the top or head resembles a gunlock, the illusion is complete when held in the hand, hence the title. It will be found especially useful, as it can be almost instantaneously altered to fit any ordinary sized nut. The lower half of the head is fixed to the handle, and the upper portion slides for adjustment; it can be locked at any position with one half turn of the handle, but it must be held in a particular way when used. It remedies one fault, common to most wrenches, the top, or acting portion, being thoroughly hardened, and will not stretch like many we have tried. It is sold by Hickling and Co., price 3s. 6d.

Garrood's 'Xtra Handle Bar (J. C. Garrood, Fakenham, Norfolk).—This is also designed to give the rider extra power over his machine. The bars are separate, one screwing on each fork at a suitable distance from the head; they bend outwards and upwards, with long knobs at the end. They are quite out of the way of the legs. The idea is that, in climbing hills, the rider is to relinquish the ordinary steering rod and, leaning down over it, grasp the extra handles, thereby getting on a great "pull" upwards and increased power to put into the pedals. In descending hills, "legs over," these bars may be used as comfortable rests for the heels. Of its positive merits we cannot speak so certainly, but it appears to give additional strength. Its drawbacks are a rather awkward position and a seeming liability to croppers on the flat, not when most useful—climbing hills. The price, hollow, is £1 3s. 6d.; solid, 19s. They can be attached to any machine without drilling. Time will prove if they possess the merits so prominent with their companion, the Grip pedals.

Phillip's Safety Tyre Binders (Messrs. E. Langton and Co., 18, Storey's-gate, London).—All riders know the nuisance and, in fact, danger, of a loose tyre, and the fruitless efforts that are made to temporarily secure it. With these handy little "binders" any

mishap of this kind can be rectified at once. The binders consist of pieces of steel wire hardened and twisted into a corkscrew form, in such a manner that they cannot be untwisted, but, however stretched, always return to their original form. The method of using is to twist one end round a spoke, and then simply wind the wire round tyre and felloe, and as it has a natural tendency to close tighter, it draws or binds them together. A dozen of these extremely useful—almost invaluable—little protectors roll into each other, and so occupy a very small space, while their weight is practically nothing. They are made in various sizes, from ⅛in. and ¼in. to ⅛in. and ⅜in., smaller or larger, to order. The price is only one shilling per dozen. They neither cut the tyre, nor are they likely to become cut or broken, but acting on a yielding substance—the rubber—they give and do not cut in as an ordinary wire bound round would. There is another place where they will be particularly useful—in grass racing. Those riders who wish to gain a great advantage over their rivals on a grass course, especially if it be wet or slippery, should attach a dozen "binders" round their wheels, when the result will be a good twenty yards or more in the mile in their favour—indeed, it would often make all the difference between winning and losing.

The Universal Eclipse Bicycle Stand (Goy, 22, Leadenhall-street, E.C.).—Of the many bicycle stands we have seen we must give the preference to this, as with it the machine is in a more natural position, and the wheels may be spun, a great advantage when cleaning operations are going on. It is of very simple construction, consisting of a long T-shaped piece of iron, with the end portion rather heavy, to give steadiness; at this end there are two uprights, inside which two rods slide telescope-wise. They are surmounted by Y-shaped prongs which go under the bearings, and by means of the screws any sized machine can be held. A screw permits of the central portion being slid out so as to make the support for the rear wheel a proper distance from the uprights. The stand can be screwed to the floor, but is steady enough without that. The price is 12s. 6d.

Patent Adjustable Grip Treadle (J. C. Garrood, Fakenham, Norfolk).—All agree that there is a decided waste of power in cycling in the action of the cranks, as force can only be applied during a portion of the descent of the pedal, while the ascent merely helps to lift the leg. Now, it is very evident that if the up stroke could in any way be utilised

to assist propulsion the result would be a decided gain in speed. With the pedal under notice the desired principle is carried out capitally. The body of the pedal is as usual; but from each side there is a graduated projecting flange, which allows the sole of the boot or shoe to pass underneath it, but prevents it from going too far, as shown in the sketch. The feet are thus held firmly, and also remain on the pedals over rough ground, and in racing there is no fear of the feet flying off; we have seen more than one race lost from this very cause. At hill work they are extremely valuable, as the legs, on being drawn up, bring the pedals with them and

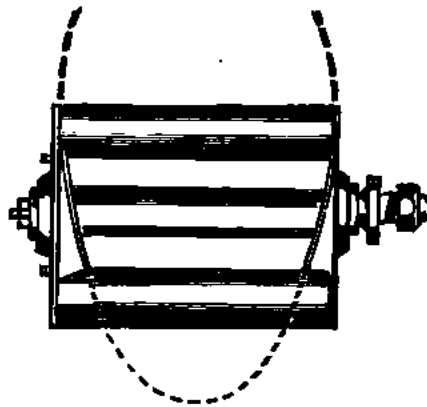

FIG. 20. PATENT ADJUSTABLE GRIP TREADLE.

so help to drive the machine; indeed, it makes considerable difference, more than appears in a mere paper argument. In very fast spurting they come out perhaps strongest, and will add a good many yards to a man's speed in a mile, especially when it comes to the last rush for home, for then every little thing tells, and if the pull up helps the push down, the rider who can command it has a decided advantage over his opponents.

Although the feet are held firmly enough to accomplish the desirable results we have enumerated, they do not bind the foot, for by any sudden wrench it is readily removed, and becomes immediately detached in case of a fall. They are not made separately, but must be had, with their own pedals, which cost, japanned black, 19s. 6d., polished, £1 2s., or

with ball bearings, £2 5s. per pair; if the clips are only required on one side the price will be 3s. less, or if both, on right and left, are to be plated, 4s. 6d. additional. Although designed to fit any foot, those who wear an extra small boot should state the fact when ordering. Only one side of the pedals have the "grips," so that the other can be used in ordinary cases. They will also be found a very valuable addition to tricycles.

Bate's Patent Lubricators (Messrs. Lovedee, Son, and Bate, Wolverhampton).—This useful little oil holder is of much the same appearance as the ordinary description, but on the top there is a circular aperture, into which a ball fits; it is pushed up from the lower side by a small coil spring, and so always kept in position, preventing the dirt from finding ingress. All that has to be done is to push in the nozzle of the oilcan, when the ball slips partly aside, and, when full, or sufficient oil has been injected, it resumes its original position. They are now largely taken up by the trade, many makers fitting them. They can be applied to most machines, and are very cheap.

Stanley Bicycle Club's Annual Exhibition.

Introduction.

Cyclists have now learned to look on the Stanley Bicycle Club annual exhibition of "wheels" and their belongings as one of the events of the year. It has become a marked date in the cycling world, a time when men, and now, happily, ladies, look about for new ideas, investigate improvements, examine every kind of machine get-at-able, and after hearing explanations of the merits of each from the maker, the derogatory remarks of rival firms, and carefully weighing the critical comments of friends, come to a decision, and choose whatever particular make they mean to patronise for the coming season. Formerly riders had to rely on price lists, or a cursory glance at some out-of-date machine, in the dimly lighted and sadly cramped room of some agent. Now, however, nearly all the great attractions for the season are massed together by the Stanley exhibition, and metropolitan riders have a good opportunity to make a selection that will do credit to their taste.

The good management of past years has caused the favour of representation among the selected ones of the Stanley show to be much sought after; therefore, it is not surprising to learn, that although the price was doubled this year the demand for space far exceeded the supply, and many firms had to be refused, while others were curtailed.

The show, which was held on the 22nd, 23rd, and 24th of February was more remarkable than any of its forerunners. Year by year the space required exceeds the supply, and next season the club will be driven to the Agricultural Hall, which is, after all, the only place where justice can be done to the machines.

Some decided novelties have been introduced, and improvements are to be found on every hand. The fact of a French maker exhibiting must

also be taken as a proof of the widespread support the Stanley has received.

Since last year the progress made with tricycles is simply marvellous; then there were only a dozen or so makers, now their number and variety almost approaches that of bicycles. Nearly every firm that makes a bicycle also produces a tricycle, and the keen rivalry leads to constant improvement; but few riders were aware that there was so wide a choice as that displayed at the show.

A whole host of fresh names appeared among the exhibitors, and some of these late comers seem determined to push themselves into prominence. Among these may be mentioned the Caroche Tricycle Company, Settle and Co., and the Phœnix Tricycle Company. Among the old firms, Humber, Marriott and Cooper went to the full length of their tether, and showed eleven bicycles and one tricycle. Simpson, of Mansfield, exhibited a new three-wheeler; and Starley—*the* original Starley—showed a *fac simile* of the Special Salvo tricycle, which he supplied by order of the Queen, and which, now that royalty has pronounced itself in favour of the exercise, is becoming fashionable among ladies. The Keens, Centaur Bicycle Co., Smith and Sons, Harrington, Handcock, Baylis and Thomas, Palmer and Co., Gorton, and others too numerous to mention, also exhibited some very good machines; but the two machines which caused more talk than any others at the show, and without doubt proved one of the great features of interest, were (first) the Steam Tricycle—a wonderful application of motive force to a cycle, and secondly, the most remarkable bicycle ever introduced—the Otto. For some time the latter has created quite a *furore*, and the show rooms in Newgate-street, have been thronged by visitors, and numbers have learned to ride the machine, including more than one young lady.

Bicycles.

THE exhibits of Hickling and Co., of Queen Victoria-street, consisted of ten machines, of which their new variety for the season—the Pilot—promises to make its mark, being light and workmanlike, with cow-horn handles, hollow rear forks, improved spring, &c. The handle bars of most of this group were remarkable for their length and good shape. The firm have made great progress since moving their factory to Maiden-

head. They showed an old London, which had been ridden some 9000 miles. The machine was in its ordinary state, not being "got up" for the occasion, and it looked but little the worse for wear, and is a convincing proof of the good work put into machines by this firm.

Messrs. Starley and Sutton introduced their handle to public notice for the first time, but its appearance was not very taking. The machines themselves are good, solid roadsters, as of yore.

Cleaver and Co., of Sittingbourne, are a firm new—save by name—to Londoners. They showed two specimens—a workmanlike 54in., with hollow felloes and a new adjustable step; its companion was similar in details, both having balls to back and front wheels.

Deane and Co., of the same town, had a speciality in their King of the Road, of which a new non-vibrating rear fork was the leading feature. The weight of the rider is borne upon springs, which connect the fork proper with an arm to which it is hinged, allowing sufficient play to break the jar. A perforated hub is another novelty.

Bayliss and Thomas seemed to rely more upon the good name their house had gained than upon any startling innovation. In this they were successful. Their exhibit included ten machines, six of which had open heads, but all direct spokes. The lock nut, as we so often predicted, is fast becoming obsolete in Coventry. All the ten machines were fit representatives of the Excelsior Works.

J. Carver, of Nottingham, sent but two machines; they were, however, "gems," and possessed all the well-known features, with one addition—a peculiar scroll support to the tail of the spring, in addition to the usual shackle, which seems to still farther reduce that common enemy, vibration. Extra care was also taken to exclude dust from the head by dust caps.

Safety and ease of mounting were the chief attractions of the Facile (Ellis and Co., 164, Fleet-street). The driving wheel was very much smaller than usual, being generally 40in. to 44in., the pedals being close to the ground, supported by a continuation of the fork and link arms. The pedal, a single round rubber block, seemed too small for the toes. With the decrease of the front, the back wheel was enlarged to about 24in. For those who desire safety before speed or appearance, the machine will doubtless answer. Six were shown from 34in. to 44in., in various degrees of finish.

Hyde and Wigfull's exhibits were a 54in. Stanley, the round tube forks of which have not yet grown familiar enough to the eye to make them lose the oddity of appearance; and the Chester, which retained its former details. The gun-metal hubs of this machine, although far too small, were yet elegant compared with its former superior companion. Roller bearings in front and cones behind were here used. The Chester has been renovated, or rather the Marmion has been introduced, and there is little doubt of its eclipsing both the original Chester and present Stanley, as it has generally a more modern look.

Richardson, Ellson, and Co., of Coventry, exhibited a machine with the Birmingham hub and projecting collar, which not only annulled all advantages derived from recessing, but actually increased the tread beyond all reason. The hubs of this machine were extensively grooved for ornament (?), and the same line of decoration was carried out on the top nut and bearing case.

Porter, of Clapham, had a couple of neat looking machines, which were called after their place of manufacture. They had a non-vibrating contrivance for the back wheel, consisting of a piece of rubber held in a slot above the wheel pin, which supported the weight, and gave with any concussion. The saddles were also supported by Wooley's patent springs. The machines were constructed on popular ideas, and deserve notice.

The North of England Bicycle Company, late of Sheffield, but now of Newcastle-on Tyne, had but a single specimen. It was, however, an exceedingly neat and practically built machine, with hollow rear forks, balls to both wheels, fine large hubs, and well finished in detail.

The Hallamshire, formerly made by Hill, is now manufactured by Ellis and Buchanan. In its new form the enormous recessed hubs and a plated saddle without covering were the most remarkable items.

Ford, of Wolverhampton, showed a fine looking 56in. plated Best-of-All, it had balls to both wheels, white bone handles, alarum, &c., and was certainly a bargain at £9. Another, the Forester, by the same maker, was finished half bright, at £6 10s.; and a third, with the very un-original title of Excelsior, at £4 10s., or £5 above 50in.—a marvel in the way of low price.

The Bicycle and Tricycle Supply Association showed their new machine, the Matchless, which is one of the most perfect roadsters ever put before the public. All parts at which concussion is usually felt are padded with

rubber, and the whole, while elegant and handsome, is excelled by none for comfort and freedom from jars. Next to this was the Durable, a thoroughly good machine, of the ordinary type, at £12 10s. Four of these machines attracted great notice, most observers being rather non-plussed in finding them not to be "Clubs"—which they were proclaimed to be on a cursory inspection.

Following these came an exhibit of a French maker, a novelty, with great wooden connecting rods running up from the pedals to long levers coming out from the head, and worked by the hands; there was also an ordinary steering bar. Special features prevailed throughout the entire machine, brass spokes, coil spring, &c., *ad lib.*

Settle and Co., of Coventry, had a couple of capital cycles, in the Grand. Special features: extra long centres and adjustable step. They are fine looking machines and well made.

The Devon Safety exhibited had something of the 'Xtra about it, the pedals being always behind the axle and supported by a long arm. The forks were almost upright, but the saddle was a long way back, so that security was preserved. It had undergone several changes since we last saw it a year ago. Another larger and better finished machine stood next to it, a 54in. plated, with Bown's bearings and the steering bar bent so as to bring the handles near the rider. Two other Devon Safetys were shown — a 56in. painted, with really comfortable foot-rests—the first we have seen since those of the 1874-5 period. This machine, by a novel arrangement of cross bars, steered by back as well as front wheel, thus enabling it to describe a very circumscribed circle. The other was a fine 58in. of the same type, suspended so that the wheel might be spun. It had the saddle over 12in. behind centres, but the handles were bent back as before.

Messrs. Sargent and Co., showed four machines, the first a 54½in., all painted, having a saddle very much like the now extinct Cornish saddle of six years ago, but withal comfortable and easy, the spring being supported by three rubber buffers, and the metallic vibration consequently greatly lessened. The second, a 54in. plated, was a fine-looking machine, with a new reversed cone bearing to act on the balls in the rear wheel. A 52in. plated, at £16 5s., and a 50in., No. 2, at £10 10s., completed the quartet of this promising London firm.

The Rücker, made by D. M. Rücker and Co., showed care in manu-

facture, and while retaining a graceful outline was strong enough to carry a giant. It had fine broad forks, extra large backbone, strong, long centres, shackle spring, handsome hubs, and lastly, a new adjustable step. The latter was about the neatest and most effective of the many "adjustables" we have seen. Two machines were shown, a 56in. all bright, and a 54in. unpolished, left as it came from the fitter's hands, in order that the public might judge for themselves as to its perfect state. With these machines a greatly improved bag was introduced.

The Howe had gun-metal hubs, nutted spokes, strong bearings, but no special features, save a single commendable one—a dust cap. Price £10 15s., for a painted 52in.; cones behind.

W. Patrick and Co., Wolverhampton, submitted a new idea for altering the elasticity of the spring. The tail end was joined by a shackle to a brass clamp, which slid on the backbone. By turning a small screw, the tail of the spring was pushed out or drawn up, consequently made more or less rigid. An adjustable step was also fitted. This (a 52in.) at £8 11s., and a fine 52in., plated, balls both wheels, at £12 17s., were the only two shown by this firm.

M. Twigg had as representatives a couple of handsome Celerrimas. The 54in. all plated was a really attractive mount. Ball bearings were fitted to the wheels and pedals, the latter in a neater form than usual. Its companion, a 51in., painted, also looked serviceable.

J. Pansey, Clapham, had a trio of steeds. The smallest had two tin boxes, like lawyers' deed cases, hung from the forks; the object was no doubt to carry provender for a run, but they certainly did not add to the appearance. The Special University, 54in., plated, £17, was a much finer machine; it was fitted with the special hub, to facilitate the removal of broken spokes. Third and last came an ordinary 52in. University.

Gorton, of Wolverhampton, came out strong with five Perfections, the low price and finish of which ought to create a ready sale. Gorton, indeed, seems determined to get a good share of the Wolverhampton trade during the coming season.

Wood's rear fork springs were prominent by reason of the violent red with which they were painted. Being attached to an old machine, and being the first trial pair made, justice was not done to their merits.

Handcock, of Bishopsgate-street, had, like many others, gone in for

cowhorn handles. His 52in. Atlas was a good-looking machine, but the brake was non-acting. His other two machines were a 54in., plated, with 100 spokes, and a 56in. with seventy-six spokes. These were excellent machines, well made, and the pedals were brought closer together, giving that much desired result, a narrow tread; semi-hollow rear forks were also fitted.

Harrington's Arabs were attractive features, but the chief interest centred in the new enamel introduced by this firm—it seemed a genuine success—forming a smooth, glossy, but very hard, coating, vastly superior to paint, and more durable than plating. The effect was marred by those on view being treated to a funereal-like coat of black. As to the machines themselves, their merit is well enough known without eulogium here.

The South London Machinists' Company's Nancy Lee machines were good, and cheap at the price named on the labels.

Humber, Marriott and Co., of Nottingham, exhibited ten of their grand machines, most being built for noted racing men. These machines formed the most effective exhibit shown by any one firm. They were indeed grand specimens of the perfection to which bicycles have been brought. The whole work and finish of these machines were simply exquisite, and if the old record times are not bowled over during the coming season the fault will be with the riders, and not with the makers. Humber's special feature for 1881 is a new double hollow felloe, of extraordinary lightness and strength.

Wm. Keen was but badly represented with an old-looking No. 1 Norwood, a No. 1 54in. all bright, and a No. 1 53in. painted.

Taylor and Lee, of Wandsworth, exhibited the Ixion, a neat but strong looking machine, with hollow backbone and rear forks all in one piece, polished, with balls to both wheels, £16 10s.

The Coventry Machinists' Company had a fine selection of eight machines, including three new types, among which we were delighted to see one with direct action spokes, a 56in. Club racer; this is, indeed, a sign of progress for the "old house at Coventry." The new Gentleman had very small nipples to the spokes and iron hubs. The ordinary Club had larger nipples, the splendid double balls for which the Club is noted, and the "spring of springs;" "Ordinary" Club again, this time a 54in. painted; a handsome 56in. of the same pattern, with single balls;

a 54in. Racer, direct spokes; and a 54in. Special Club, a roadster of the most thorough type, fitted with double balls.

Coupe, Addy, and Hall, of Sheffield, exhibited the Hall, sort of combination of the Pony and Facile, with original notions. Speed and safety are both studied, the pedals being thrown low down, so that a 6ft. man could reach the 36in. machine shown. Multiplying power was added, so that in speed the 36in. became a 52in.

S. Davis and Co., better known in the sewing machine trade, had a large number of their Period machines in a row all to themselves. These represented a 52in. Period roadster, built after the Humber model, with a thrice-curled spring support for the tail of the spring. The others comprised a 56in. Racer, with the *quoted* weight of 28½lb.! all plated; a 54in. Period, also plated, and with the same spring; three other somewhat similar machines, the last being a hundred-spoked 56in. racer (29lb.!), neat and taking looking.

Palmer and Co. exhibited two splendid racers, one of which was a noble 59in. racer, built for Cortis. A roadster was also shown, a 54in., with double ball bearings, £10 10s., one of the cheapest machines in the show. The same house had also an entirely new machine, called the Anti-vibration. An arrangement of springs on the rear fork allowed it to "give" when striking an obstacle, without affecting the backbone. The spring was double, and looked easy, while the handles were attached to a sort of independent support before the head. This was hinged below, being acted on by two springs, and took the jolting jar from the arms.

C. S. Snow, of Kingsland, showed two machines—a No. 1 Birkbeck, 53in., front roller brake, after the Timberlake pattern, price £12; and a No. 2, with ball bearings, hollow forks, &c., at £16 10s.; both had lock-nutted spokes in gun-metal hubs.

Rawson, the well-known long distance rider, had two machines, which were well worthy of inspection, both being of extra large size and good finish. Narrow tread was a marked feature in these, and from centre to centre of pedals they were barely 12in. to 12¼in. A few old firms might take pattern from this Derby maker. The second machine was a 55in. racer.

Hillman, Herbert, and Cooper exhibited eight of their make. First a splendid 52in. D.H.F., for Mr. A. H. Llewellyn-Winter, for his projected tour in the United States this summer, when he is to lead a party of

English riders. It was specially built to be as perfect as possible, with all the firm's new patents lavished upon it, including the new double bolt spring, ball pedals, adjustable step, &c., nickel plated, the list price ran up to £24 8s. A specimen of the No. 0, balls in front, cones behind, planed, was worth the £12 10s.; another of the same class, enamelled, with parallel bearings, was only £10; a third, with balls in front, £11 15s. for a 52in.; a fourth, like the second, but a 48in., was valued at £10, all having lock-nutted spokes. A 56in. D.H.F., similar to that built for Mr. Winter, but minus the ball pedals, cost £22 18s., and a 55in. with that feature, but an ordinary spring, was £23 10s. This formed a beautiful set, of which the makers might well be proud. The last two wheeler was a 51in. D.H.F., with all the special points, save the spring. The firm also exhibited a bicycle for a child, neat and well made, a handsome case of balls, pedals, spring, hubs, bearings, heads, &c.

In the annexe, where the "overflow" bicycles were stowed, Withers and Co., of Cheapside, as agents, had several machines, including a handsome Imperial, by Smith, of Nottingham, a fine 54in., all bright. Two Royal Mails were another variety to make their *début* in London; both had the patent adjustable handle. The 54in. painted, £15 10s., with Rudge's balls back and front, made a fine roadster. Its companion—a 56in. racer, all bright—had that popular bearing to all three points; the gun-metal hubs were of a particularly good shape, price £18 17s. 6d. Two Woodcocks, by the Tangent Co., Coventry, were good-looking machines, with Rudge's bearings, direct spokes, &c. A 52in. roadster, and 58in. racer, both found purchasers.

John Keen exhibited a wonderful specimen of lightness—a 51½in. racer, well under 25lb. weight, built for a racing member of the Surbiton B.C. It retained its old form, but the spring was absent, the saddle-head being affixed to the neck in lieu of it.

G. W. Ash, of Southsea, had a good show of four Leader bicycles; all were good reliable machines. The Southsea Leader, the low-priced variety, at £8 10s.; Leader, balls both wheels, very cheap, at £11 11s.; a 52in., burnished, at £15 15s.; and a 51in. Leader, also polished, £15 15s., with novel shaped handles. These machines introduced two or three very good points, notably a double bow action spring, which allowed "play" in every direction.

Lane and Son, of Wolverhampton, showed some low priced machines. A 52in., £6 10s.; a 52in., balls in front, and burnished, £8 10s.; with balls both wheels, and a new bayonet hollow fork, £10 10s.

The Queen Company, of Coventry, exhibited two fine looking, well finished machines, with all modern improvements.

The Birmingham Small Arms Company exhibited several machines in addition to the Otto. The Alpha, No. 1, with new and elastic spring, 26in. handle bar, double ball bearings, &c., was worth the £13 13s. asked. Their other type, the Special Alpha, had hollow felloes, elegant hubs, and other good features, price, plated all over, save rims, £18 18s.

J. Dovey and Co., of Wolverhampton, exhibited four of their Expresses, their low price leading many to ask, "How can it be done for the money?" Germany has of late been this firm's chief market, large numbers having been despatched to the "Fatherland."

Garrood, of Fakenham, had a very novel idea in the 'Xtra auxiliary handle bar, which fastens to the forks beneath the head, about 9in. below the top of the ordinary steering bar. The object is for the rider to lean over and grasp the 'Xtra when getting up hill. The same maker had a new idea in a safety pedal, to prevent the foot slipping. It was a pity this maker did not exhibit one of his capital Norfolk tricycles, as it would have secred a success.

J. Strange exhibited three machines named the Surrey. They consisted of a 52in. all plated—balls both wheels, a 54in. all bright, and a 53in. plated. They were nice-looking machines; but although the maker was careful to let the public know he was not A. E. Strange, he did not say what Strange he was or whence he came.

Aves, of 46, Barbican, showed a splendid 54in. semi-racer. It seemed a considerable advance on last year's pattern, good as that was. The one under notice was all plated save rims; for bearings, double balls were put to the driving wheel, and the Pickwick cones behind; the saddle was supported by Wooley's patent spring. Altogether it formed a very fine machine.

Sparrow's Amazon formed a climax to the whole show. It looked anything but a lady's cycle. It went small wheel first, and the handle was placed beneath the seat. We do not think many of the fair sex will be found daring enough to mount it, let alone attempt to ride it. Indeed, it would require a very plucky male rider to master it. The action and

position were, to our thinking, out of all reason, and if kept as shown it can never become a success.

Tricycles.

The tempting display of tricycles exhibited was enough to convert the most inveterate non-rider into an enthusiastic cyclist. In the annexe the first on row No. 1 was an Imperial by Smith, of Nottingham, built on quite new principles to any he has hitherto adopted, all three wheels being of different sizes—*à la* Excelsior.

Among the exhibits of the Queen Bicycle Company were two of the Duchess type; the first having many special advantages, including extra hill power, or the pedals may be left free to revolve on descending slopes. It seemed, altogether, a machine to be highly commended. Another, but considerably different, being driven by bands like the Otto, also promises to attract great attention this year; it was a very striking looking machine, with only two tracks, and two 54in. driving wheels.

The Delta, with double strap brake (by the Small Arms Company), was another which is sure to make its mark; both wheels drive, but either is free enough to facilitate turning in either direction. The price ran from £14 14s. to £16 16s., according to size. The saddle was made to slide backwards or forwards very freely, or to take off instantly. The Beta possessed many special features, the action being something like the Omnicycle, but the power was communicated to the driving wheel by means of a monster cog wheel. The third machine, the Alpha, also claimed double driving, but it did not seem a success, as the pedals often revolved without any effect on the wheels.

Hillman and Herbert exhibited a small Flying Dutchman, and one with the strange title of New Patent, having double driving and small sized wheels.

Starley and Sutton's exhibit was an extensive one, consisting of five machines—a large Meteor, two Princesses or ladies' machines, a fine Meteor with double brake, and a Sociable tricycle for two riders; all the machines showed efficient workmanship.

The steam tricycle exhibited was, of course, the great feature of the show; indeed so great was the crowd round that portion of the floor that neighbouring exhibits were almost overwhelmed by the throng which

pressed round to hear the explanations given by Mr. Bateman, the maker. There is yet a great future for this class of vehicle, and it only remains for further development to bring it to a successful issue. Unless informed of the fact, no one could recognise in it a steam carriage. The engine was placed above the boiler, all being covered over with a dome, and the maker said that when the machine was at work there was neither smoke, noise, or smell, and that there was no fear of explosions. The fuel being liquid, a large supply could be carried, while steam could be raised to 50lb. pressure in five minutes; the safety valve was fixed for 200lb., and the boiler tested up to 700lb. The wheels were also a feature, consisting of steel tubes, and immensely strong. Motive power was communicated by a small spur wheel, driven at a high rate of speed, and connected with a much larger wheel by means of an endless chain; this in turn moved the driving wheel. It is the intention of the maker (Mr. Bateman), under whose skill as an engineer we look for many improvements, to add pedals, so that it will not be solely a steam carriage, but one in which steam is merely an auxiliary power. We hope that success may wait on such a daring innovation on our ideas of cyclistic progress.

The South London Machinists' Company exhibited a 46in. Flying Scud, with two seats, rotary action, and driven from both sides. The price was £23 15s., but the actual weight must have been fully 50 per cent. over the estimated 80lb. The next machine was a single Flying Scud, with ball bearings and an Excelsior rear wheel. Two others were also on the line—a 40in. plain bearings, at £15, and an Incomparable at £17 10s., driven by chain, and another Flying Scud, all plated, single driving, and steered from behind. On it two lamps were placed on a level with the rider's chest. All were much above the quoted weight.

The Devon has by no means stood still while others improved, but has travelled towards perfection faster than most of its rivals: a splendid double machine, or indeed, it might be called a family vehicle, as, in addition to the usual seats side by side, for pater and mater, a small one was affixed behind, so that one of the youngsters might also be taken out for an airing. An extra safety brake was added, so that any hill could be descended safely. A single Devon contained all the improvements applied to the double one, including the rear seat. The third carried a

fine oblong portmanteau, wherein any outfit required could be comfortably packed.

Devey and Co. exhibited an Express on the Meteor principle, which was well worth the £12 asked.

Warman, Laxon, and Co., exhibited a No. 2 Triumph with one of the new saddle seats; and a beautiful little three-wheeler called the Midget, for a five-year-old rider, at £5 5s. Beside it, and giant-like in comparison, stood one of their ordinary Triumph tricycles—a strong-looking machine.

A curious looking manu-pede-motive machine was shown by F. H. Ayres, called the Hercules. It was driven by both arms and legs, and the action seemed very cramped, but the one shown was only suited to a rider of dwarf-like proportions.

Simpson and Son showed their new Defiance tricycle, which had much to recommend it. Chief among many features was that of independent pedals, with rotary action; it was compact, neat, and turned in a wonderfully small space.

Carooche tricycles were among the new three-wheelers of the season. The Child's, at £4 4s., was a neat little thing. The ordinary Carooche—had equal sized wheels, one driver, which was worked by a pinion wheel placed behind the ones on axle and wheel. A wooden saddle with back rest was fitted; price £14 14s. These machines can easily have a wheel removed so as to pass through a doorway.

Markham had only a single machine, a rotary-action-chain-driven Champion, with two equal sized wheels in front and the steerer behind, price only £8 16s.

Humber, Marriott, and Cooper showed a splended 52in. Marriott, all plated. The steering wheel was behind, and it was driven like a bicycle from pedals below the axle and near the ground. It is worthy of record that on this machine G. L. Hillier took second place in the championship. He rode over the (road) course, 50 miles, in 4h. 15min.

Grout, of portable bicycle fame, had a new tricycle, the Arrow, which had a double set of gear wheels, whereby steep hills could be made easy by altering the cog wheels, which alteration could be readily effected from the saddle.

Starley Brothers had on view a facsimile of the machine supplied to Her Majesty—a beautiful Special Salvo—henceforth to be known as the

Royal Salvo. Several improvements had been introduced which made it neater in outline than formerly. Four of these splendid machines were greatly admired, the independent action of the wheels once more proving a puzzle to the non-mechanical spectator. For ladies, special protectors are added to prevent their dress getting mixed up with the gear.

Bayliss and Thomas came out very strongly in the tricycle department, having an entire row of six machines to themselves; the first being a 52in. all plated. A ladies' 44in., geared so as to equal a 50in., looked compact and neat. Invalids were not forgotten, as the Hand Lever Excelsior offered exercise to those who could not use their legs. A Lamplugh and Brown seat, the acme of ease, crowned a neatly painted Excelsior; and, finally, a 52in. all plated, formed a most attractive show.

"Rob Roy" (the Zephyr Bicycle and Tricycle Company) had the one driving wheel worked in a peculiar way. On the left side a large brass plate, with a toothed flange inside, worked on a cog wheel attached to the axle. The rider had a clear space in front, the steering wheel being behind. Another of this class had chain action.

Hickling and Co. had two Telescopic tricycles, their peculiar collapsing properties being especially useful where stowage room is limited. In workmanship they were thoroughly sound and good.

The Coventry Machinists' Company were as usual strongly represented. Their Special Club was an exceedingly fine machine. The Cheylesmore Club—another new brand—had a mechanical arrangement to gain driving power for both wheels, and a powerful double brake. A Ladies' Special Club made a gem of a cycle, with 40in. wheels and a band to protect the dress from catching in the cogs and rims. The Cheylesmore possessed the advantage of back pedalling, or the pedals could be freed entirely; otherwise it was like the Cheylesmore Club.

The Coventry Phœnix was something after the Salvo pattern, with two driving wheels and a light frame. The wheels had independent and joint action, the same safety rod coming out behind as in the Salvo.

The Centaur Bicycle Co. exhibited a well finished double machine, but not confined to two riders, as one half could be readily detached and a spare wheel added, so as to form a single machine. The Centaur No 1 was of the popular shape, two equal sized wheels, the left only driving; the small wheel behind was guided by a new plan from the handle on the right side. Instead of the usual rack and pinion, a deep corkscrew

groove was cut on the bar supporting the handle, and a socket fitting round this communicated the power behind. It was a great improvement, being much steadier than the old way. A special Centaur, with balls to all wheels, the small wheel in front, and a capital double spring support for the saddle, which gave a firm but elastic seat, was also shown. In point of beauty the No. 1 was far in front.

In the Arab Tricycle, exhibited by Harrington, many entirely novel effects were produced. In steering either wheel was released and the saddle slid automatically to the inside, so that the weight was in the centre of the circle, and therefore not liable to tip over. Both wheels drove; there was no dead point—in fact, a whole host of special features were embraced in its improvements; but the machine on view was only hurriedly constructed for the show, and hardly gave a fair opinion of this really excellent machine.

A couple of monstrosities, termed cycles, were shown, but to what class they actually belonged it would be hard to define. One had four wheels, the chief of which was the ordinary driver, in front. There was a pilot one connected by a front-bone, another small wheel was to be found behind, and supported by a lot of cumbersome framework, one on either side. We believe the (paper) theory of the invention is, that when the daring rider who mounts it gets under way and fairly balanced he can ride on the centre wheel only, leaving the three others suspended in mid air. Should it be accomplished, it will be one of the best balancing feats on record. Another was shown, but it did not possess such an octopus-like look, as it had only three wheels, those at the side being absent.

Last of all the tricycles, but not least, came Gorton's Ordinary Extra Special No. 1 Tricycle, all three wheels of different sizes; the left wheel, as ordinarily, was the driver; it was small, compact, and neat. This completed our tour of inspection among nearly 100 tricycles.

Accessories.

W. J. Spurrier, of 10, Newhall-street, Birmingham, exhibited his "Takeabout" knapsack, which commanded general attention. This handy method of carrying luggage has secured great and widespread popularity. Its chief advantage is that the size can be suited to the

parcel to be carried, the package being wrapped in a waterproof sheet which is strapped to a light wicker support, and rests comfortably on the shoulders. We used one of these capital contrivances lately in a walking tour, and found it most convenient, and not at all tiring, or, like the majority of knapsacks, heating. We have also heard numbers of riders speak very highly of it. It is made in three prices, 5s. 6d., 7s. 6d., and 10s. 6d. A good handbag on the same principle was also shown price from 3s. 6d.; to the latter an attachment can be added, allowing it to be secured to a backbone.

Stephen Withers and Co. showed a large selection of special articles required by wheelmen. Among these the racing shoes were commendable; they were like a (racing) walking shoe with an extra clump added, but two spaces kept so that the edges of the rattrap fit in exactly. The new pocket wrench exhibited was handy in shape and effective in work. Uniforms, stockings, caps, some capital badges, bags, lamps, bugles, and endless other odds and ends were also shown.

E. Tyler, of 42, Exmouth-street, E.C., had a splendid array of medals, badges, and cups; all showed very fine workmanship. Two very pretty medals, gold and silver respectively, were particularly neat in finish; they had been made for presentation to the Sydney (Australia) Bicycle Club by the Surrey Bicycle Club. The badges of the new Tricycle Association were also very effective.

W. Spurrier and Co., of 35, Coleman-street, London, had some of the prettiest and most artistically elegant prize cups we have yet seen. The new art decoration, so fashionable in jewellery, was here applied to dull silver goblets, cups, mugs, &c., and the effect was most striking.

Mappin and Webb showed a considerable number of trophies for the path, road, and river, but they partook more of the typical "pots" and medals.

A case of well executed badges by Boyden, 34, Woodland-road, N., completed the contents of the platform.

Maynard, Harris, and Co., exhibited some waterproof collars of fashionable shapes; those hitherto sold have been sadly out of date. All sorts of the usual requirements were here to be found, including the dressing case we commented favourably on last year.

Goy, of Leadenhall-street, among his many exhibits, showed a new stand (the Eclipse) for bicycles, on which machines, when fixed, can be "spun."

It was applicable to all sizes, and was about the most practicable we have seen. The price, 12s. 6d., was moderate. It is the only one on which a machine can be really shown off. A genuine curiosity was the baby bicycle, a 22in., which has been ridden over a hundred miles by a youngster aged four years and four months (i.e., born in October, 1876), who has been a rider for over a year. It was made by Beach, of Plymouth. Among several plate polishers, the Canadian may be mentioned. Stanton's Bicycle Indicator can now be used with a hub lamp.

Lamplugh and Brown have well nigh defied all opposition by the unrivalled excellence of their saddles. The new bicycle seat is the greatest triumph they have yet achieved, while the suspension bicycle saddle is in almost universal use. A new cyclist's wallet was introduced for the first time. It was made of handsome chocolate coloured leather in three sizes, the largest being 7in. by 5in by 5½in.; it had solid ends, extra strong, so that the contents could not be crushed. The Cambridge Bag (A. P. Trotter's design) is now made by Messrs. Lamplugh and Brown.

Dearlove's exhibits attracted general attention, as the merits of his lamp, the King of the Road, is now well known and appreciated by riders.

Bown, who has gained a widespread fame for the Æolus, had a most interesting case, showing all the parts of these noted bearings. A new tricycle bearing, applicable to carriages, was exhibited for the first time. Another large case contained fittings for all parts of machines—spanners, pedals, bells, gongs, the holdfast (revolver) wrench, and other things *ad lib*. A small wheel, fixed so that it could show the freedom of running, received a large amount of attention.

Clare, of Fenchurch-street, had an extensive assortment of riders' requirements of the usual class, a number of their Guiding Star lamps, and several well-made club uniforms on lay figures.

Little and Co., of the Grand Hotel Buildings, Trafalgar Square, in addition to their excellent bicycles, showed a case of cups and elegant art jewellery, some of the designs being very chaste.

Rea, Neale, and Bourne, of Birmingham, exhibited a very good lamp, called the Eclipse, seemingly a combination of the King of the Road and Cooper's Inextinguishable, the top being suspended by springs. They were in several varieties, from 4s. to 15s. An ornamental "head" at 11s. 6d. was one of the chief of the group.

R. E. Phillips, of 37, Great George-street, Westminster, showed specimens of his excellent road route cards, which, in a handy form, gave various routes in different parts of the kingdom; a small but practical adjunct to secure loose rubbers, by means of twisted wire that automatically holds the tyre in its place; and a new metal, "Argunoid," which promises to create something of a revolution in the construction of bicycles. This metal possesses peculiar features, being like nickel in appearance, and non-rusting. It promises to have a wide field open to it, and will be a decided improvement.

Salsbury, in addition to their already famous lamps, &c., exhibited a new pattern called the "Bull's-Eye." As the name implies, the light is magnified by means of a large bull's-eye; the projecting glass is, however, protected by a raised reflecting cone. The new "Champion" for bicycles gives the most powerful light we have yet seen thrown out by a practical cycle lamp of any description; it is also of the bull's-eye pattern, and therefore concentrates rather than diffuses the light.

J. S. Hancock, 266, Goswell-road, E.C., who now supplies the greater number of firms with his patent moulded rubbers, had an extensive stall of rubber goods, chiefly tyres, and the new vulcanised handles. His excellent fluted non-slipping tyres are gradually growing into favour as riders become aware of their merits.

H. Keat and Sons had, as usual, a good show of club bugles, of sizes and prices to suit any pocket.

Smith's (West Bromwich) Home Trainer is a heavy wheel, turned by cranks and pedals; over this a bicycle saddle and handle bar are placed. By means of a strap the wheel can be tightened to any extent. The idea is to afford means to get practice at home—despite the weather out of doors.

Challis, the well known maker of bicycle bells, had a very good selection effectively displayed on a board, whereon a number of bells were so arranged as to form the words "Challis' Stop Bells," "Challis' Cycle Bells."

INDEX.

T. LANE AND SON,

BRUNSWICK BICYCLE WORKS, BRUNSWICK STREET, WOLVERHAMPTON.

THE EXTRA SPECIAL CHAMPION ROADSTER.

This machine is fitted with patent Æolus ball bearings to both wheels, best steel U rims of new section, large flange, gun-metal hubs, improved bell pattern, firmly fitted on steel spindle; seventy-two plated spokes to driving wheel, twenty to twenty-four in hind wheel, best red rubbers firmly cemented in, the improved Stanley head, with solid horn handles on steel handle bar, 22in. to 24in; weldless steel hollow forks, best steel backbone, improved spring adjustable step, best rubber or rat-trap treadles, front wheel spoon or roller brake, plated suspension saddle, alarm bell, oil can, and wrench. This machine is splendidly finished, either burnished all bright or part burnished and painted in two or three colours, to suit taste of purchaser, at the following prices:

	£	s.	d.
46, 48, & 50 inch	11	10	0
52 & 54 „	11	15	0
56 to 60 „	12	0	0
Nickel Silver plated all over	1	15	0 extra, nett.

Part plated and painted, £1 5s.

THE NO. 1 CHAMPION.

We would specially request all intending purchasers to carefully consider all the wearing parts and material in this machine. THIS MACHINE IS WITHOUT DOUBT THE CHEAPEST MANUFACTURED IN ENGLAND. It is built with similar Stanley head to our Special, with front wheel brake, solid horn handles, weldless steel hollow forks of best make, best steel backbone, easy riding spring, and good saddle and bag. The Humber pattern double adjustable row of ball bearings to driving wheel, and dust-proof adjustable cones to hind wheel; gun-metal hubs, with large bell flange, firmly keyed and soldered on steel spindle; steel U rims, with best red rubber tyres firmly cemented in; sixty plated spokes to driving wheel, and twenty to hind wheel, or more if specially required; rubber or rat-trap treadles, steel fluted cranks, with patent alarm bell, oil can, and wrench. The cones and bushes to hind wheel, centres, and set pin in head, are all carefully hardened. This machine is sent out either all bright, highly burnished, or part burnished and painted to suit taste of purchaser. Weight of a 52in., 40lb. Prices:

	£	s.	d.
44, 46, & 48 inch	8	0	0
50, 52, & 54 „	9	0	0
56 58, & 60 „	9	10	0

Patent Æolus ball bearings may be fitted to hind wheel of this machine at an extra cost of 15s. nett. If nickel plated all over, £1 15s. extra, nett. Half plated and painted, £1 extra, nett.

Special "Express."

This Machine is sent out complete, with saddle and valise, spanner, oil-can, and patent alarum bell. NO EXTRAS. Weight of a 50in., 40lb.

PRICES:

44 inch	£6 10 0
46 „	6 15 0
48 „	7 0 0
50 „	7 5 0
52 „	7 10 0
54 „	7 15 0
56 „	8 0 0
58 „	8 5 0

Ball Bearings to front wheel only, 20s. extra. Ball Bearings to both wheels, 30s. extra. Hollow Forks, 10s. extra.

"EXPRESS" BICYCLE, No. 2,

THE WORKING MAN'S FRIEND.

This Machine is made with U or V rims, Direct or Nipple Spokes, Plain Bearings, Stanley Head, Step and Trouser Guard. Painted and picked out in two colours, or bright. Made strong to suit the rough roads. Cheapest Roadster in the market.

NET PRICE:

All sizes... ... ... £4 10 0

With Front Wheel Brake, 3s. extra.

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DEAR SIR,—My hair went white through trouble and sickness, but one bottle of your Hyperion Hair Restorer brought it back to a splendid brown, as nice as it was in my young days. I am now forty years old, and all my friends wonder to see me restored from white to brown. You can make what use you like of this. Yours truly,
(Mrs.) MARIA WORTHINGTON.

122, High-street, Stourbridge, May 16, 1878.

SIR,—I find your Hyperion Hair Restorer is a first-class and really genuine article, and is well worth the money. After using it thrice, my hair began to turn the natural colour, whereas before it was quite grey; it also keeps the hair from falling off, and I shall always recommend it to every one I know. You are at liberty to publish this if you choose. Yours truly, (Mrs.) M. DAVIS.

Thirsk, Yorks, January 21, 1878.

DEAR SIR,—I use your Hyperion Hair Restorer, and find it everything which has been said in its favour. I am, dear Sir, yours truly, T. COATES.

Porchester, near Fareham, Hants, Oct. 16, 1875.

SIR,—Please send me another bottle of your Hyperion Hair Restorer; it is better than any other restorer I have tried. Yours faithfully,
(Mrs.) C. CHAMPIN.

High-street, Corsham, Wilts,
December 2, 1874.

DEAR SIR,—I enclose stamps for another bottle of your Hyperion Hair Restorer; its clean qualities are sufficient to recommend it anywhere.
Yours respectfully, E. MAYNARD.

St. Heliers, Jersey,
August 1, 1873.

SIR,—Please send me another bottle of your Hyperion Hair Restorer; I bear willing testimony to its being very pleasant to use, both as to cleanliness and absence of disagreeable smell.
Yours truly, F. DE LUSIGNAN.

2, Fir-street, Sydenham,
July 15, 1873.

DEAR SIR,—I am most happy to tell you that I have reason to commend your excellent Hyperion Hair Restorer, as it has already turned the grey hair of a person fifty-seven years old to its natural colour. Yours respectfully,
T. WHATMORE.

83, Dewsbury-road, Leeds,
May 23, 1873.

DEAR SIR,—I want half-a-dozen more bottles of your Hyperion Hair Restorer, some for friends and the remainder for myself; it is the best restorer of grey hair to its natural colour.
Yours truly, JAMES DAWSON.

***** Be careful to ask for Latreille's Hyperion Hair Restorer, as the manufacturer is also proprietor of Latreille's Excelsior Lotion, which is a separate preparation, of universal repute for 20 years past, as a Producer of Hair.**

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They contain ingredients which no other Biscuit or Dog Food possess, they are pure, wholesome, easily digestible, and highly nutritious.

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PREPARED POULTRY FOOD.

This Food is prepared chiefly from the Buffalo Meat Biscuits, together with a small quantity of oyster shells for shell making, mixed with various other ingredients, all of which are of the highest class, and will be found well worthy the consideration of all poultry keepers.

Mixed with hot water and given warm in the morning will be found of great advantage.

20s. per Cwt., Carriage Paid.

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THE FINEST EGG PRODUCER.

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Or PEARL DENTIFRICE is of inestimable value in preserving and beautifying the teeth, strengthening the gums, and giving a pleasant fragrance to the breath; it eradicates tartar from the teeth, prevents and arrests decay, and polishes and preserves the enamel, to which it imparts a pearl-like whiteness. Its unprecedented success for more than half a century shows the universal favour in which it is held, while the fact of its being entirely free from any acid or mineral ingredients constitutes it the safest and purest tooth powder ever used. To prevent fraud the genuine Odonto has a 3d. Government stamp on the box. Ask for Rowland's Odonto.

ROWLAND'S MACASSAR OIL

Is universally in high repute for its unprecedented success during the last 60 years in promoting the growth, restoring, improving, and beautifying the human hair. It prevents hair from falling off or turning grey, strengthens weak hair, cleanses it from scurf and dandriff, and makes it beautifully soft, pliable, and glossy. For children it is especially recommended, as forming the basis of a beautiful head of hair, while its introduction into the nursery of Royalty is a sufficient proof of its merits. Sold in usual four sizes.

ROWLAND'S KALYDOR,

An Eastern botanical preparation, perfectly free from all mineral or metallic admixture. It is distinguished for its extremely bland, purifying, and soothing effects on the skin; while by its action on the pores and minute secretory vessels, it promotes a healthy tone, allays every tendancy to inflammation, and thus effectually dissipates all redness, tan, pimples, spots, freckles, discolourations, and other cutaneous visitations. The radiant bloom it imparts to the cheek, the softness and delicacy which it induces of the hands and arms, its capability of soothing irritation, and removing cutaneous defects, render it indispensable to every toilet. Gentlemen after shaving will find it renders the skin soft, smooth, and pleasant. Of all Chemists, at 4s. 6d. Avoid cheap spurious imitations. Sold by all dealers in perfumery.

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Sold in a handsome little box, with Brush, Leather, Directions for Use, an Analysis, and numerous Testimonials, price 1s.

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The above are quite a novelty.

7 Waterloo Cup Winners, 21s.

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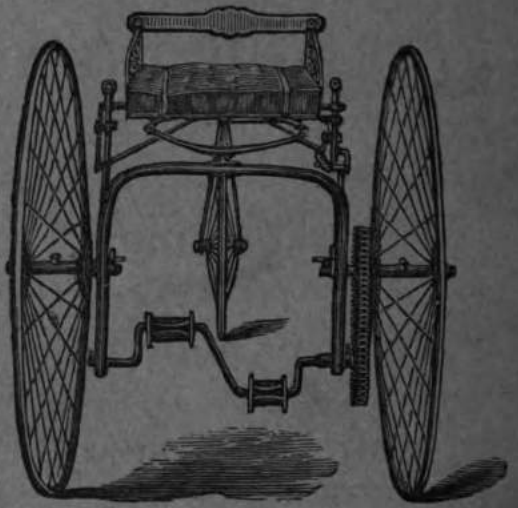

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Is pronounced unrivalled. It is manufactured of the very best materials, with the most complete tools and machinery. It has hollow oval fork, hollowed tapered backbone made of the best patent weldless steel tube, steel rims, double ball bearings, &c.

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Bicycles of the Year, 1884:

BEING

A CHRONICLE OF THE NEW INVENTIONS AND IMPROVEMENTS INTRODUCED EACH SEASON, AND A PERMANENT RECORD OF THE PROGRESS IN THE MANUFACTURE OF BICYCLES;

DESIGNED ALSO TO ASSIST INTENDING PURCHASERS IN THE CHOICE OF A MACHINE.

WRITTEN FROM PERSONAL EXAMINATION

By HARRY HEWITT GRIFFIN

(London Athletic Club, B.U., C.T.C., &c.)

SEVENTH YEAR OF PUBLICATION.

LONDON: L. UPCOTT GILL, 170, STRAND, W.C.

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ILLUSTRATED.

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SEVENTH YEAR OF PUBLICATION.

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PREFACE.

ALTHOUGH twelve months have passed away since the appearance of our last annual volume, there is but little to record in the progress of the bicycle. The cause is not far to seek. The wonderful improvements in the construction of tricycles and the enormously increased demand for them has quite cast bicycles into the shade, both in manufacturing and popularity.

The outcome of this movement shows itself in the great increase in the form and variety of safety dwarf bicycles—a class of machine that has been designed to prevent the bicycle being forsaken by all but the younger and more athletic of its patrons. Many of these are worthy of attention, and there is no doubt of their practical utility. The general form partakes of an ordinary dwarf machine, with lowered pedals, the wheels being driven by endless chains, and geared up considerably, as in a tricycle. One of the most notable examples of this type is the Kangaroo, but we are surprised that the Cheylesmore or Bourdin clutch has not, ere this, been applied to some of these machines. The advantage—that of "free" pedals, *i.e.*, pedals which remain at rest and do not revolve in "coasting" down hill, and which permit the machine to run on as long as the impetus lasts, without moving the feet—would be a decided and

much appreciated improvement. One thing, however, must be insisted on in any machine so fitted—an absolutely reliable and powerful brake. This is of the most imperative importance, as everything depends on the brake, there being no back pedalling.

More attempts have been made to gear up high machines, but success has not yet crowned the efforts of any inventor. It is impossible to have anything more beautifully simple than the action of a bicycle.

In perfection of finish and attention to minor details, the bicycle has about reached the length of its tether. Thanks to the success of Harrington's enamel, which has been almost universally adopted, bright machines are virtually a relic of the past, and thus a vast amount of worry and trouble is saved to riders. The accepted finish of a first-class two-wheeler is to be enamelled all over, except hubs, cranks, spring, and handle bar, which are electro-plated; these details, with ball-bearings to the pedals, in addition to both wheels, ought always to be included in the price, and never form an extra.

Racing machines have scarcely altered—they cannot well get lighter; but speed rates have, at several distances, been advanced another peg, and riders can now travel at a pace on the path that would have been considered utterly impossible a few years ago. Amongst the most remarkable records established by amateurs during the past year are—¼ mile in 40⅘sec., by A. Thompson, Sutton B.C., and ½ mile in 1min. 19⅖sec., by the same rider; 4 miles in 11min. 3⅓⅕sec., by H. W. Gaskell, Ranelagh Harriers; 100 miles, by F. R. Fry, of Bristol, in 5hrs. 50min. 5⅕sec., all at the Crystal Palace; and 37 miles in exactly *two hours*, by H. F. Wilson, Surrey B.C., at the Surbiton Ground. The professionals have also moved with the times, and Howell's 5 miles in 14min. 28sec. is only less remarkable than F. Lees' 20 miles in 58min. 34sec., and 20 miles 905 yards

in the hour. Even these figures are likely to be improved upon in 1884.

Every detail, weight, and measurement to be found in the following pages is the result of the most careful *personal* inspection, no statement of a maker ever being "put down" till verified personally.

In conclusion, we have only to add that we have not the slightest interest in any machine or maker, and that the statements made are in every way unbiassed; and this being the case, we trust that the descriptions of the various machines given in the following pages will prove of real service to riders and embryo cyclists.

HARRY HEWITT GRIFFIN.

17th May, 1884.

Bicycles of the Year,

1884.

No. 1. The 'Xtra Roadster (Singer and Co.).—Very great changes and improvements have been made lately in this machine, which holds the premier place among safety bicycles. In its construction, the key note which is followed is the centre of gravity in relation to the rider's weight, and instead of placing the saddle almost vertically over the centre of the wheel, it is about 8in. or 10in. further back. This position is gained by causing the forks to slant rearwards (see Fig. 1). Under ordinary circumstances excessive rake is open to numerous objections, but in this case it brings many advantages—of these more anon.

Of course, the ordinary details of construction have to be departed from in several ways. In order to secure proper power over the steering, the Stanley head is perpendicular, the shoulders supporting it being bent so as to be easily attached to the hollow fluted forks. Power is applied, not to the crank itself, but to the lower end of a lever, through which there passes a short rod supporting the pedal; the latter does not revolve, but can only turn about three-quarter way, all that is required. The levers, oval steel tubes, bend forward and work on a short stout pedal pin, having two rows, a little apart for steadiness, of ball bearings; from this they run upward, and curving slightly towards the wheel, they join, by ball bearings, a short link, 7in. long, the other end of which works in an adjustable ball and socket joint on a small stud or arm which projects from near the top of the fork. This arrangement throws the pedals some 12in. further back than usual, and drops them about 3½in.; these conditions can be altered at will, and the 'Xtra can be arranged so that a large wheel may be ridden by a small man, or *vice versa*.

The cranks are detachable and adjustable; as the pedals can also be raised or lowered some 3in., a very considerable difference can be made in the throw of the treadles. Owing to the position of the rider, a considerable proportion of his weight is borne by the rear wheel; it is therefore both larger (22in.) and stronger than usual; its forks are hollow, and, bending down, run almost horizontally to the ball bearings.

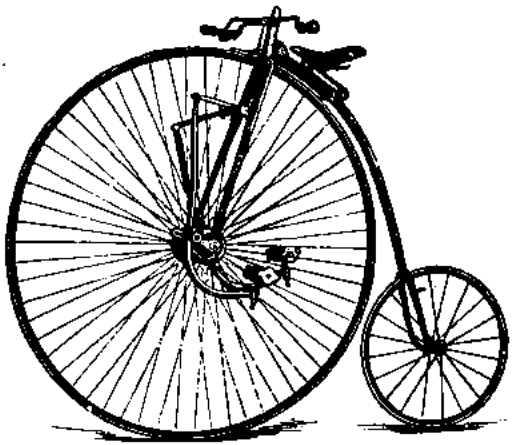


FIG. 1.—THE 'XTRA ROADSTER.

Andrew's extra long centres are used, as in the British Challenge (see Fig. 3). They are protected by a dust cap, which is really effective and of a neat design. The handle bar is 26in. to 28in. long, dropped at the ends, and it has a stout lever to what may, without prejudice or favour, be described as the best and most powerful bicycle brake in use. It is of the spoon variety, but, owing to the nature of the machine, it may be applied with impunity and great force without bringing about a sudden dismount—head first over the handles. There is little to add of the ordinary details; the wheels have Hancock's fluted ⅜in. rubber tyres, rather small steel hubs, generally plated, direct spokes, crescent rims, &c. An Arab spring is fitted over the short oval backbone, and a suspension saddle. "Long-distance" for choice, added. All machines are coated with Harrington's patent enamel in first-class style, and the bright parts are plated, while as to the workmanship, &c., has not the name of Singer a world-wide reputation on this score?

Another very important point is the splendidly narrow tread—only 10½in.—the narrowest of any large machine, and, moreover, directly beneath the rider. This accounts to a great extent for its splendid capabilities for hill climbing, and the ease with which it is driven. It is, of course, understood that the pedal action is somewhat different from the ordinary, being more of a direct down thrust than what is known as the "rotary." The steering requires a good deal of attention, as the feet are of very little assistance in guiding the wheel. As to weight, it is handicapped by the addition of some 10lb. in levers, &c., so that it will be found to be almost the old standard of "pounds for inches," *i.e.*, a 52in. runs to about 52lb., more or less, and costs, enamelled and part plated, with balls to the wheels, levers, and links, £22. The special mud guard (5s. extra) is a most beneficial addition.

No. 2. The 'Xtra Light Roadster.—Built in consonance with the taste of riders who *must* have light machines. It corresponds with the foregoing in general details, save that it is of lighter construction, and the wheels have hollow felloes, smaller rubbers and laced spokes. These alterations raise the price to £24 for any size up to a 52in.

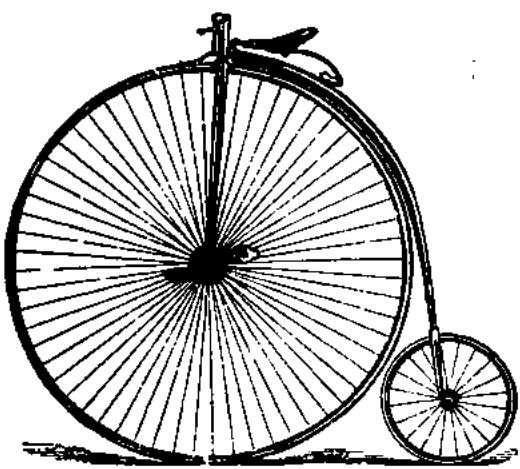


FIG. 2.—THE BRITISH CHALLENGE ROADSTER.

No. 3. The British Challenge Roadster.—This machine, shown at Fig. 2, is what it professes to be—a sound, reliable

roadster—*thorough* in every detail, and of more than usual merit. Commencing with the rolling stock: The wheels have strong steel crescent rims, fluted ⅛in. and ¼in. tyres, about sixty direct action butt-ended spokes screwing direct into the recessed gun-

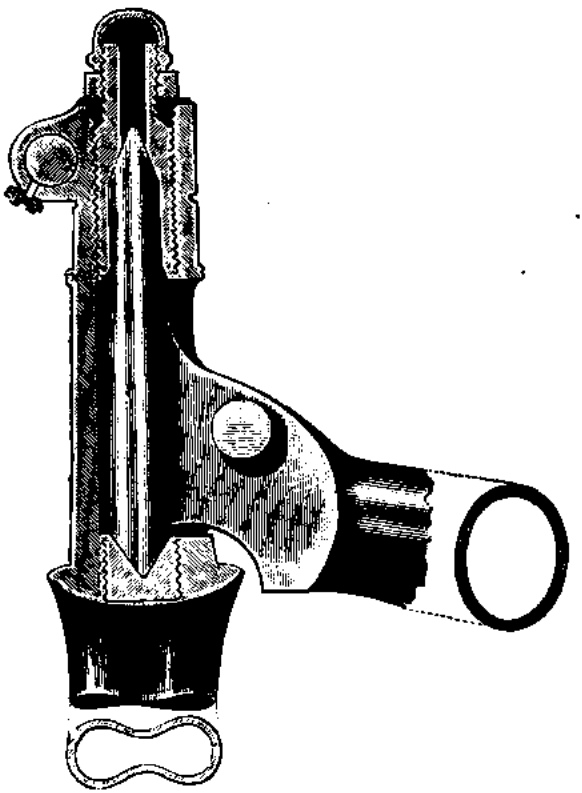


FIG. 3.—FORK HEAD OF BRITISH CHALLENGE ROADSTER.

metal hubs, which are of a good size. The forks are hollow and deeply fluted, with good broad shoulders; at the bottom they are secured by a hinge knuckle-joint to the bearings, and at the top are crowned by a very neat Stanley head, with an excellent dust

cap which effectually prevents the ingress of dirt to the centres; the last-named are of an exceptionally good pattern (see Fig. 3). It will be seen that both the top and bottom centres are "male;" the lower works in a hardened steel "female" cone which is let into the arch of the forks. The top is held securely by a tubular screw bolt, which comes down over it and holds it remarkably firm and steady; and by means of the internal cone is readily adjusted and locked by the upper nut. Over this comes a dome nut, and on removing it oil can be injected into the aperture (see Fig. 3) from whence it percolates down to the centres.

The steering rod is bent down at the ends, 28in. long, and carried by an adjustable boss in front. The handle knobs, which include an unseen, but very appreciable, improvement, are outwardly ebonite and inwardly soft rubber—the latter being next to the metal steering rod, forms a yielding pad which acts as a buffer, and giving to a slight extent with pressure, absorbs

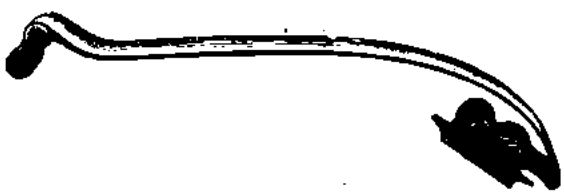


FIG. 4.—THE BRITISH CHALLENGE SPRING

a considerable portion of the vibration, making it a great deal more comfortable for the hands. Horn knobs can be had if preferred. A long upper lever, with horn handle, is attached to the brake; it comes out nearly as far as the guiding rod, enabling it to be easily grasped; the spoon is well shaped and turned up in front, so that it cannot dig into the rubber.

Improvements are also carried out in the backbone, which is oval and immensely strong; it follows the line of the wheel, and by its shape acts as a contrast to the size of the felloe and rubber. At the tail end it is joined to the rear forks, which are also strong and hollow; the small wheel is 18in. high, and runs on ball bearings. The spring is elastic and well arched. The front end is attached to a shackle, which is in turn fixed to the neck, with a forward and upward action. A boss, which is secured to the backbone, holds a case containing two round blocks of rubber (see Fig. 4); they are kept separate, but connected by means of a bolt which passes through each and joins a shackle; the end of this projects, and is linked to the spring, which thus rests on rubber, cutting off the metallic vibration in this direc-

tion. In action the spring is comfortable and easy. Hancock's patent fluted Safety tyres are put to all machines without extra charge; they are cemented into the steel crescent rims, and, to a great measure, prevent slipping on greasy or wet roads. Every machine is built in the best possible manner, and ball bearings are fitted to both wheels and pedals, and usual places. These are elsewhere illustrated (see Figs. 6, 7, and 8). The whole machine is coated with Harrington's excellent enamel, with the bright parts plated. A 54in. costs £20, rising and falling 5s. per inch.

No. 4. The British Challenge Light Roadster.—Very small wrought-iron flanges replace the gunmetal hubs, and the tyres are ⅜in. and ½in. The back wheel is also reduced in size from 17½in. to 16in. It is about 5lb. lighter than the regular roadster, while it is the same price.

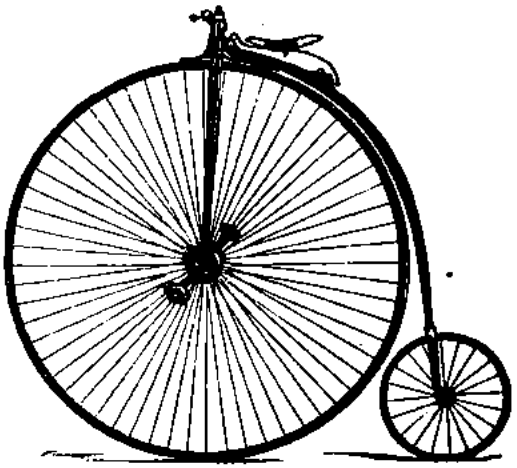


FIG. 5.—THE SPECIAL BRITISH CHALLENGE ROADSTER.

No. 5. The Special British Challenge Roadster.—In general construction this machine is like the British Challenge Roadster, but the forks are similar to the D.H.F. Premier arrangement of twin tubes. They are joined by a cross plate, just above the wheel, and the tops run into another; between these the centres work in an open head. A neat shield protects the rider from oil. The same spring, &c., is employed, and also

the bearings. These are shown at Figs. 6 and 7, and consist of a double row of hardened steel balls. The inner collar is first screwed on over the axle—right up against the hub (see Fig. 6).

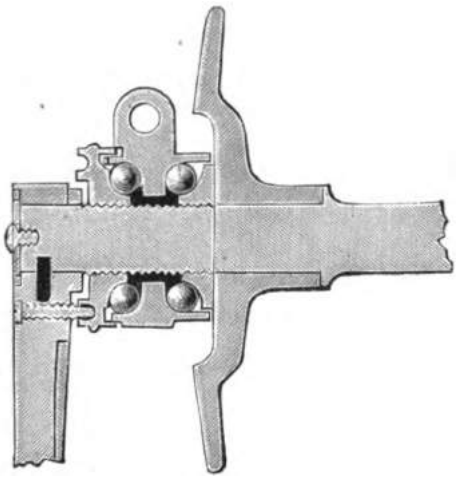


FIG. 6.—THE CHALLENGE FRONT WHEEL BEARINGS (Sectional View).

It has a grooved face—better described as a rounded cone. The outer bearing case has a central flange, which divides the balls into two rows. On the outside there is an adjusting ring with

FIG 7.—THE CHALLENGE ADJUSTABLE DOUBLE BALL DUST-PROOF BEARINGS.

a similar inner face, while outside there are a series of holes (see Fig. 7). A screw passes through the boss of the crank into one of these holes (see Fig. 6). The dark aperture (immediately

above this) is the slot through which the key passes for securing the (detachable) crank. The small central screw merely holds a plate in position on the end of the axle. By slacking the lock screw the outer, perforated, ring of the bearing case may be turned, and the required adjustment made, when the screw is replaced. The bearings are most efficient and easy running, and are applied to all Challenge machines. A lubricating orifice, protected by a spring clip, is put outside the case (see Fig. 7). The price is £20 for a 54in.

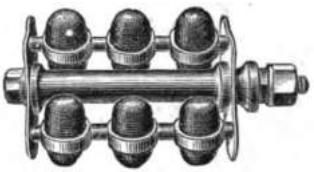


FIG. 8.—THE CHALLENGE PEDAL.

No. 6. The Royal Challenge Roadster.—A first-class machine, but with less expensive details than the British Road-

FIG. 9.—THE ROYAL CHALLENGE ROADSTER.

ster. It has, however, the same bearings and pedals; the latter are a special feature in this group of machines, and are shown at

Fig. 8. In place of the usual parallel bars, a series of round pieces of rubber—six to each pedal—are held by rings; they form a most comfortable pad for the feet. Plain broad hollow forks are put to the front, and semi-hollow forks to the back wheel. The detachable cranks, small hubs, long centres, &c., remain the same, but the spring is replaced by one with a barrel slide tail (see Fig. 9). Harrington's enamel is employed to give the frame a glossy coat, and the fittings, &c., are left bright—not plated. Price, including ball bearings to wheels and pedals, £16 for a 52in.; with plain or cone pedals, £15.

No. 7. The National Challenge Roadster.—An old type which has been before the public for five years. It is on the lines of the Royal, but has solid forks to both wheels, balls to the front, and cones to the rear wheel and pedals. It has, however, the Challenge head, the Royal spring, and fine large gunmetal hubs, &c. The tyres are plain red, and the machine is painted instead of being enamelled. No variation nor extras are permitted, and it is only made in sizes from 48in., £10 10s., to 56in., £11 10s.

No. 8. The Youth's Challenge Roadster.—A capital mount for boys. Parallel bearings to the front, cones rear wheel, solid forks, straight handle bar, and is painted all over, except spring and cranks. Price £8 10s. for a 44in., or £6 10s. for a 34in.

No. 9. The Challenge Racer.—Although Singer & Co. are late in coming into the field as racing manufacturers, this machine promises to be seen in many a contest. Very fine laced spokes are adopted; they are linked through a small light iron hub and carried back, tangent-wise, to Warwick's hollow felloe, where they are held by small nipples. Of course, the forks are hollow, and, although there is no superfluous weight, they are strong and rigid. The handle bar is also hollow and bent down in the regulation way. Ball rat-trap pedals are used, Price, enamelled, part plated, £20 for a 50in., or £21 10s. for a 54in.

No. 10. The D.H.P. Premier, No. 1 Roadster (Hillman, Herbert, and Cooper).—The test of time has not affected the popularity of this noted machine. Most riders now know the peculiar formation of the forks, and that they consist of four small tubes, two each side, starting from a "lug," which is knuckle-jointed to bearings, where they are individually $\frac{1}{2}$in. in diameter, and touch each other, gradually separating and growing larger till they are $\frac{1}{2}$in. thick and $\frac{7}{16}$in. apart at the lower bridge. This consists of a metal plate pierced by four holes, which joins the forks just above the wheel. From this

they gradually draw nearer each other until they finally run home into the top plate or bridge, which also forms the handle bracket. This makes an open head, but allows of long 5in. centres being employed. The arrangement forms a very strong head, although, to our thinking, it is not so graceful as the Stanley, but this is purely a matter of taste. The handle bar is usually 26in. or 28in. long, and is either straight, bent, or "dropped" at the ends, as shown in Fig. 10. The brake spoon comes well out on the rubber, and the hand lever is within a convenient distance

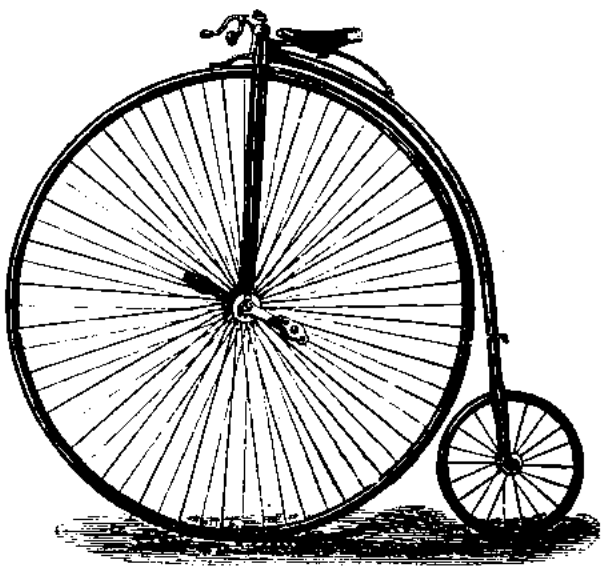


FIG. 10.—THE D.H.F. PREMIER NO. 1 ROADSTER.

for the fingers. The spring—introduced in 1881 as a leading feature—is still adopted It is in the form of a double bow, the upper portion of which has the ends curled over to receive the extremities of the lower part; the ends are additionally secured by small hinge bolts to prevent the possibility of their becoming detached. In its centre the lower spring has a large slot traversing it lengthways—cutting out the whole central portion; the object being to permit of its "giving" on each side of the backbone, to which it is attached by a clamp

(see Fig. 11) in the middle. The whole forms a delightfully easy spring, applicable to nearly any machine. The rider's weight being in the centre, he gets the full benefit of both bows, making it nearly equal in length to the grand old spring of boneshaker days, combined with the closeness of build necessary for modern machines; it also permits of a slight side roll. The backbone is of

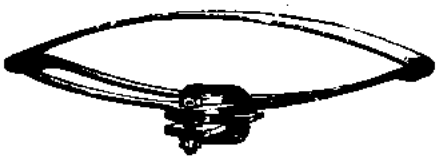


FIG. 11.—THE D.F.H. PREMIER DOUBLE-ACTION SPRING.

good size, and, of course, tubular steel, as are the rear forks. A 17in. back wheel runs on ball bearings. Mounting is facilitated by a capital adjustable step, as shown at Fig. 12, which is readily fitted at any height without cutting or weakening the backbone; it also fits other machines, and can be had separately, price 4s. Hillman's patent adjustable double ball bearings have been in use

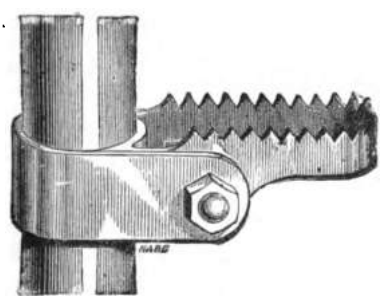


FIG. 12.—THE D.F.H. PREMIER ADJUSTABLE STEP.

for some years. A double grooved collar is screwed on the axle (E); in this twelve balls work, kept apart by a collar (G); the top and bottom of the case (D) are grooved in a corresponding manner. Over the case there is a sort of holder (A) or fork (see Fig. 13). The lower ends project below the case, and are joined by a cross bolt (B), which is pierced in the centre to permit of a small screw (C) passing through and pressing against the bottom of the case; by slacken-

ing the lock nut (H) and screwing this up, the required adjustment is easily made. The balls work in two grooves in the axle (see Fig. 13) and are held in their places by a perforated collar (see Fig. 15). The bearings are knuckle-jointed by the lug (F) to the forks. They make a strong, reliable, and easy running bearing,

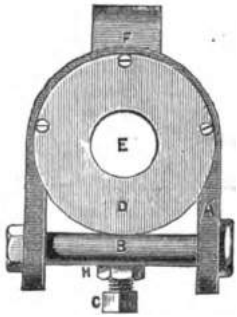


FIG. 13.—THE PREMIER BEARING CASE. (Front View.)

FIG. 14.—THE PREMIER BEARING CASE (Sectional View.)

which is applied to the driving wheels of all the bicycles made by the firm. The axle, like that of the racer, is hollow—that form being now fitted to all machines except the No. 0. The cranks are either detachable or fixed, and the ball pedals fit closely. Patent non-slipping fluted tyres are placed in hollow felloes

FIG. 15.—COLLAR HOLDING BALLS. (Side View.)

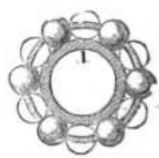


FIG. 16.—COLLAR HOLDING BALLS. (Sectional View.)

(if solid), £1 1s. less; they are of the regulation size, ⅞in. and ¾in. Summing up, the Premier may be pronounced a roadster of the highest class. The machine is coated with Harrington's noted enamel, with the usual plated parts. Price of a 52in., as described, £20 3s. 6d.

No. 11. The D.H.F. Premier No. 2 Roadster.—Without the special points, which are set down as extras in the

list. This leaves the main machine the same, but with plain red rubber tyres, cone pedals, and cones to the small wheel, ordinary spring, solid crescent rims, &c. Price of a 52in., £16 10s.

No. 12. The Royal Premier Roadster.—The same in every detail—with two exceptions—as the machines we have just described. The first of these is that of single hollow forks, the adoption of which necessitates the second —the Stanley head, which is of the Andrews pattern. We have

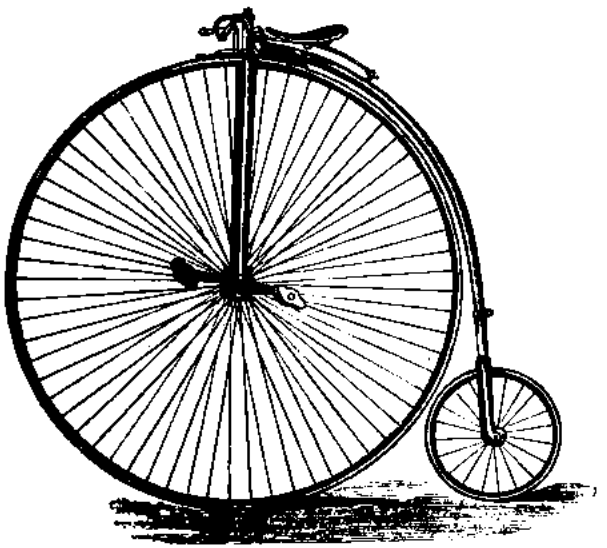


FIG. 17.—THE ROYAL PREMIER ROADSTER.

frequently alluded to the advantages long centres have over the old short pattern. Capital ones are here adopted, and the appearance of the Royal can be gathered by the illustration at Fig. 17. The price is nearly the same as the D.H.F.—£20 6s. for a No. 1. or £16 10s. if without the special points, like the D.H.F., for a No. 2.

No. 13. The Premier Racer.—This machine has very broad tubular forks hinged to the bearings, which partake of the D.H.F. type, or rather a very light modification of those

fitted to the roadster, with two rows of balls. The fixed cranks deserve mention for their absolute simplicity; they are merely a plain bar of steel, 1in. broad by ¼in. thick, and capable of adjustment from 4in. to 5in. Bown's racing ball pedals are adopted, and the fitting throughout is very close and accurate.

Small 15 gauge spokes screw direct into small light steel hubs, only 2¼in. deep by 5¾in. broad. The hollow rim holds ⅝in. rubber for the front and ½in. for the rear wheel. A decided novelty and departure from all established principles is to be met with in the axle, which is 1¼in. in diameter and hollow, being, in fact, a steel tube plugged and tapered at the ends to receive the bearings and

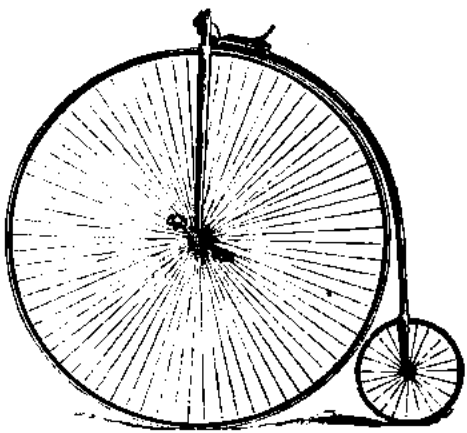


FIG. 18.—THE PREMIER RACER.

cranks. The backbone is round, without a spring. The saddle, which is attached to it, has a horizontal adjustment of 1in. The light neck is provided with very long centres for the Stanley head; a bent hollow handle bar (29in. long) is also fitted, and the trailing wheel has hollow forks and two rows of balls on each side for the bearings. The framework is coated with Harrington's black enamel, the bright parts being plated, and the machine has a "fit" look about it that promises well for its performances (see Fig. 18). Weight of a 56in., 28lb. Price £21, any size.

No. 14. The Popular Premier Roadster.—Wheels, head, forks, &c., a facsimile of the Royal Premier Roadster. The steering bar is 28in. long, and straight. An extra powerful type of brake is used; the spoon, turned up in front, folds round

the tyre, acting on it at a point 4in. from the shoulders of the fork; the grasp handle is in a good position, and considerable

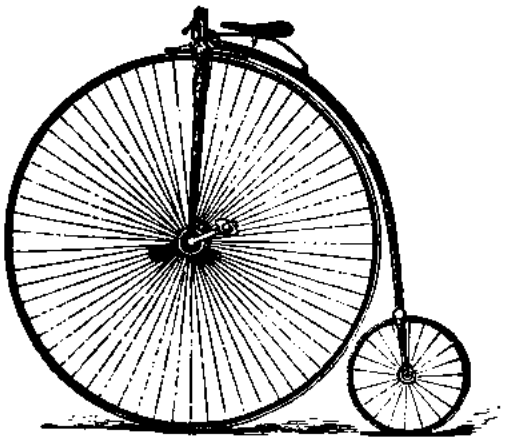


FIG. 19.—THE POPULAR PREMIER ROADSTER.

force can be exerted. The backbone is rather smaller, and only an ordinary spring is fitted, with suspension saddle (see Fig 19).

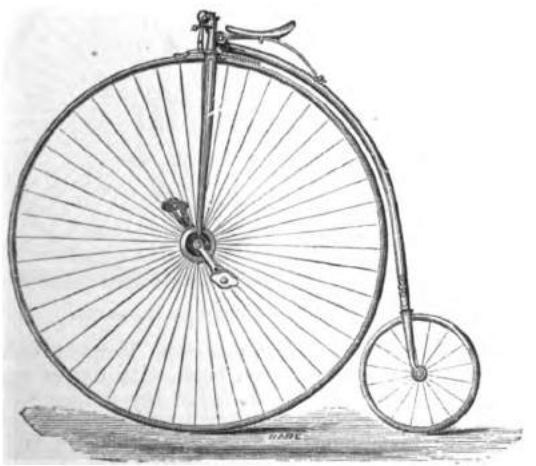


FIG. 20.—THE PREMIER NO. 0 ROADSTER.

Gunmetal hubs, of a fair size, receive direct spokes; the felloes are solid, and hold moulded rubbers. The machine is coated with Harrington's enamel, and, with ball bearings to both wheels, the price is £13 12s. It is only made in the following sizes: 48in., 50in., 52in., 54in., and 56in.

No. 15. The Premier No. 0 Roadster.—Both this and the last machine are made on the interchangeable principle, so that any part can be at once replaced. The forks are solid, and a plain saddle replaces the suspension, but the Premier head and D.H.F. bearings are still retained. Even this type has the same fine hubs and other good points, and it may justly be considered one of the cheapest machines in the market (see Fig. 20). It is coated with Harrington's enamel, in first-class style, and well finished. Price, 48in. to 56in., with balls to both wheels, £12 5s.; or with cones to rear wheel, £11 5s.

No. 16. The Kangaroo Premier Roadster.—Otherwise known as the Shelley Safety, after Sir Percy F. Shelley, Bart., with whom it is a great favourite. As will be seen by Fig. 21, it

FIG. 21.—THE KANGAROO PREMIER ROADSTER.

has some special features peculiarly its own. Round tubular forks are employed. They have an open head, with exceedingly long centres, and are carried some 10in. below the hollow wheel axle to which they are joined by a short arm and ball bearings. At the bottom each side supports a short axle, on which is placed a pulley or large pinion and crank with usual pedal; the latter is, therefore, brought close to the ground, and the tread being well

back, the position of the rider is rendered much safer. A chain runs from the crank pulley to a smaller one on the wheel axle, the effect being, therefore, to gear up the machine considerably. Every part is made in the best possible style, the machine is coated with Harrington's enamel, has ball bearings to both wheels, and the lower crank axles, a long bent steering rod, Arab

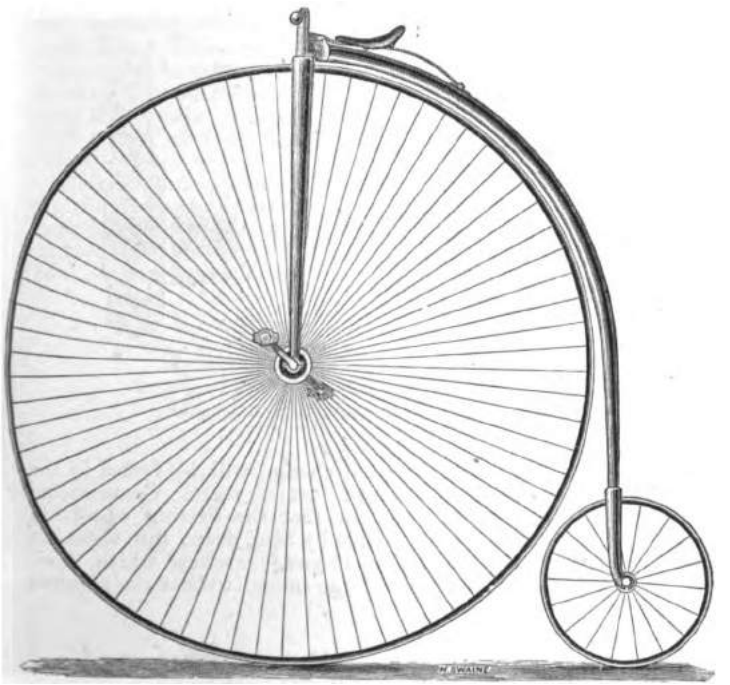


FIG. 22.—THE CLUB RACER.

spring, &c. The front wheel is generally 36in., geared up to 48in., with a 22in. rear wheel. It goes in capital style, and ought to be popular with the class of riders for which it is designed. Price £20.

No. 17. The Club Racer (The Coventry Machinists' Com-

pany.—This machine proved one of the most prominent in racing circles during the season of 1883, it is quite a gem in the way of cycle manufacture, both in constructive detail and appearance; the latter can be partly judged from Fig. 22; by comparing it with other illustrations, the graceful outlines can be appreciated. The general object in view has been to reduce weight without sacrificing strength. This has been accomplished

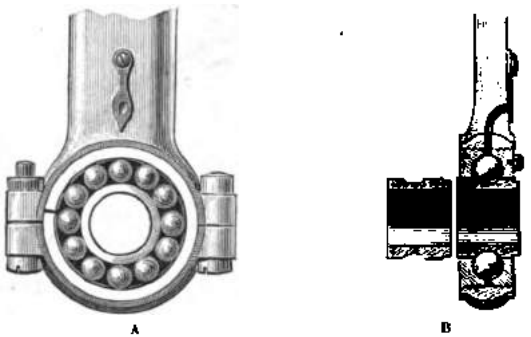


FIG. 23.—THE CLUB SINGLE BALL BEARINGS.

satisfactorily, and a considerable change will be found in the machine, as compared with that of former years. Commencing with the "rolling stock," we find that the driving wheel has light (plated) steel hubs, 5¾in. wide by 3¼in. deep; into these are screwed seventy-two very fine 15-gauge spokes, which, however, are butt-ended, and plenty large enough to bear the required

FIG. 24.—THE CLUB NON-SLIPPING CRANK.

tensional strain thrown upon them. A single row of balls form the bearings, see A, Fig. 23; they are held between two appropriately-grooved steel rings, the inner (*i.e.*, next the hub) of

which is held fast in the case; the outer collar (*i.e.*, the one next the crank) being adjustable. By turning it the two are brought closer together, and the balls consequently tightened. Before any operation of this kind is performed, the nut which holds together the "jaws" of the collar or case, which is divided into two halves, ought to be slackened, and made quite tight when the adjustment is completed. The balls work on a grooved collar, which is slipped over the axle (see B, Fig. 23), and they are lubricated from a hole, protected by a spring cover, in the fork. The cranks are keyed on fast, and the boss fits close up to the fork ends; the pedal also has no room lost, and is secured from slipping by three notches, giving a throw of from 4½in. to 5in., being cut in the face of the slot (see Fig. 24). Ball pedals also fit closely, so that the tread only measures 12½in.

An improvement has been made in the hollow felloes, which are simply rolled tubes, not two parts joined together; the racer felloe is much deeper than the roadster, to hold the small ½in. tyre (see Fig. 25). The racer generally has ½in. plain rubbers, or really a little less, as they are slightly stretched when

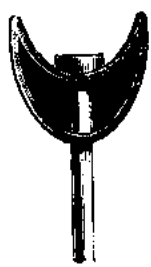


FIG. 25.—THE CLUB RACER HOLLOW RIM.

cemented in. Splendidly strong forks, which gradually increase in width from 1in. at the bearings to 1¾in. at the shoulders, support the Stanley head; the centres of the latter are of the improved type, and are extra long, being held by a hollow screw coming over the top; the lock-nut is kept well down, thereby improving the appearance of the head. The hollow handle bar is carried slightly in front, and is nicely curved, so as to give the rider's legs plenty of room, the centre being 4½in. above the

wheel, while the ends are only about 2in. Just now the prevailing fashion is for very long steering rods, so that they generally measure 28in., but are regulated to order. A well-shaped neck carries a bolt, round which the fore ends of the spring are wrapped, and lying low or near the "spine" it brings the saddle, when the rider is mounted, within a couple of inches of the height of the top part of the wheel, so that he is near his work.

Special care is taken with the backbone, which is oval, measuring in the largest part 1¼in. deep by 1¼in. thick, and is formed of fine weldless tube. It follows the curve of the wheel for some distance, then runs nearly straight to the hollow rear forks, which at the extremity turn back to the pin of the 16in. rear wheel, which, of course, runs on ball bearings, which are a light form of those shown at Fig. 23. The machine is coated with plain black enamel, except cranks, handle bar, and spring, which are plated, giving it a most "workman-like" look. During 1882 and 1883 it was successful on the path. Amongst numberless victories we may cite those of Herbert Gaskell, Ranelagh Harriers, London, who, after several other successes, won the One Mile Amateur Championship, at the Crystal Palace, London, on 14th July, 1883, when he rode the last lap—503yds.—in 40⅘sec. A week later, on the same ground, he won a Four Miles Scratch race in 11m. 34⅘sec.—both these times being the best on record. A. H. Robinson, also of the Ranelagh Harriers, won the twenty-five miles Amateur Championship of America, in by far the fastest ever recorded in the States, at Springfield, Massachusetts, in 1883. We could give any number of other feats—but these are sufficient to show what has and can be done on the machine. For the present (1884) season a large number of the best riders in London, including Messrs. Gaskell, Milner, Adam, Thompson, Robinson, and others have chosen it as their mount, so that we may expect to see it constantly to the fore. As regards the weight, it has fully kept up with the recent development in that respect, as we found a 57in. to scale only a shade over 25lb., a 55in. about 23lb., while some are even lighter. The price, any size, is £19 10s.

No. 18. The Club Semi-Racer.—Introduced specially for the 1884 season—the newest type of the Club does every credit to that renowned old machine. It has much the same features as the Racer (see Fig. 22), but is slightly stronger throughout, to the extent of being some 6lb. to 8lb. heavier. A brake is also added; and the tyres are a shade larger—⅛in. to both wheels. It has the same single row ball bearings and other details, including steel hubs with direct spokes. It will be found peculiarly suitable for grass or road racing, or for general use by light-weight riders. It is enamelled, part plated, has a bent handle bar, and

ball bearings to the three parts. Price of a 54in., £19 17s. 6d.; if with ⅞in. and ¾in. tyres, £20 15s.; rising and falling 10s. per two inches.

No. 19. The Special Club Roadster.—This machine is, of course, much stronger than either of the preceding types, and the hollow felloe is broader and stronger than that put to the racer (see Fig. 26), and contains Hancock's fluted rubber, ¾in. and ⅝in. respectively. A capital type of double ball bearing is used. A collar, with upright dividing flange, is screwed on the axle; on either side of this a row of balls is placed and held by caps, which screw into the case from each side; a very fine adjustment can be made, and it forms a splendid easy-running bearing. The rings are held securely by the divided case, which is joined at the sides, in the usual manner,

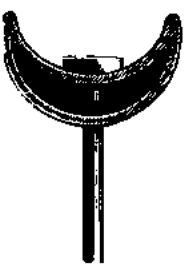


FIG. 26.—THE ROADSTER FELLOE.

by screws passing through lugs. From a casual view the cranks appear to be fixed, but they can be easily drawn off. In order to do so, the following directions must be observed. Unscrew a steel plate over the end of the axle and place a small instrument (provided for the purpose), but little larger than a spoke tightener, over the boss of the crank, the point of the screw resting on the axle and the jaws of the vice under the edge of the crank boss next the bearings, and then turn the screw, and the crank is forced off.

The usual slots are cut to prevent the ball pedals slipping. Deeply-fluted forks are used; they support a Stanley head with well-fitting dust cap. Double male centres (see Fig. 27), and a long (27in. to 29in.) handle bar (see Fig. 28) are adopted. The well-shaped grasp lever adds still further to the attractions of the Special Club: instead of being straight it is

curled up so that the fingers cannot slip off—a great improvement. The famous Club spring is so well known that it need hardly be described. A projecting boss on the neck holds a piece of rubber, a larger arm on the backbone, lower down, does

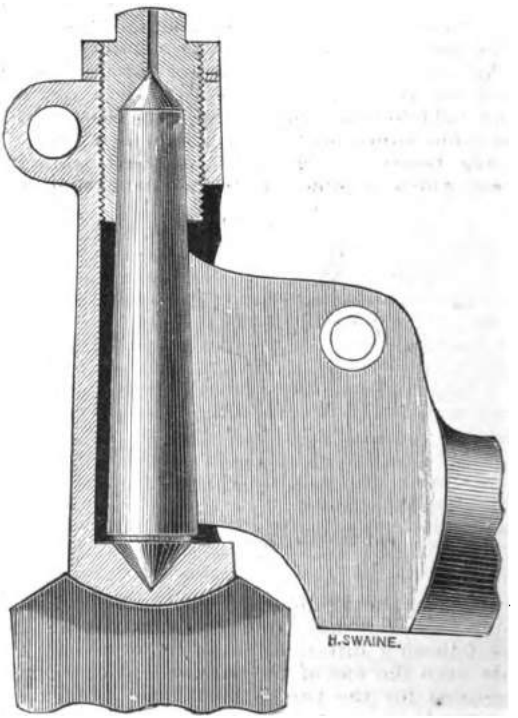


FIG. 27.—THE CLUB CENTRES AND NECK.

the same (see Fig. 29). On these blocks (which are larger and stronger than formerly), the fore and aft ends of the spring are suspended, so that the weight rides on rubber, without any vibration. Oval backbones are still a component part of these machines, also hollow rear forks. The 17in. back wheel runs on

ball bearings. All wearing parts are subjected to the very best hardening process, and the workmanship and finish are of the

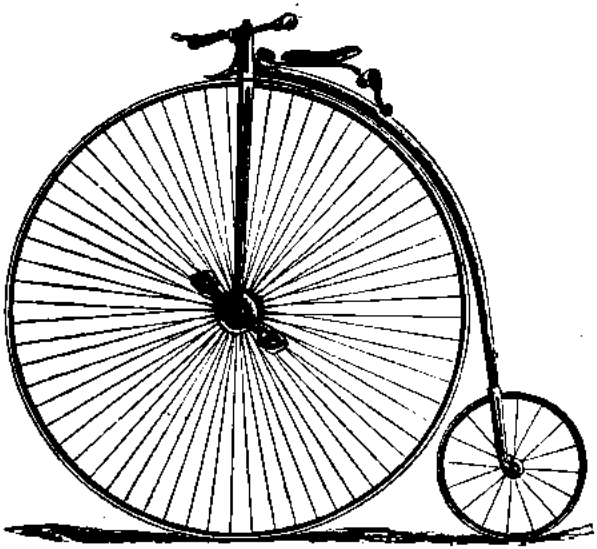


FIG. 28.—THE SPECIAL CLUB ROADSTER.

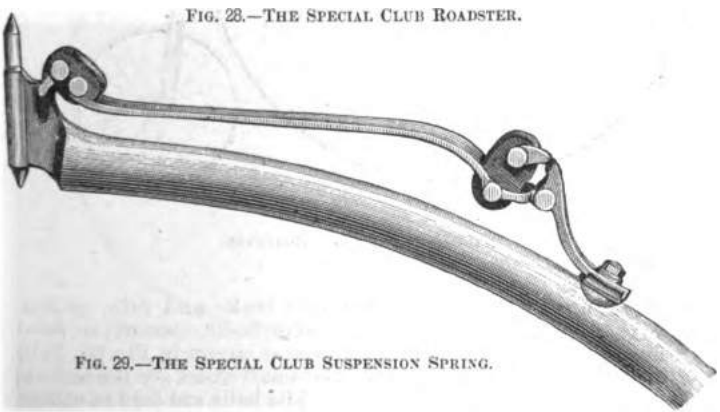


FIG. 29.—THE SPECIAL CLUB SUSPENSION SPRING.

very highest order. A very strong roadster, 54in., weighs 42lb. to 44lb., and costs, with bent handle bar, balls to three parts,

enamelled and part plated, £21 7s. 6d.; with ⅞in. and ¾in. tyres £22 5s.

No. 20. The Club Roadster.—A high class roadster, without any very special points, excepting that it is made, as usual with the firm, in the best possible manner. The spring is more like that of the Racer (see Fig. 30), the front being curled round a rubber-clothed bolt, while the tail slides through a boss on the (oval) backbone containing a roller which

FIG. 30.—THE CLUB ROADSTER.

gives it an easy motion. A good lever brake and 24in. or 26in. straight bar (if bent, an extra charge of 7s. 6d. is made) are fitted before the head, which has the centres as shown in Fig. 30. Balls are put to both wheels; those of the small wheel are the same as applied to this group of machines. The balls are held in collars, and adjustment is made by screwing up the caps at each side (see Fig. 31); fixed cranks, steel hubs, direct spokes and solid

felloes with ⅛in. and ¾in. moulded rubbers, complete the general details. All bright parts are plated, the remainder enamelled.

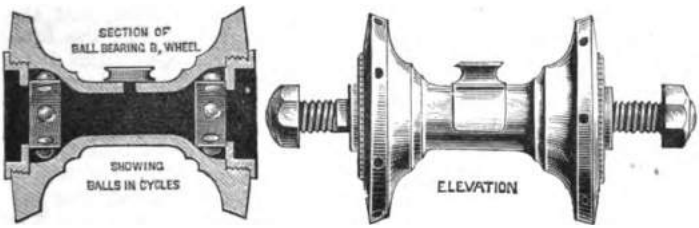


FIG. 31.—THE CLUB ADJUSTABLE BACK WHEEL BALL BEARINGS.

Price, with balls to the three parts, £18 10s. for a 52in.; or, if with bent bar, non-slipping tyres, and detachable cranks, £19 12s. 6d.

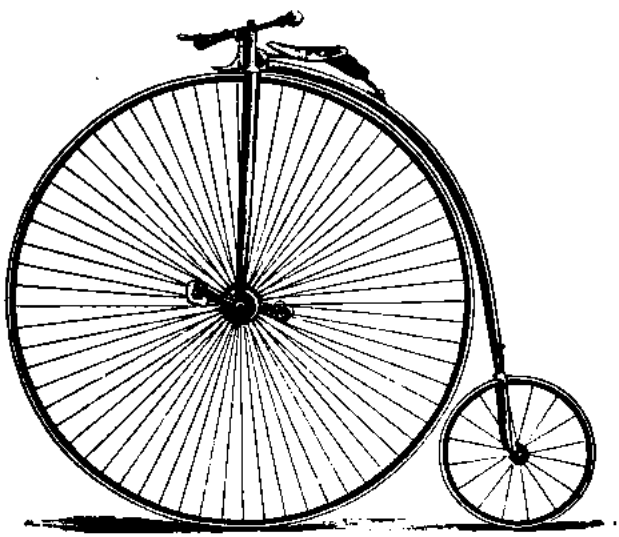


FIG. 32.—THE UNIVERSAL CLUB ROADSTER.

No. 21. The Universal Club Roadster.—The lowest-priced machine made by the Company. Double balls are

used for the front wheel, the shoulder of the case slipping up the ends of the hollow forks. Fixed cranks, adjustable from 4in. to 5in., are fitted close, and the tread is only 13in.—fairly narrow. The forks are thin, but neat, and the Stanley has a neat neck, practicable dust cap, and the long centres. A shorter bar, 26in. long by 4½in. above the tyre, forms the "rudder." It has the same excellent brake lever, the spoon is extra heavy and thick, and acts very smoothly on the tyre. Instead of the rubber suspender, a neat spring is bolted to the neck, and the tail slides in a leather-lined boss on the round backbone (see Fig. 32). Cones to the 18in. rear wheel, but they are of an exceptionally good pattern, easy running and long lasting. The bright parts are plated, and altogether it is bound to be a great favourite, as the cost is moderate. Price, up to 56in., £12 12s. Very cheap.

No. 22. The Russian and American Club Roadster.—As might be gathered from the name bestowed upon it, it is chiefly built for the two countries set forth in its title. It bears a close resemblance to the Special Club, but is heavier and stronger, so as to be thoroughly reliable in every way. A better mount could scarcely be found for foreign travel. The price of a 52in. is £22.

No. 23. The Rival British Mail Roadster (Thos. Smith and Sons).—This machine has Andrew's long centres with a Humber-shaped neck and good dust shield. The handles, 25in. long, are dropped at the ends, and have horn knobs; and the front brake is of the ordinary pattern. In order to give increased elasticity to the spring, the fore end is split, and the divided ends curl round a bolt passing through the neck, while the aft extremity works on a shackle. Solid felloes carry 9-gauge spokes screwing direct into good size gunmetal hubs, which are plated.

Double ball bearings, kept apart by a perforated revolving collar, and adjusted at the sides, are hinge-bolted to the ends of the hollow forks. Neat, detachable cranks carry plain rat-trap or rubber pedals. Hollow rear forks and oval backbone are made in one piece, Surrey pattern. Plain red moulded tyres, of the regulation sizes, ⅛in. and ¾in., are adopted. The Rival makes a fair roadster; price, with balls to both wheels and part plated, 52in., £15 18s. 6d.

No. 24. The Imperial British Mail Roadster.—The best machine made by the firm. Every part has secured the best attention; hollowness reigns supreme in the framework, in which the bent handle bar shares, while the rims are of the well-known Surrey type, and a lighter gauge (butt-ended) spoke is

adopted. An Arab spring supports a Lamplugh and Brown's suspension saddle. Bown's or Rudge's bearings are put to both wheels and pedals; the latter have a 13½in. tread. In general details the Imperial is like the Rival, only better finished, plated all over, and with fluted rubbers and other details, making a good class roadster. Price for a 52in., £21; part plated, £18 17s.

No. 25. The British Mail Roadster.—The other extreme. Solid forks, plain or cone bearings, round backbone, 24in. straight bar, simple shackle to tail of spring, commoner rubbers, direct spokes, fixed cranks, and other details of a plain, serviceable painted machine. Price of a 52in., £7 12s.

No. 26. The Special Facile Roadster (Ellis and Co.).—This belongs to what may be described as the "Safety School," and, although originally designed for nervous or elderly riders, its adaptability to the more general work of a bicycle throws it open to all, especially to those who feel inclined to shirk the dangers incidental to a high machine, but hardly like to take to a three-wheeler. One of the greatest objections of the latter is their great demand for stowage room. In this respect the Facile excels, as it goes away into a very small space, while it is much the same weight as the ordinary bicycle.

Many riders who merely judge by appearances profess to look down with scorn on this little machine. For their benefit it may be stated that no one machine of any type can show such a splendid series of road records. Two "all-day" races, confined to these machines, have taken place, the first on 30th September, 1882—London to Bath and back—when W. Snook rode from Fleet-street to Bath and back to Kensington, 214¼ miles, in the twenty-four hours, and won. The second race took place on 23rd June, 1883, and J. H. Adams won with a score of 221¼ miles; J. W. M. Brown, second, 215 miles; C. D. Vesey, third, 206¼ miles. Since then Adams, on 15th September, 1883, rode 242½ miles on the road, within the space of "one natural day." This stands as the best *authentic* performance on record. We have quoted these feats at some length in order to prove of what the Facile is capable.

Now as to the design of the machine. It will be seen by glancing at the illustration (Fig. 33) that the chief points are the suspended pedals and large back and small front wheel. The former constitute the feature of the machine. The hollow forks are continued below the axle, from which point they curve outwards for 9in. and downward 6½in. The crank is 3in. long; and attached to what would be the pedal pin there is a light steel rod, which joins the lever arm at a point 4½in. from the pedal, and 7in. from the outer end, where it works on a bolt securing it

to the prolonged fork. The connecting rod can be lengthened or shortened, thus allowing the machine to be used by riders of various heights, as the pedals can be raised or lowered. The pedals themselves are of a novel shape, consisting merely of a single bar of rubber, held by the lever arm, which opens out into a prong to receive it. This plan is advocated by the makers and seemingly approved of by those who use the Facile, as they claim that it gives the foot more freedom; but we cannot help

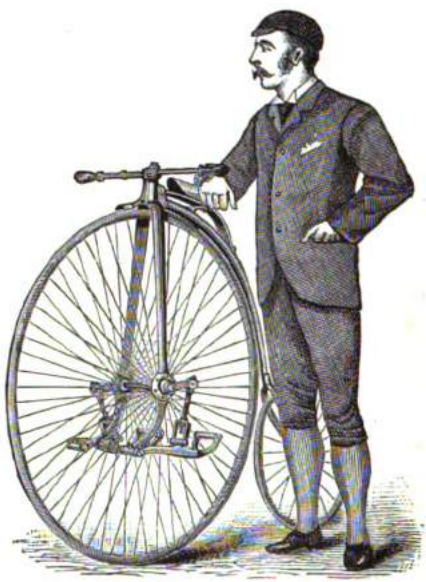


FIG. 33.—THE SPECIAL FACILE ROADSTER.

thinking that a more decided pedal, on the plan of that fitted to the 'Xtra, would be less tiring, and give a much more secure foothold, especially in wet weather. This has been partly met by making the bar somewhat broader and by fitting it with raised guards on each side to prevent the feet slipping off.

The "linked-lever" lever action of crank and pedal naturally gives a strange motion to the pedals. When suspended they work almost vertically, there being less than an inch

between the extreme rearward and forward movement. When in progression, i.e., being ridden, the feet, and consequently the weight, are always behind and below the axle; therefore there is no inclination to "go a cropper," as in the ordinary machine, where the whole pressure is exerted in front of the axle. In this we have the real "safety" of the Facile. Small wheels do not give immunity from accidents, they only make them less severe; but here the rider's weight and application of force actually add to his safety and stability. The action, too, is more direct from the thigh, and is applied during almost the entire fall of the pedal. The actual difference, looked at from a scientific point of view, is that with a (so-called) rotary motion of the pedals the feet describe a series of cycloids, whereas with the Facile action they rise and fall at a gentle angle, not a curve, the pedal being always beneath the rider, and not at one time in advance of and at another in rear of him, or, rather, the fork.

We note with pleasure that the makers now include all required improvements in the price. The Facile has special ball bearings to the front wheel and connecting rods, with Æolus to the rear wheel. Hancock's non-slipping tyres (⅜in. and ½in.) are also applied; 13-gauge butt-ended spokes screw direct into gunmetal hubs; the hollow forks, which have a 2in. rake, are crowned by a Stanley head, with long centres, a good brake, and 24in. or 26in. handle bar. The "spine" is much straighter than usual, owing to the back wheel being rather more than half the size of the driver. For the latter, 42in. to 44in. is the most popular height, with it a 22in. rear wheel. Owing to the position of the pedals, they can be brought much nearer together than on a high machine, the width of tread being only 10in. This is another very strong point in the Facile, and one which will go far to account for the long distances and fast times that have been accomplished on it. In point of speed over short distances it is, of course, behind the ordinary machine, but riders can with ease keep up with a club run; and on a tour they are quite a match for the ordinary, while it is a capital hill climber. To return to the machine itself, a 42in., with ball bearings as described, and treated with Harrington's enamel, costs £16. This size weighs just 46lb.

No. 27. The Extra Special Facile Roadster.—A new form of the Facile for 1884, and a decided improvement upon all preceding patterns. Fine-gauge laced spokes are linked through steel hubs, and are carried back to Warwick's hollow rims, into which they are screwed by means of small nipples. Plain moulded rubbers, ⅜in. and ½in. in size. A special form of ball bearings have to be adopted; they are made specially by Bown, and are in the form of a large flange (part of which is cut away

to permit of its slipping on the axle without springing the forks) joining the upper and lower portions of the fork. The flange holds on the inner side a fixed, and on the outer an adjustable, ring; between these a single row of balls is placed. Below the axle the forks—or, rather, continuation thereof—curve forward 6¼in., and down 6¾in.; to the extremity of this the lever is pivoted, as in the Special. Much the same proportions as in the Special are adhered to; the total length of the lever is 12in.; almost in the centre—5¼in. from the centre of the pedal bar—it is hinged to the small frame and adjustable connecting rod; the latter being joined by ball bearings to a short pin on the end of the 3in. crank.

Strong hollow forks are fitted to both wheels; those of the front have 2½in. rake and carry a good Stanley head with long centres, 26in. handle bar, and a really effective brake. The spring is of the simple order, with a comfortable Brooks' or Lamplugh and Brown's saddle. Balls are, of course, fitted to the 22in. rear wheel. As in the Special, the rider is vertical above his work; the pedals rise and fall 11in., almost the whole of the stroke being utilised. The machine is coated with Harrington's enamel, and, with the bright parts plated, costs £20 for a 42in. or 44in; if with Arab spring and fluted tyres, £21. A 40in., or lower size, is 10s. less.

No. 28. The Facile Racer.—Also new this year, and a bold experiment. There is no reason why it should not be fairly successful, though theory is against the use of small wheels; but that argument can scarcely be used in the case of the one we inspected—a fine-looking 50in., specially built for J. H. Adams, the hero of the long road rides, for use on the path in 1884, and on which he won three prizes at the first race meeting in which he competed. It has ½in. and ¾in. rubbers, and the rear wheel is only 18in. The general construction is lighter, otherwise it is like the Extra Special Roadster. Price £20 for a 44in.

No. 29. The Facile Roadster.—The lowest-priced variety, and more like the old type of machine, with plain bearings to front and cones to rear wheel. Solid U rims hold ¾in. and ⅞in. red rubber tyres. No. 11-gauge spokes screw direct into gunmetal hubs. The same head, long centres and backbone are used as in the other types. It is painted, and weighs about 50lb. Price £12 10s., or, if enamelled, £13 10s.

A few general details may be added concerning this group. In order to overcome the objection some riders have to dwarf machines, a new patent arrangement can be used to raise the pedal, so that a larger machine can be ridden. The additional cost runs from £1 to £2. Although the machines have con-

siderable adjustment, the following table is a guide to the respective sizes:

Length of Leg.	Ordinary Facile. Connecting rod adjustable from 6¼in. to 7¼in.		7¾in. to 9in.		With Raised Pedals.
30in.	36in.		32in.		42in.
31in.	40in.		36in.		44in.
32in.	42in.		38in.		46in.
33in.	44in.		40in.		48in.
34in.	46in.		42in.		50in.
35in.	46in.		44in.		52in.
36in.	48in.		44in.		54in.

With the exception of the raised pedal the machine is the same. The peculiar formation of the machine makes it decidedly the best bicycle for attaching lamps to. Permanent clips are

Fig. 34.—The Facile Roadster.

put on the ends of the fork continuations, where, from each side, they enable the lamps to shed a splendid light directly in front, and are not affected by the working of the levers. The clips cost 4s. per pair, and should be added to every Facile.

No. 30. The Will-o'-the-Wisp Roadster (F. Hucklebridge).—An ordinary strong roadster. Hancock's fluted rubbers, potential rims, spokes eighty in number and of 13 gauge, large steel hubs, 5in. deep by 5½in. broad, with Rudge's bearings bolted to the broad hollow forks, make up the driving wheel. Long Andrews centres (protected by a dust cap) are put to the Stanley head, which has a 28in. bar and "cross" handles, *i.e.*, the handles are about 3½in. long, of comfortable shape, and vertical to the steering rod. There is a good front brake, the spring has an ordinary slide tail, and is surmounted by a Long Distance saddle. Ball bearings are put to both wheels, the rear wheel being generally 16in.; it has also hollow forks. Detachable cranks are adopted, with rat-trap rubber pedals. The machine will be found reliable and well made; it is finished painted and half bright, price £15 15s.

No. 31. The Ideal Safety Roadster.—Despite its three-wheeled appearance, it is no more a tricycle than the Salvo, or any other tricycle with a small wheel at the tip of the safety tail, can be termed a four-wheeler. The rear fork terminates in rubber pads or buffers; slightly above these, arms slant forward and downward, and are attached by a free bolt to a loop that runs half round the diameter of the wheel, from the axle. This attachment is, however, never called into action, as the main junction between the loop, and, consequently, the small wheel and the forks, is a spring on each side. That on the right is the "safety," and is to prevent the back one coming down too far; it is used after the rider mounts, to cause the machine to assume its right attitude, and to assist in "lifting," so to speak, the backbone after an undue depression arising from the roughness of the road or other cause.

In actual mounting, or when the "safety" spring is overcome, the rubber buffers descend and rest on small plates on the "loop." The spring on the left is really one of the leading features of the machine, or rather its action, as it is of light—about 14-gauge—steel wire, and is lapped round the loop and fork arm, after being coiled to form a spring between. When the machine is being ridden properly, this spring is the only link between the trailing and driving wheel. It is compressed by anything above 3lb.—about the weight of the wheel itself—which causes the buffers to descend and rest on the small plates.

As to the stouter (or safety) spring wire assisting the other, it can, by a rider accustomed to the machine, be done without entirely. Indeed, the chief object of the light (left) spring is to press down the small wheel so that it shall always rest on the ground. This is absolutely necessary, as, were it rigidly connected with the backbone, it would rise off the ground if the

machine tilted forwards; the rider would then have no command over the steering, which would, in consequence, become wild and erratic. Now, however, even if the mid-wheel is raised two or three inches higher than the small one, the latter drops below the level, and rests on the ground, or it will act *vice versâ*, so that at all times full command is had over the rudder.

Now, as to the pilot wheel and front bone or frontal portion. The pilot wheel is, or ought to be, always an inch or two above the ground, and only touches *terra firma* when a bump causes the driver to pass the centre of gravity, and go forwards—he can at once resume his normal attitude. The proof of the little work it does was clearly manifest in a machine which had been

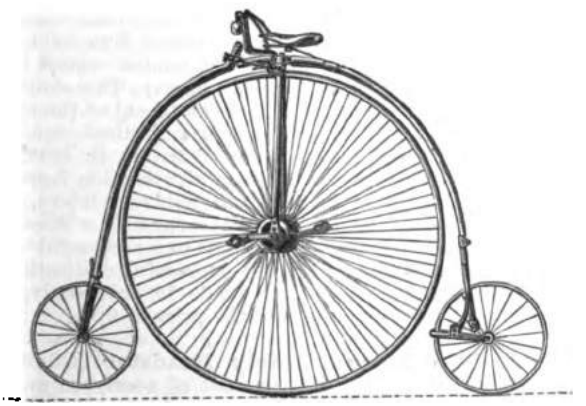


FIG. 35.—THE IDEAL SAFETY ROADSTER.

in use for some time, as the rear rubber showed signs of hard usage, while that on the front wheel scarcely betrayed any symptoms of wear, but the tyre of the large wheel was far more worn than even that of the trailing wheel. The backbone terminates in a large ring case over the shoulders of the vertical hollow forks; these are crowned by a plate to receive the before-mentioned ring, which contains double rows of ball bearings round a short central spindle. The centres are 8¼in. in advance, being at the extremity of what may be considered as a forward extension of the back-bone. The neck is on the upper end of the front bone, and fits over the centres in the ordinary way (see Fig. 35).

Steering is effected from handles, which are of the orthodox shape, but not position, being rather further forward—*i.e.*, beyond the centre of the wheel, and nearly above the second head, but disconnected with it. The rod to which they are attached screws over, and is firmly secured to, the top spindle of the forks; the wheel is therefore operated on in the usual manner. Command is obtained over the front bone and pilot wheel by means of a link running from near the top of the left fork to the head of the front portion. This little rod, which couples the two portions, works in a ball-and-socket joint at each end, and causes the pilot wheel, when on the ground, to make a somewhat sharper curve than the driving wheel. This arrangement effectually prevents its natural inclination to skid, and instead of detracting from, assists the efficacy of, the steering.

Good broad hollow forks are used in front; they are almost perpendicular, and are bolted to ball bearings, detachable cranks, ball pedals, &c. The handles are bent, and a capital brake is applied by pulling up a lever by the fingers. The short spring brings the rider directly over the forks and head of the machine; his work is thus directly beneath, giving a vertical action to the pedals. The Ideal is the invention of Mr. E. H. Hodgkinson, and it answers capitally, the absence of vibration from behind being a great boon. It is fast, and not very heavy, while it is, although not proof against all falls, very safe. When being ridden the Ideal is the nearest approach to a successful unicycle or monocycle, yet made, and is the successful realisation of an ingenious idea. At present it is made to order only, for the inventor, by F. Hucklebridge, and the price is £20.

No. 32. The Marvel Safety Roadster (Rudling and Coffin).—Another eccentricity, but not of nearly so practical a nature as the Ideal. It is a machine that would doubtless be considered the acmé of perfection by followers of the Browning school amongst tricyclists, but to the mind of the more practical bicyclist it is too toyish to be popular. Small wheels, when of a reasonable size, as in the Facile, are an assured success, but, when only 25in., they are absurd, and the Marvel would form a fitting companion to the ridiculous little sociable tricycle Markham showed, at the recent Sportsman's Exhibition in London, as a skit upon the mania for absurdly small wheels.

We must revert back to 1820, the days of the Hobby Horse, or the very first stage of boneshakers, in 1867-8, to find a parallel in the relative sizes of the wheels. Here, as in the first cycle of sixty years ago, both wheels are of the same height, or rather lowness, 25in. They are joined by a backbone, which runs from the Stanley head of the front wheel to the axle of the rear wheel. Stout mud-guards are placed over both wheels. An upright pillar runs up from the backbone, or rather tubular beam, and

supports a bent handle; attached to this there is a lever, by pulling down which a spoon brake is applied to the back wheel. The ⌐ rod which supports the Arab spring and saddle is far too long, and would be a source of weakness. A very strong pillar runs down from the beam—a little further back than the handle support—and carries a pair of bicycle cranks, pedals, which are within 2½in. of the ground, and a large pulley. A chain passes round this and runs back to one, just half the size, attached to the rear wheel, which, therefore, becomes the driver, geared up to double size, *i.e.*, made equal to a 50in. Steering is effected by two light rods, which run from a short cross-piece above the Stanley head horizontally to a similar cross-piece attached to the pillar of the handle bar, which is worked by the steering rod.

There are some claims in the prospectus which, if substantiated, would indeed make the machine something more than a marvel. Two of these we quote: "If the front wheel of the machine were smashed to atoms by impact with an obstacle it would simply place the rider on his feet, because the front of the machine would be lowered; it is thus utterly impossible for him to be thrown over the handles." This is radically opposed to the laws of force and motion. If one of the inventors will charge a brick wall with sufficient force to "crumple" the front wheel, or even dash at a high curb, we do not think it likely that he will repeat his theory of "simply place the rider on his feet." Again, we are told: "The speed of the machine is superior to any other;" when we see it accomplish a mile in less than 2min. 40⅘sec., or cover more than 20 miles 905 yards in the hour, or 242½ miles in the day, we will give credence to the statement.

The price of the machine, with ball bearings to both wheels and the crank shaft, and with the bright parts plated, is £18 15s.; with plain bearings and left bright, £13.

No. 33. The New Marvel Safety Roadster.—Another, and more recent, pattern of this curious cycle. It is, if possible, more ridiculous than the one just described. Safety machines are, as a rule, none too attractive, but very few riders, unless those whose sole object is to attract attention, would care to appear upon a toy like this. The same scheme is followed as carried out in the Marvel, but with a radical alteration in the framework. In place of having equal-sized wheels, the rear is 26in. and the front only 12in. The latter has tiny forks, with a double arm at the top; this is, by means of short forks, attached to a tube, or rather long socket, which holds the adjustable rod carrying the handle bar. This supporting rod is also hollow, and through it runs a wire, attached to a bell crank at the bottom, and the brake lever at the top. On de-

pressing the last-named, the bell crank is pulled up, and it, by a wire, pulls the spoon of the brake on the tyre.

A very short backbone runs from the front wheel to the strong horizontal forks of the rear or driving wheel. This also supports a socket, for the ⌜ pin, Arab spring, and suspension saddle, and a crank axle, very low, bringing the pedals close to the ground. On this is placed a large chain pulley, or pinion; a similar, but much smaller one, is fixed on the extended axle of the driving wheel, a chain encircles both, and the effect is to gear up the 26in. wheel to about 62in.! to accomplish which enormous power must be put forth, and great friction overcome. As an eccentric formation of the bicycle, it is worth notice, but it is not likely to take rank as a practical machine. Price and other details similar to the Marvel.

No. 34. The Invincible Racer (Surrey Machinists' Company, Limited).—This machine is a marvellous combination of strength and lightness, and one of the very best racers in the market, having been the first cycle that was ever ridden twenty miles in the hour, by Dr. Cortis, at Surbiton, on 2nd Aug., 1882, when he covered 20 miles 325 yards in 60min. With the exception of the quarter, half, one and three-quarters, two, three and four miles, all existing records up to twenty-five miles have been made on the Invincible. A splendid series of successes have been scored upon it, and it is now used by a large number of well-known racing men.

So satisfactory have the rims proved that no departure has been made from their original form. The felloes are made from thin sheet steel in two parts. The lower portion is 1-32nd part of an inch in thickness, and is bent into a ∪ shape; the top cover is but half the thickness, *i.e.*, 1-64th of an inch; it is made with overhanging lips, which are brazed over the lower. The rim thus formed is simply marvellous in lightness and strength, although to the uninitiated eye it looks heavy. The best pianoforte wire—16 gauge—is used for spokes. These are held in the lower part of the rim by a ▭-shaped washer and lock nut; they are tightened by a small instrument which passes through holes in the upper half of the rim. The spokes are linked through the hub, and crossing just outside its edge, are carried back tangent-wise and spread apart to about one-fifth the circumference of the wheel. At about two inches from the edge of the hub, or 4in. from the centre of the wheel, each spoke is joined to the one it crosses by a little solder. This arrangement virtually acts as an 8in. hub, and as the spokes pull against each other they mutually strengthen the wheel and make it very rigid. Rubbers of ⅛in. and ¼in. are firmly cemented into the felloes. An extremely light form of axle and hub, in one steel forging, and of good breadth, 5¼in.

by 2¼in. deep. The tread, by close fitting, is kept narrow—12¼in.

Flat fixed cranks carry Bown's ball pedals, but the bearings of the front wheel are of the well-known Surrey Machinists' Company's pattern, and consist of two rows of twelve balls in a grooved case, with side adjustment. There are in all forty-eight balls to the front wheel, and they run splendidly. The

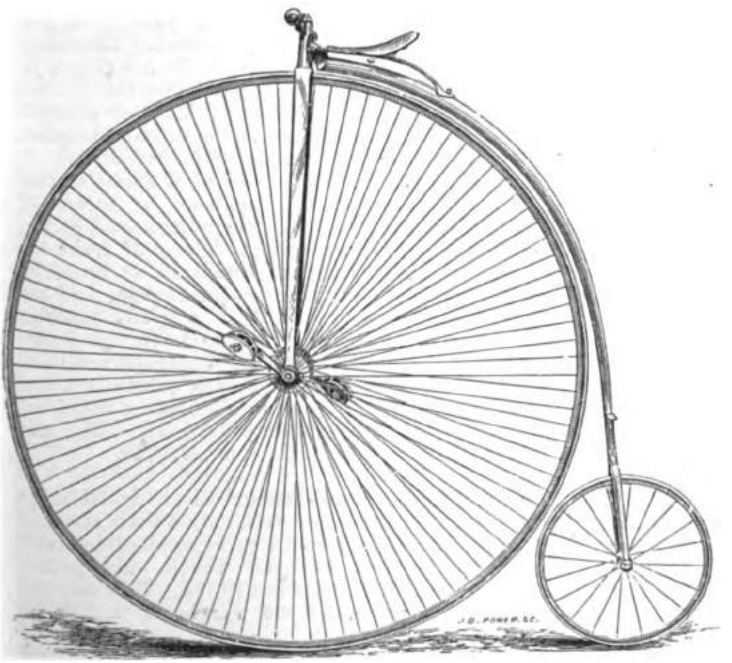


FIG. 36.—THE INVINCIBLE RACER.

same kind of bearings are used in the back wheel, and they certainly have no superior; not only are they different from others, but the mechanical principles on which they are constructed are excellent. The balls are held in small cases on the inside of the fork ends. The cones are a fixture on the axle and hub, and, being of small diameter, impart a very slow motion to the balls, which, consequently, last longer and are steadier,

while a more free-running bearing could not be wished for. Sixteen inches is the accepted height for racing rear wheels; the spokes, &c., are similar to those already described. A 16in. wheel, all complete, for attaching to the rear forks, with rubber, axle, &c., weighs barely 16oz.

The framework is also on the old lines, with some slight improvements. The front forks are oval, with rounded edges, extremely light, and have more square shoulders, and the tubular part is carried above the top of the wheel; instead of there being a heavy solid piece attached to the head, it is now much lighter while retaining its strength. Another advantage is, that the forks being wider at the top, they do not clog with mud. The Stanley head is also made lighter, but the centres (Andrews pattern) are 4¼in. long. Either a bent or straight hollow steel steering rod, with good horn knobs, or cross handles, according to order, are fitted; they average 27in. in length.

The spring has been abolished in favour of a small slotted flange, which is brazed to the oval backbone by means of spreading arm clasps. It permits of a little adjustment, and is, of course, much lighter than any spring. The rear forks are hollow, but not in one piece with the backbone, as formerly. Harrington's enamel is applied without extra charge, and the bright parts are plated. The Invincible is a grand machine (see Fig. 36), and capable of even greater deeds in the future than have been already accomplished on it. Imaginary weights never found a place in our reports, and with carefully tested scales we found a 59in. to weigh 26lb. and a 54in. a little less than 20lb., both complete, with saddle, pedals, &c. The nett price for any reasonable size, all complete, is only £19.

No. 35. The Invincible Semi-Racer.—But little description is required, as it is the same in detail, only a little stronger built, having ⅞in. and ¾in. tyres, a really good serviceable brake, plain spring, &c., with balls to both wheels and pedals, enamelled and part plated. The price is £19 15s. This machine makes a splendid grass racer, as the weight of a 55in. is only 27lb.

No. 36. The Invincible Roadster.—Thirty-three pounds for a 50in. would, a few years ago, have been considered very light for a racer, but even the strongest Invincible roadsters seldom exceed this. The framing is stronger throughout than either of the machines just described, and the tyres slightly larger—⅞in. and ¾in.—and of the best soft Para rubbers; for rough work 1in. tyres of this very fine rubber give a delightfully easy motion to the machine that is a treat after the bumping caused by small hard tyres. Both forks are, of course, hollow, and balls are put to the pedals, front and rear wheels.

We must again refer to the ball bearings of the trailing wheel for their special excellence. In roadsters the width between the rows of balls gives increased steadiness in running. The spring has a simple slide tail, and is made more comfortable by a block of rubber between it and the backbone. General details are similar to its lighter companions. Coated with Harrington's enamel and part plated, price £19 10s. for any size. Unlike most makes, no extra charge is made for "odd" sizes—*i.e.*, such as 55in. or 53½in., &c.

No. 37. The Humber Racer (Humber, Marriott, and Cooper).—No machine in the market has a better name, nor has any make for so long held a foremost place in racing circles. In going over the Humber even the non-rider or casual observer cannot fail to be struck by the simplicity that is prevalent in the general framework; a closer inspection betrays rare excellence of workmanship, accuracy of fitting, and elegance of design.

The wheels have a hollow rim of exceptional merit, formed of three parts: First, an outer wide U; the edges of this are turned inwards and are lapped over a crescent-shaped piece which forms the bed for the rubber; this is in turn further supported by an interior narrow U, the top ends of which spread out and, with the sides of the crescent, are held under the turned-in edges of the outer portion, the three being brazed together. The actual measurements of the parts of a rim to carry ⅛in., or a little larger, rubbers, are: Total width, ⅝in.; total depth, ⅝in.; depth of crescent, ⅛in. The spoke passes through this, and the head is held by two thicknesses of metal at the bottom, giving it abundant support, and, moreover, the strain tends to pull the parts together rather than separate them, so that it is immensely strong as well as light. The average-sized rubbers are $\frac{9}{16}$in. and ⅛in. for front and rear wheels respectively. Spokes—between sixty and seventy in number, of 13 gauge piano wire—screw direct into handsome gunmetal hubs, which average 3in. deep by 5½in. or 6in. in width (according to the size of the wheel), and are well recessed to admit the bearings.

The ball bearings consist of the usual case containing two rows of balls placed as far apart as possible; this gives a great increase in the steadiness of running. They are adjusted by first slacking the nut which holds together two projecting lugs of the case, on one side only, not both, as formerly, and then, by the aid of a small instrument provided for the purpose, the outer plate is screwed round, which has the effect of still further spreading, and therefore tightening the balls. In order to allow the case to go as far as possible into the hub, the shoulder for attaching to the fork end is placed at the outer

side, so that the forks fit close to the hub; they are oval in form and exceedingly handsome and strong, being sufficiently rigid for any roadster. A slight change has been made in these for the present season. The forks are still further strengthened by a sort of flange above the shoulders, which forms a ring, ¼in. wide, round the bottom of the head; the tops of the forks are rather further apart and broader than before, and the whole is "as firm as a rock."

An adjustment of from 4in. to 5in. is allowed by the slot in the fixed cranks for the ball rat-trap pedals; all being close built, the tread is only the merest shade over 12in. The neck is of a new design, being reduced to the smallest dimensions (1¼in. by 1¼in.,) and is placed above the end of the "spine"—merely sufficient to attach the end of the spring to it. This allows the top of the backbone to be brought close up to the head. Very long centres, that go right up above the handle bracket, giving steadiness and strength, are used. The handle bar is tubular throughout and nicely curved. A capital rule is followed to decide its length by making it equal to half the height of the wheel; thus a 56in. has a 28in. bar, and a 60in. one measuring 30in. Another innovation is to be found in the cross knobs to the handles. These are most comfortable to grasp, being of horn, and measuring 4½in. long, and tapering from 1¼in. thick in the centre to ¾in. at the ends. They are fixed at an angle of about 45deg., and give a better purchase and greater command over the machine.

A new plan is introduced with the spring; it is, of course, only meant for racers, and consists of a short strip of steel secured to a small bolt which passes through the neck, so as to prevent it from rising. Near the tail there are three or four holes, and on the back of the light saddle there is a small arm which passes through one of these holes and is held by a nut. Under the spring there is a good block of rubber, so that the rider has both adjustment and comfort—luxuries too often denied to racing men. The backbone is round, of good size (4½in. in circumference), and tubular right down to the hollow rear forks. The whole machine is nicely japanned like enamel, except the handle bar and cranks, which are plated. Despite the reduction of weight, the Humber seems even stronger than when 8lb. or 10lb. heavier. We recently inspected a group of racing machines built for some well-known men, including Wilson (who won the fifty miles amateur championship in 1883 on a Humber); Prentice, the well-known Eastern Counties rider; Buckley, the O.U.B.C. crack, and others, including a noble looking 60in. for J. H. Pibell, a London rider; the last-named machine had a 30in. bar, 18in. rear wheel, hub 6½in. in width, and weighed, all complete, 26lb. We also found a 56in. to be 22¾lb., and a 54in. to be only 21½lb. It would be a well-nigh

endless task to attempt to chronicle even a percentage of successes gained on the Humber, but we must not overlook the splendid performances of Fred. Wood, the chief professional champion in 1883, when he won the 20 miles championship on June 9th, 10 miles championship on July 7th, and (again) the 20 miles on July 14th, riding the last lap in 36sec. (quarter mile); on August 4th he won the 50 miles in 2hrs. 48min. 10sec., and the mile on August 8th. The most remarkable feat, however, performed on the Humber was by F. Lees on 18th August, 1883, at the Belgrave Grounds, Leicester, when he rode 10 miles in 29min. 23sec., 20 miles in 58min. 34sec., and 20 miles 905yds. in the hour! In amateur circles, as already pointed out, it has a fame second to none. The price, including ball pedals, plated parts, and bent handle bar, is £20 10s.

No. 38. The Special Humber Light Roadster.—A most useful machine for use on the road by light riders, or by those who do not care to incur the expense of keeping two machines, as, on removing the brake with which it is provided, it can be used on the path and is specially adapted for racing on grass tracks. It is equal in every way to either the roadster or racer, and is about 8lb. heavier than the latter. It is only made to order. Price £21 complete.

No. 39. The Humber Roadster.—But little difference can be found, save general weight and strength; the tyres and hubs are larger, the former ⅞in. and ¾in., and the latter 5⅛in. by 5in. deep. A most comfortable support for the saddle is found. Attached by a plate to the backbone there is a curl spring; to the third or inner curl the end of the main spring is hinged, and gains an elastic purchase that is a source of pleasure to the rider, as it gives an easy and agreeable motion. A really good "grasp" is put to the brake, one that can be held by the fingers without straining or fear of slipping. The whole machine is very neatly painted in lines and japanned, with plated parts, cranked handle bar, brake, balls to wheels and pedals, suspension saddle, &c. Price £21 for a 54in. We found a 54in. to weigh 39lb.

No. 40. The Sun and Planet Safety Roadster (The Safety Cycle Company).—This is a safety dwarf machine geared up one-fourth or one-fifth. The average size of the driving wheel is 40in., and outside each fork, secured to the hollow axle, there is a light 8in. skeleton wheel (see Fig. 37). A spindle is passed through the hollow axle; on each end of this there is a double crank. The first is 5in. long and carries on the inner side a 2in. pinion with roller teeth; from the end of this (No. 1) crank a second (No. 2) is attached by a swivel

bolt, and supports a hanging pedal adjustable from 5in. to 7in. The action is simple. Working with the usual pedal action, the small pinion runs round the larger, and turning it therefore drives the machine; it is much more simple than it looks and is a proved success. 40in. wheels are generally used, geared up to 50in.

The machine has all the usual parts of a bicycle—hollow forks, Andrews-Stanley head, a good lever brake, 26in. handle bar, shackle to the spring, and last, but not least, a sort of arm guard

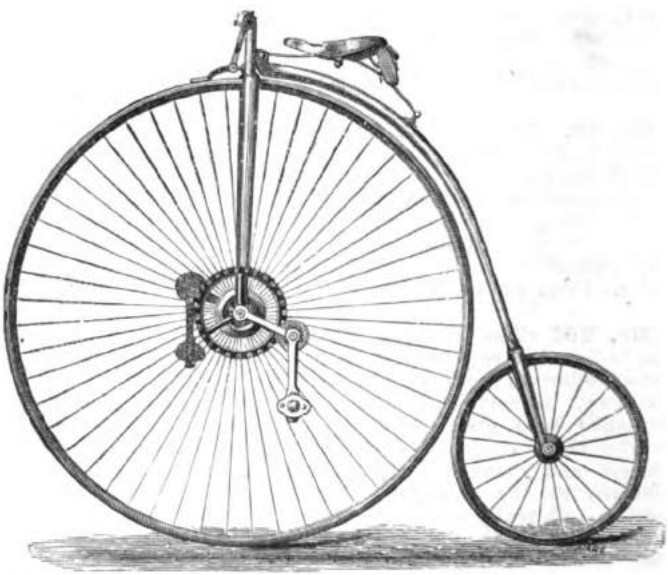


FIG. 37.—THE SUN AND PLANET SAFETY ROADSTER.

which moves round with the crank, and effectually prevents the trousers from becoming entangled between the cog wheels. Ball bearings are put to both wheels and the top of the "pedal hanger," where the first and second cranks are joined. As at present made, the pedals have a 13½in. tread. It is finished painted, with bright parts plated, balls to three places, &c. Price £20; if without balls to rear wheel and nickel plating, £17 10s.

A lighter form, suitable for racing, is also made; it has small steel hubs, laced spokes, hollow rims, &c. It is notable that the

Sun and Planet is one of the *very* few geared-up bicycles which have proved practicable. Some fair times have been accomplished upon it, such as 10 miles in 33min. 20secs., and one mile in 3min. 7secs.

No. 41. The Granville Speed and Power Roadster (The Granville Bicycle Factory).—It is the gear which calls for notice in this machine, the principle of which can be better understood on referring to Fig. 38. It can be fitted to nearly every type of machine. A Facile was the subject of our inspection. In an ordinary machine a strong bracket runs out from the fork; to

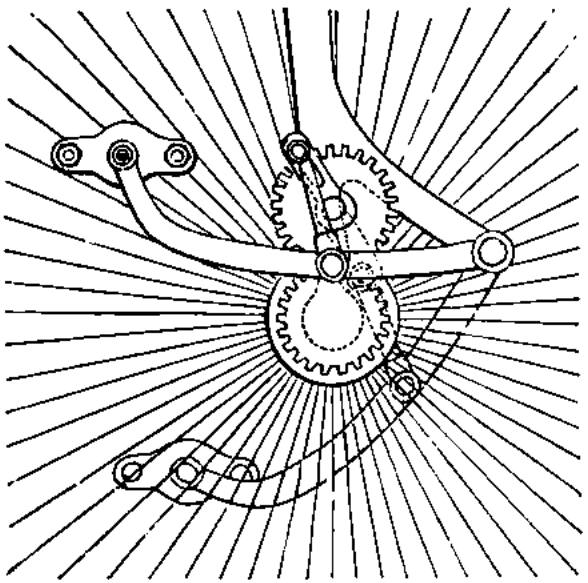


FIG. 38.—THE GRANVILLE GEARING.

this the end of a strong bent lever is pivoted (see Fig. 38). On the end of the axle there is a pinion, or cog, wheel 2⅛in. in diameter. Over this, pivoted to the fork, there is a 3in. pinion (these sizes are changed, according to requirements, for gearing the machine up or down). Attached to the latter there is a short crank, with adjustable slot; this is connected with the

lever by a link arm (see Fig. 38). The action of the pedals is up and down, and the axle pinion is driven by the one above it. It can be made to almost any range of speed, from 40in. up to 50in., or *vice versâ*, or other powers. The machines on which it is supplied by the makers have no special features, and cost £13 13s. to £18 18s., according to quality. The cost of fitting it to other makes depends upon circumstances. When working, the rider is, of course, directly above his work, and the application of power being always behind the axle, greater safety is secured.

No. 42. The Rucker Roadster (M. D. Rucker and Co.).—For a long time the Stanley head has been used by the various bicycle makers with little alteration, but with the Rucker we are introduced to a decidedly benefical change (Fig. 39). In place of the upright of the neck (B B) having centres top and bottom, the ends are only grooved, the lower being a male (*i.e.*, raised), and the top female (*i.e.*, sunk). These are, however, only to a very slight degree. The upright is drilled throughout its entire length, in order to allow a bolt (C C) to pass through. This may be said to form the actual centre. A thread is cut on the lower end of the bolt, to enable it to screw into a recess (E E) in the bottom of the head; the top of the bolt forms a large cone over an inch long, which fits into the boring in the head, the bottom having a raised ridge to fit into the groove mentioned; a thin lock nut (D) at the top secures it firmly, and the whole is nearly flush with the support of the handle (A A). From this description, aided by the illustration, it will be readily understood that the neck works freely on the centre pin, but while the latter is held firmly, top and bottom, the steering cannot become shaky and loose, a most important improvement, and one that increases the rigidity of the whole machine.

The handles are carried in front, and the bar is generally 28in. long by 5½in. above the tyre, and is either straight or bent to order. The ruling feature of the machine—extra strength and rigidity—is carried out in the brake, the spoon of which bears fully 2in. on the rubber, the distance from the fulcrum to the extremity being 5in. The upper arm runs up the front of the head and curves round the boss; the top lever is very strong, and comes out nearly to the end of the handle bar, terminating in a flat portion that is comfortable and easy to grasp. A rubber guard holds it "off" when not required "on." The whole is very strong, and great power can be applied. A dust cap is put to all machines with bright heads. Leg guards, consisting of two rods with balls at the ends, are added. Extra broad forks are employed: they are immensely strong, and taper from 1⅛in. to 1¼in.—an exceptional breadth, but one that goes far towards securing that general rigidity for which the Rucker has long been

noted. For bearings it is enough to say that Rudge's are used, or, failing them, a double ball bearing of the makers' design. They are bolted to the bottom of the fork, and fit right inside the hubs. Seventy is the general number of spokes; they are of 12 gauge, and either screw direct into the hubs, or are laced. Hancock's patent fluted, anti-slipping, moulded tyres are cemented firmly into the steel crescent rims. Either fixed or detachable cranks, with a slot that admits of adjustment to the extent of 1in., are used. A choice of rat-trap or rubber pedals may be

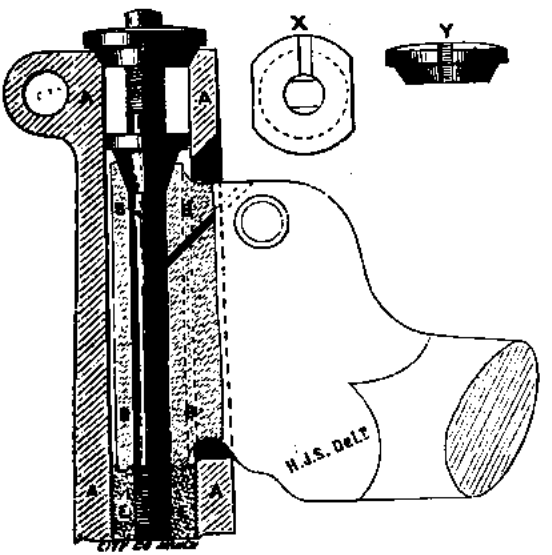


FIG. 39.—THE RUCKER HEAD (Swindley's Patent).

had; they work on ball bearings, and fit close up to the face of the crank, thereby bringing the tread down to only 12½in.

Returning to the framework, we find that the backbone is in keeping with the forks, being round, and 1¼in. in diameter, a size that is retained while following the line of the wheel in a good curve to within 10in. of the end, where it begins to taper. The rear forks are half hollow, and are, with the backbone, wonderfully strong. The rear wheel, unless specially ordered otherwise, is 17in., and is always fitted with ball bear-

ings. No great novelty is introduced with the spring; it has a shackle joint in front, with upward play, while the spring itself is curved and very elastic; the tail terminates in a sharp curl, which is held in a small phosphor-bronze boss attached to the "spine." The step is, however, rather new in design, as may be seen by reference to Fig. 40. A rack, or small rod, with a series of rounded notches, is affixed to the left lower end of the backbone. The boss of the step is shaped to fit the backbone

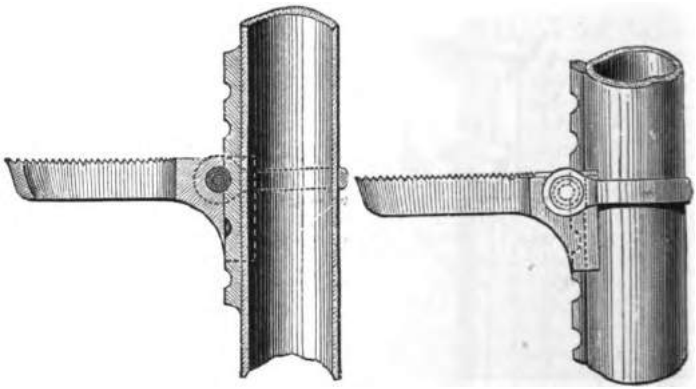


FIG. 40.—THE RUCKER STEP.

and rack, the end being drilled for a taper pin; this passes through the eyes of a collar strap which encircles the backbone, and fitting in a notch, is held by a nut on the other side. By this means the step can be adjusted some 4in., and there is no danger of its slipping. It is a handy and neat arrangement. The Rucker is a thorough roadster of the highest class. The price, for all sizes, enamelled and part plated, £20.

No. 43. The Rucker Racer.—A further improvement on last year's type. The machine we inspected was a very fine-looking 60in., that will doubtless be heard of on the racing path pretty often during the present season. In the construction of the wheels, the popular and successful "laced" spokes are employed; they are of 16 gauge, and are linked through a very small hub, only 2in. deep by 5/8in. broad; they are then carried tangentwise to the rim, spreading out gradually, so that on reaching it there are thirteen other spokes between the two ends

—the strain is thus distributed far better. Hitherto the objection against "laced" spokes has been that they were liable to break just outside the rim. An improvement has been adopted in the Rucker, which does away with this. The nut which holds the end of the spoke within the hollow rims has a projecting tube, or sleeve, which goes over the spoke, extending about ¼in. outside the bottom of the rim; this projects, and materially strengthens the spoke. Warwick's patent rim, with ¼in. rubbers, helps to make up a capital wheel. Light and close-fitting ball pedals are used, so that the tread is kept fairly narrow—under 13in. Good broad hollow forks are put in front; they are at the bottom hinge-jointed to ball bearings, and at the top support the head, with Swindley's patent centres, which having proved successful in the roadster, are sure to do so in the racer. The handle bar is 26in. to 28in. long, and curved or straight to order. No spring is used for the saddle, a clip passing round the backbone bringing it nearer the work, and making it more rigid. A 16in. rear wheel, working on balls, Rucker's pattern, is used behind, and the whole may be pronounced a capital-looking racer. Bicycle making has contributed to increase several branches of trade; but the Rucker was about the first to make a new departure and patronise the cork industry. With a view to save weight, the hollow (bent or straight) handle bars are clothed for 4in. or 5in. with a sleeve of cork. It forms a comfortable hold for the fingers with those who adopt either the "under-grip" or "over grip" when racing, but prevents the ends of the handles being held. Finished, enamelled, and part plated, price £20; weight 25lb. for 56in.

No. 44. The Rucker Tandem Roadster.—Something like a novelty, really the revival, but successful adaptation, of a very old scheme, that of linking together two large bicycle wheels. When previously attempted the difficulty was in steering, as, owing to the rigid connection, the riders used to come to grief at any attempt to turn. This drawback has been mastered by designing a very clever universal joint. First of all, the backbones of two machines are removed. There is a big tubular beam—6ft. to 7ft. long. On the front end of this there is an ordinary centre; this is placed in the head of the front wheel as usual. At the other end the tube tapers and runs into a long case of a small oblong frame, and is held by lock nuts, so that it forms an universal joint, permitting it to twist sideways, and have double action. The frame goes over the head of the rear wheel, and another set of centres are placed in the usual position, and a stump of backbone sticking out at the back supports a saddle on an Arab spring. A step is provided for the back rider, whose handles' knobs are turned back horizontally. The *modus operandi* is for the machine to be

steadied for the first rider to mount; he then moves off, and the seconds one springs up into his saddle. Those who have tried it speak of the very high rate of travelling that can be attained, and declare that the feeling is so akin to that of an ordinary bicycle that the difference can scarcely be detected, save in greatly increased steadiness. The forks of the first wheel are made to slant forward, so that the rider is splendidly above his

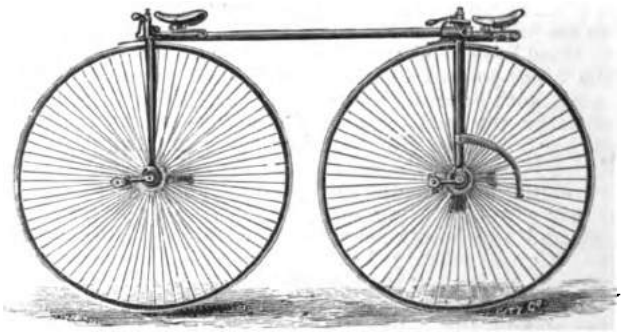


FIG. 41.—THE RUCKER TANDEM ROADSTER.

work (Fig. 41). There is no danger of a direct cropper, but slip up or side falls can be enjoyed. Machines to which the beam are fitted need not necessarily be of the same size. It costs £7 10s., or, with the cycle wheels, £25. Judging by appearances, the Tandem ought to be very fast on either the road or path. We are curious to know its comparative speed on a racing track, with that of a single machine.

No. 45. The Atlas Racer (T. Hancock).—Rigidity combined with lightness has been the aim of the maker in the construction of the Atlas, and he has certainly carried out his task with great success. One of the first features to strike the eye is the handsome large hub, a contrast to the ridiculous little ones that are now being so generally employed, to the detriment of the machines. The Atlas hubs are of an original design, and extremely light, the pair weighing barely ¼lb. They are made from the best light sheet steel, and stamped into shape, so that a recess is formed to allow room for the case of the single row ball bearings.

Tangent spokes, 16 gauge, have been adopted. They are held inside the Surrey rim (hollow) by a long D nut, and are linked

through the hub, about ¼in. from the edge, and, crossing 2½in. from it, they spread to 5in. apart at the rim; this gives a strong resisting strain to the wheel, which is wonderfully rigid. A close tread is secured, as the hubs measure 4¼in. deep by 4¼in. broad, and the bearings are bolted to a solid piece at the end of the fluted hollow forks, which permits of their lying close to the hubs; the cranks and Bown's racing pedals also fit very closely, so that about 12in. will cover the distance between the centres of the pedals.

The backbone is fluted, and is hollow right down to the rear forks; it measures 1⅛in. deep by ⅛in. thick. Gorse's Patent American Head—the racing pattern, a very much lighter type than is applied to roadsters—adds still further to the attractions of this excellent machine. In the American head the centres are held by two bosses projecting behind the head proper, so that the backbone, to a great extent, self steers and assists in keeping the front wheel in a straight line. The pillar supporting the bosses is hollow, and it carries a 28in. straight or bent hollow handle bar. This has wooden sleeves at the ends, and these can be provided with a round cap to prevent the hands being hurt. The spring is very simple—merely a piece of steel hinged to the neck and kept off the backbone by a thick rubber buffer; it is pierced with a number of holes to permit of the saddle being adjusted. The machine is, *in toto*, a first-class one, and a proof, were any needed, that the large firms have not a monopoly of turning out good steeds for the path. The price is exceedingly moderate, only £17 complete, balls to three parts, japanned and part plated; if with an ordinary head instead of the American, the price becomes £16 5s. We found an Atlas, with 55½in. driving and 15in. rear wheels, to scale, all told, under 22lb.

No. 46. The Matchless Roadster (The Bicycle and Tricycle Supply Association).—With the Matchless we are introduced to one of the most remarkable and most meritorious bicycles ever put before the public. While closely following the accepted line of the two-wheeler, its many special points can only receive justice in a lengthened technical notice; we therefore devote unusual space to describing it. The credit of the design and invention of this machine is due to Mr. Nahum Salamon, who, for the past dozen years, has been one of the pioneers of the cycle industry in this country. The present machine is the outcome of the most careful study, every part having been thought out, experimented upon, and altered, till the present pitch of perfection was reached. Vibration, and its attendant train of evils, has been grappled with, and overcome to an extent that would not be thought possible. The means by which this result has been arrived at is by breaking

the rigidity, or rather metallic connection—for rigidity is perfectly preserved—by the introduction of rubber buffers at the various "joints" of the machine. This has been carried out, not merely in one or two portions, but in every possible part. Before passing into details, the general effect of these radical alterations must be considered. Not only is the machine second to none in comfort, but the rubber buffers add immensely to the "life" of the machine, the absence of vibration preventing, to a wonderful extent, the wear of the parts. It is owing to this fact that the Matchless costs less than any other bicycle for repairs, while, after a couple of seasons' hard usage, it will be worth pounds more than many another bicycle will in the usual way, which cost as much, and only did the same amount of work. We have inspected a machine that was ridden over

FIG. 42.—FRONT WHEEL BEARING BOX, WITH RUBBER CUSHION DETACHED FROM FORK.

8000 miles on the road in 1883, by E. Tegetmeier, of the *Field* newspaper, and it was practically as good as new. Yet another point is, that a better pace can be kept up on rough roads than with a rigidly constructed machine.

Taking the bearings first, we find that they are of the double ball type, but different from the usual kinds. The balls are thrown wider apart than ordinary, and work inside the case, which gives increased steadiness and smoothness of running. Twelve are put on each side, *i.e.*, twenty-four to each bearing. The two rows are divided by a central ridge or collar, all parts being splendidly hardened. There are, of course, two outer cones to each case: these screw upon a thread cut on the axle, the inner is next the

hub, and a fixture, that is to say, does not adjust, but can be removed in case of necessity. The outer cap next to the crank has a series of holes in its face, the end of the spanner fits into these, and by turning round the balls are tightened. The inner face of the case has a rounded groove, which fits against the balls, and as the "thread" is of a very fine pitch—twenty-six to the inch—the slightest adjustment can be made. The whole produces a splendidly easy running bearing. It was in this portion that the difficulty of applying the rubber buffers was chiefly manifest. The inner case is deeply grooved in the outer centre, over and into this a stout rubber ring ($\frac{1}{16}$ of an inch thick) fits (see Fig. 42), the lower side of which is shaped like the potential rim, and fits accurately into the groove; the top portion has a wide flange, which spreads over part of the case, forming a raised pad with rounded surface.

The greatest care has been exercised in the construction of the oil hole. A small steel cylinder passes up from the inside, almost flush with the rubber; into this a tube, which comes down from the centre of the outer case, fitting deeply and exactly into the cylinder, shuts off all communication between the oil and rubber. The outer case, or "metal strap," as the maker technically terms it, has a rounded groove inside to fit over the rubber, and is adjusted at the sides. A lug of good length goes up into the fork end, into which it is brazed, being shaped to fit the fluting. This gives an universal joint to the forks, thereby preventing any cross strain on the bearings, which makes them run much steadier and easier. The cranks are detachable, and have a hole drilled through the boss, to allow of a screw bolt passing into a hole in the bearing case, to prevent it turning round. The inner face of the crank is fluted, and the adjustable slot notched to prevent the pedal pin from slipping: the throw is about as usual. Fluted rubber bars are put to the ball pedals. Good fitting is carried out, but the tread is still too wide, about 14in. The wheels present considerable alteration from last year; the gunmetal hubs have been abandoned in favour of small steel flanges, 3in deep by 5$\frac{1}{2}$in. in broad. The spokes are of a fine gauge, but butt-ended; that is to say, that while the actual spoke is 11-gauge, the portion screwing into the hub is 7-gauge. Light steel (solid) crescent rims hold Hancock's patent non-slipping tyres.

The forks are formed of weldless steel tube, very deeply fluted, and tapering from 1$\frac{1}{8}$in. in width at the shoulders, to $\frac{7}{8}$in. at the feet, where the lugs of the bearing cases run into them. The head is neat in form, and has a raised milled ring at the top to relieve the bare appearance. A really good dust cap goes nearly round it, and the little piece at the bottom, a vital point that is usually left unprotected, is not forgotten. Internally the centres are extra long, 4in., and are both "males," and the bottom of the

top screw is formed into a cup (or female cone), which fits over the upper one, infinitely preferable to the old plan of a female centre and male pin; the lock nut and top of screw are countersunk, so that they are almost flush with the top of the head. The whole arrangement is exceedingly firm in action, but free in working. It should be added that the top screw is drilled, so that oil can be injected through the small orifice at the top, after removing the rounded cap nut, without having to open the cover.

We now come to another very important innovation, the support of the handle bar. At the first glance two things are chiefly noticeable: the beautifully-shaped knobs, and apparently very large boss in front of the head, for carrying the centre of the bar, but there is more in both than is shown outwardly. We will deal first with the support or boss: this is made in a solid forging with the head, and it consists of a central projection, 2¾in. wide, with a boss on each side, 1¾in. wide, or a total width of 6in. A ring case screws over each boss; the latter are bored to the depth of nearly an inch, and in these, tubes of rubber 1¼in. long, the walls of which are $\frac{1}{10}$in. in thickness, are placed round the handle bar. The hole, which is drilled through the whole boss, is of ¼in. greater diameter than the handle bar, and it consequently has ⅛in. space all round, and rests entirely on the rubber. When the cap cases are screwed on they press on a small loose cone, which fits over the bar against the ends of the rubber tubes, and, by compression, causes them to swell, making them bind tightly round the steering rod, and holding it perfectly rigid, although the valuable anti-vibration properties are retained. A space is allowed at the ends of the caps for deflection, but this cannot occur to an appreciable extent under any strain put upon it by the rider. A fixed rigidity is not, however, absolutely necessary, as by changing the rubbers it can be altered.

The bar averages 28in. in length. In the knobs we are introduced to another vast improvement; the ends are black, rounded, and beautifully smooth, being made of ebonite or hardened rubber. Inside there is a large pad of soft rubber; this extends nearly an inch beyond the rod, and encircles it throughout. A small metal tube is now placed between the soft and hard rubber at the small end; this prevents the liability to break in case of a fall. The rider thus grasps a firm bar, which is quite isolated from the machine—save by rubber—which absorbs the terrible jarring and shaking that is so common. The brake is well proportioned and accurately fitted. The fulcrum, a stud coming out from the crown of the arch of the forks, is so placed that it gives full power to the spoon, which fits exactly on the tyre, and is well turned up in front. It acts far more powerfully on the fluted than on an ordinary

tyre. The upper arm is bent so as to fit round the boss of the head, and the hand lever comes well out towards the end of the bar.

The main spring is of straight steel, 13in. long; at the front end there is a strong C-shaped bracket; the turn-up top of this supports a bolt, which runs downwards, and has a very large head with raised edge; in this box, which is close to, but does not touch, the neck, the lowest rubber ring is placed, also above this, but separated by a metal washer, another, and then a sort of cap, with a projecting arm on either side, which fits over the rings and keeps them in their place, while the front ends of the spring are linked over the arms. Thus the rider's weight rests entirely on the rubber rings, and annuls vibration. A somewhat

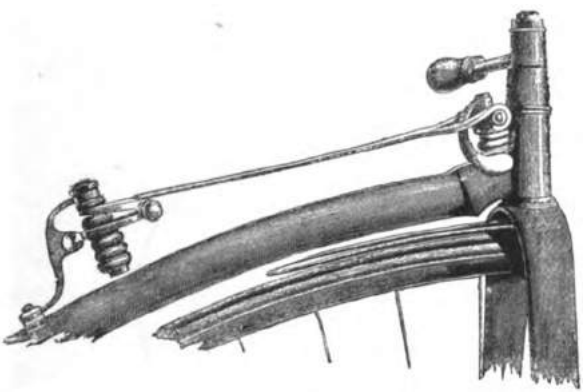


FIG. 45.—THE RUBBER COMPRESSION SPRING.

more complicated arrangement is necessary at the tail, and the bracket is shaped like an erratic F (see Fig. 43), the tail being securely screwed to the backbone; the upper arm supports a bolt, like that described at the front end, and the second arm is bolted to a short joint, which is also bolted to the boss on the lower side of the spring. This forms the connection when there is no weight on the spring, but when the rider mounts, his weight, depressing the spring, slackens the joint and bears on the actal tail end, which has a large oval hole to go round the bolt; it rests on the rubber ring, separating it from the joint. There are also several rings between the bottom plate of the bolt and the joint, and also, one between the tail end and top. The outcome of these devices is that not merely does the rider

gain a delightfully easy resting place, but the rubber supports back and front permit of a certain amount of forward and backward play, and also allow a slight side roll, without any side shake, besides a considerable up and down motion, although by itself the spring is as rigid as can possibly be required.

Of late, considerable attention has been directed by several inventors to the method of attaching the rear wheel, in order to counteract the great amount of vibration coming from it. This has not been forgotten in the Matchless. The forks terminate

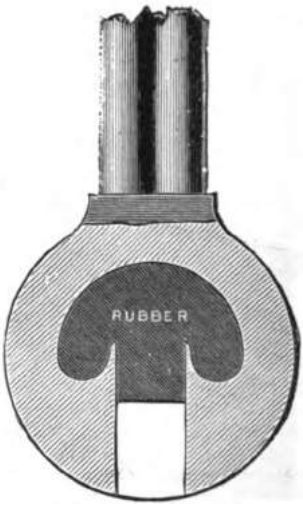


FIG. 44.—HIND WHEEL, FORK END.

in a small flat round disc of metal, which is cut away in the centre to hold a large piece of soft rubber (see Fig. 44), which is kept in its place by two metal flanges; the ends of the spindle (or rear wheel axle) work in metal tubes, and another piece of rubber is put below; the whole is held firmly, and there is no danger of the rubber coming out. The whole weight thus rests upon a rubber cushion, which partly giving to the constant jerky action common to all back wheels, mitigates the evil to a great extent, and almost annihilates vibration. Capital ball bearings are used; they are readily adjusted by means of a

cone. The general size of the small wheel is 17in., with ⅜in. rubbers. The backbone is oval in form and immensely strong; the rear forks are, like the front, hollow and fluted. Each and every portion is made with the most scrupulous care, and, being constructed to scale, are therefore interchangeable. The finish and general construction are of the highest standard of excellence. It is painted and part plated, with ball bearings to the three parts. Considering its special attractions and "monopoly" features, it must be ranked as one of the cheapest (where value for money is considered, and not mere lowness in price) machines in the market, at £18 17s. 6d., for a 50in.

No. 47. The Matchless Light Roadster.—A speciality for 1884. After three seasons' triumphant success with the Matchless, it has been found that many riders are so wedded to extreme lightness that no attractions, however great, will induce them to regard with favour any machine that is above, what was a few years ago the racing standard, 20lb. less than "pounds for inches." To meet the wishes of this, now large section of riders, the light form of the Matchless was brought out. As regards the general framework, it is the same, but lighter, than the Matchless. The wheels are, however, different, having hollow felloes, with ⅜in. non-slipping tyres. Laced spokes are also adopted, light small steel hubs, and rat-trap ball pedals (rubber if preferred). With these exceptions, our former description applies. Although light, it is quite strong enough for all ordinary purposes. It is also painted, with all bright parts plated. Price £20; weight, 34lb. to 36lb. for a 52in.

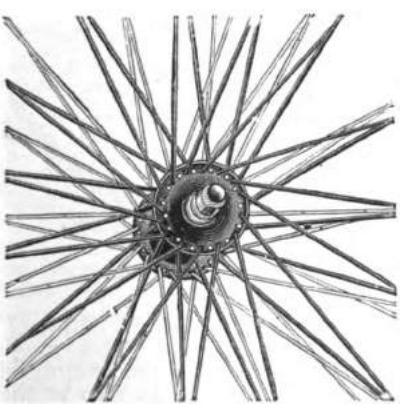


FIG. 45.—THE PIONEER LACED SPOKES.

No. 48. The Pioneer Racer (H. J. Pausey).—We very

much doubt if there is a single firm amongst the smaller makers that has a better reputation for a first-class racing machine. It is no more than Pansey deserves, for he works hard to keep his machines in the front rank, and it is certainly "a feather in his cap" to have built the two machines which finished first and second in the fastest amateur handicap on record.

Within the last year the machine has been entirely revised,

FIG. 46.—THE PIONEER RACER.

and laced spokes form a special feature. In the Pioneer, a very fine 17-gauge wire has been adopted. These are passed through the small steel flanges of the hub (2¾in. by 5¼in), which are made in one piece with the solid axle, and then at the ends headed to 13-gauge (the exact difference in size being ·056 and ·095 of an inch); on the thicker portion a worm is cut, enabling it to be screwed into a D shaped nut within Warwick's hollow

rims. Thus no strain is thrown on the weak portion, and the wheel is made generally stronger. Red moulded ¼in. rubbers are cemented into the front, and ⅜in. into the rear (also hollow) rims. The spokes, after linking through the hub, cross at ⅜in. from it, where they are laced over and under each other, and again cross at 4in. from the edge of the flange (see Fig. 45)—thus forming a double tangent, and at the rim, the ends of

FIG. 47.—THE PIONEER SEMI-RACER.

each spoke have nine others between them, making the wheel splendidly rigid.

Bown's racing bearings are hinge bolted to broad strong forks, which have a good square leg and "ring" shoulders, *à la* Humber, giving great rigidity. The hollow steering-rod is nicely curved (see Fig. 46), and has cork sleeves, to form a grip for the hands, with a plated cap at the ends. The large oval

backbone is brought right up to the head, the neck being short but neat. A clamp encircling the backbone holds the saddle instead of a spring. Fixed (solid) cranks are used, but they have an adjusting slot for the ball rat-trap pedals. The tread is very narrow, only a shade over 12in., and tells very strongly in favour of the machine. As we have already pointed out, it is a first-class machine, and well worth the attention of any racing man. It is finished enamelled nearly all over, the few bright parts can be plated, and the price is £20 2s. 6d., any size. We found a 58in. to weigh just 25lb., while a 52in. frequently comes out at about 20lb.

No. 49. The Pioneer Semi-Racer.—Built somewhat stronger throughout; this type has spokes two sizes larger, 15 gauge with 11-gauge butt ends. They are laced in the manner just described, and Warwick's rims are also adopted, but they have ⅞in. and ¾in. rubbers. The hubs measure 3¼in. deep by 5in. wide, and are in one with the axle. A good curve is given to the 27in. hollow handle bar; the brake has a capitally shaped spoon, and an efficient dust cup is put to the head.

In order to gain increased elasticity, the fore-end of the spring is double curled round a bolt passing through the neck, the tail works on a shackle (see Fig. 47), and a block of rubber is put between the spring and oval backbone. A light and convenient form of adjustable step is put to these machines. In other details it is identical with the Racer—and when we placed a 52in. on the scales, they recorded exactly 30lb. Finished enamelled, various parts plated, and balls to the three usual places, the price is £21; if with straight solid bar, cones rear wheel, plain pedals, £18 5s.

No. 50. The Pioneer Roadster.—Another degree of strength, and with large gunmetal hubs, direct (butt-ended) spokes, Warwick's Potential (solid) rims, and other details as in the lighter types, price, balls, three parts, enamelled part plated, £19 5s.; with hollow rims, £20 10s.; or straight bar, plain pedals, painted, solid rims, &c., £17.

No. 51. The Wanderer Roadster.—Another machine by the same maker to suit those with shallower pockets. It has Stanly head, &c., solid rims, good sized gun-metal hubs, direct spokes, plain pedals, ordinary details and finish. A good strong machine. Price, with balls to both wheels, £12 10s. All this group of machines are subject to 10 per cent. for cash, which makes a considerable difference in their cost.

No. 52. The Express Semi-Racer (J. Devey).—Without going in for fancy finish or expensive etceteras, a good honest

machine is produced at a very low price—strong enough for touring, light enough for racing. The Express has a good light steel backbone, hollow forks to both wheels. Small rubbers (⅛in. and ¼in.) are generally used but where the machines will be mainly used as a roadster a size larger can be substituted; they are held in crescent rims, and seventy-two 12-gauge spokes run direct into the gunmetal hubs, which measure 5in. wide by 4½in. deep, and are recessed to receive the case of the bearings, so that the tread is narrow. A good long handle bar, dropped or straight, has a capital break; detachable cranks are also included. With the bright parts plated and Rudge's ball bearings to the three places the price is very moderate indeed—£12 12s. for any size. A 52in. scales about 34lb.

No. 53. The Express Racer.—Minus the brake, but with hollow felloes and generally lighter than the foregoing, it will be found a very fair machine for use on the path. Bown's Æolus bearings are put to the wheels and pedals. It is painted and part plated. Price £12.

No. 54. The Extra Special Express Roadster.—Somewhat more substantially built for road riding. The rubbers are ¼in. and ⅜in.; the bar is "dropped," and the brake has an extra long spoon, making it very powerful in action. The other sundries include ordinary spring, Brooks's saddle, Premier (adjustable) step, Rudge's ball bearings to all three parts. As regards the finish, it is nickel plated all over, even including the lamp and bell, which are presented with each machine. The price, including all, is £13 for a 54in.

No. 55. The Special Express Roadster.—Plainer in finish than the Extra, being light, all bright, or painted. It has direct spokes, large gunmetal hubs, Æolus ball bearings to both wheels, plain pedals, hollow forks, &c. Price, 52in., £8.

No. 56. The Express No. 1. Roadster—The wheels are the same as in the Special, with ordinary balls to the front, cones to the rear wheels and pedals. Solid forks, Stanley head, and general details, complete a very cheap machine. Price £6 10s. for a 52in.

No. 57. The Workman's Friend, or Express No. 2 Roadster.—Aptly named; it ought indeed to prove a friend to working-men, and solve the problem of cheap fares in getting to and from work. Plain hardened parallel bearings are put to the front wheel, cones behind. Good strong wheels are made up with rather large direct spokes, solid forks, crescent rims, &c. It has a front wheel brake, plain saddle and spring. In short,

it is a strong and reliable machine, being wonderfully cheap at £4 10s., for which it is painted and part bright.

No. 58. The Star No. 3 Roadster (J. Stanton).—A registered pattern of bearing, designed by Stanton, is fitted to the front wheel. A grooved sleeve or collar is put on over the axle, and in this a double row of balls, separated by a cage or perforated collar, work. Adjustment is made on the Sheffield system, by screws which pass through projecting lugs at the sides. This plan is a slight modification of that applied to the Humber and other makes a few years ago. A strong hinge joint attaches the top of the case to the bottom of the broad hollow forks; ball pedals and detachable cranks are used, but they are not closely fitted, as the tread measures 14½in.

The hubs are of gunmental, 5½in. wide by 5in. deep, and direct spokes radiate from them to the crescent rims, which have rubbers of the usual sizes. Enormously long handle bars are used, the one we saw being 30½in.; the head has long centres, which are protected by an efficient dust cap; front brake of the ordinary type. The spring is curled in front, to give more elasticity, and the tail works in a dovetailed slide. The machine looks a strong roadster. Price, three parts plated, and with balls to both wheels and pedals, £12 12s.; weight, 52in., 43lb.

No. 59. The Star No. 2 Roadster.—The same pattern of balls in front, but with cones to small wheel and pedals, smaller hollow forks, no dust cap to head, 26in. bar, commoner rubbers, hubs 5½in. wide, 4in. deep. Finished, painted, and with parts bright, otherwise like No. 3. Price £6 10s.

No. 60. The Star No. 1 Roadster.—Single balls to front wheel, hollow front forks, fixed cranks, solid forks and cones behind, single slide to spring. Painted. Price £5 10s.

No. 61. The Star No. 5 Semi-Racer.—A lighter edition of No. 3, being a semi-racer. Price £12 12s., weight, 48in., 32lb.

No. 62. The Original Star Roadster (J. Parr).—The wheels have Warwick's new patent hollow rims, direct spokes, and grey rubber tyres of the usual sizes. In the front double ball bearings; the balls are put as far apart as possible, to give greater steadiness to the wheel; they adjust from the sides and go right inside the hub, so that the pedals (also balls made by Parr) are not far apart. On the outside face of the bearing case there is a groove, so that the face of the crank boss can fit close into it and keep out all dust and grit. The weldless tube, of which the backbone is formed, is of 16-gauge, *i.e.*, the thickness of the walls (or sides) are equivalent to a 16-gauge spoke, or

·065 of an inch. Perched on this there is a spring somewhat after the Humber type. The rearmost portion turns three times, and to the central curl the end of the flat spring is attached by a bolt; the front is fixed fast to the neck. It rides very "easy," especially when surmounted by a suspension saddle. The machine may be relied on as a good one. Price, painted and part plated, with ball bearings, £16.

No. 63. The Flying Eagle No. 1 Roadster (H. Matthews).—A choice is given of either Bown's or Rudge's ball bearings for both wheels, which also have hollow forks; in front they are bolted to the bearings, and are topped by a Stanley head, with bent bars, long centres, &c. The spring works on a shackle, and about sixty 12-gauge spokes are put into the wheel, which has crescent rims and moulded rubber tyres. Other details as usual. Hubs, handle bar, and cranks are plated. With ball bearings, &c., the price is £12 10s.

No. 64. The Flying Eagle No. 2 Roadster.—A lower-priced variety of the same. The backbone and forks are lap welded, Andrew's centres are put to the head, and the bars are "dropped" at the ends, and have a front brake. The cranks are detachable; plain bearings to pedals (which have a very wide tread—14in.); the spring is arched and curled in front. Ball bearings (not Bown's or Rudge's) are put to both wheels, but the general finish is not so good as No. 1. Price, any reasonable size, £9.

No. 65. The Royal Mail Semi-Racer (Royal Machine Manufacturing Co., Limited).—A splendid machine, fit for use on the road, well under 30lb. weight, and, what is still more important, a tread under 12in.! These two much-to-be-desired ends are brought about by skilful manipulation on the part of the makers.

Taking the wheels, we find that the best piano wire, of 15 gauge, is exclusively used, and that seventy-two spokes are put in the front, and twenty-four in the rear wheel. Three forms of rim are used, Warwick's, the Surrey, or the Royal Mail. The spokes are threaded through holes in the hub, and are carried back, tangent-wise, to the rim. About 4in. from the edge of the hub, where they cross, they are bound together, thus virtually giving a 12in. hub, and making the whole wheel much more rigid and strong; they are then held by nuts inside the rim. We are glad to see that the ridiculously small hub has been given up, and its place taken by one of reasonable dimensions—4¼in. deep by 5¼in. broad—but by splendidly close fitting of the ball bearings, fixed cranks, and ball pedals, the tread is only 11¾in.—a commendable degree of "narrowness" we have never known lessened with a hub of similar width.

Broad strong hollow forks are surmounted by the ordinary, but light made, Stanley head, with long centres. The bar is 28in. over all, being bent as desired, and can be made adjustable as in the Roadster (see Fig. 49). There is a good lever brake. The spring is simple and light, and the saddle either Brooks's or suspension. It is generally finished with a coat of black enamel, with parts plated, and is A1 in every respect. We found a 55in. to register only 28½lb. on carefully tested scales. Price, all complete, £19 10s.

No. 66. The Royal Mail Racer.—Our description of the Semi-Racer applies to this—save that it is lighter and is without a brake. Since last year, very little change has been made. Every part is beautifully constructed, and fined down

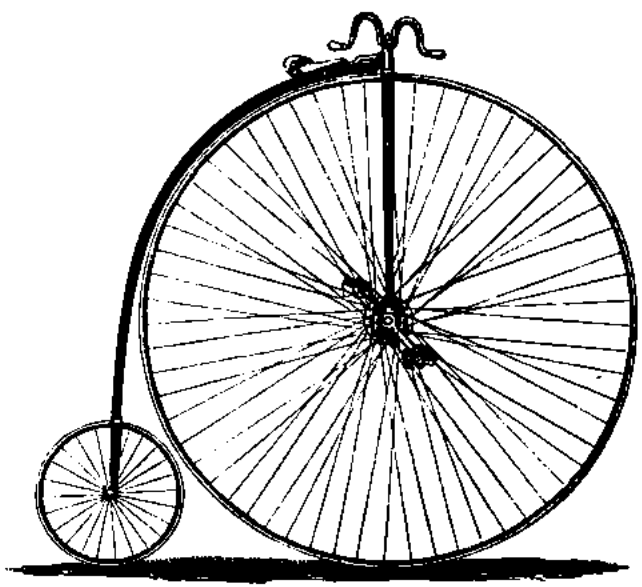


Fig. 48.—The Royal Mail Racer.

as much as possible. The Royal Mail felloes are used, with ¼in. and ½in. rubbers; the pedals have a 5in. throw, which can be extended ¼in.; the tread is under a "foot" (12in.), and the *tout ensemble* is pleasing in the extreme (see Fig. 48). Balls

are, of course, put to the three parts, and the machine is enamelled and plated. The two we weighed were above the standard, being 26lb. for both a 53½in. and a 54½in., the average weight being some 3lb. lighter. The price is, for any size, £20.

No. 67. The Royal Mail Roadster.—Not less worthy of attention than the two preceding types is the Royal Mail Roadster (Fig. 49). It is, of course, much stronger throughout, and has a very special point, which has long been a characteristic feature in this machine—from the commencement—it is that

FIG. 49.—THE ROYAL MAIL ROADSTER.

of an adjustable handle bar, which may be of any shape or length. The boss in the centre is supported by a clamp, which fits into a slot cut in the front of the Stanley head, and is secured by bolt and screw (see Fig. 50). This permits the steering rod to be lowered or raised about 2in., a change

which will often prove of considerable service. Every detail of the machine is thoroughly well made; but not differing from the recognised lines, we need only say that it has direct spokes, solid felloes, hollow forks to both wheels, an efficient brake is

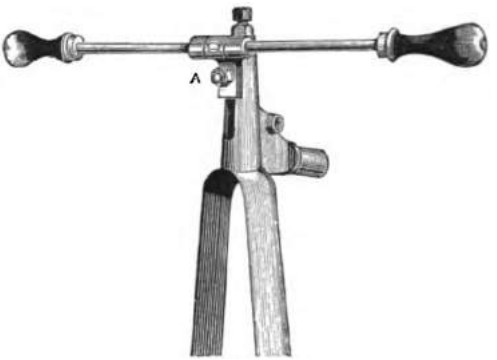


FIG. 50.—THE ROYAL MAIL ADJUSTABLE HEAD.

also to be found, and the entire machine is a roadster of the best class. It is enamelled, part plated, and has ball bearings to the three usual parts. Price only £16; or, at the London office, about £13 12s.

No. 68. The Duplex Excelsior Hollow Fork Roadster (Bayliss and Thomas).—The present machine does not differ very essentially from that described last year. It retains the old open head, the hollow forks going right up, from the knuckle joint which attaches them to the bearings, to the handle bar; the length of the latter is regulated by a very wise rule, the length being made one half the height of the wheel, *i.e.*, a 54in. machine has a 27in. bar, a 50in. a 25in., and a 60in., one 30in. long. Very long centres are put in; they work between the upper and lower bridges, or cross pieces, joining the forks as before. The brake has a long spoon and lever that enables it to be easily and powerfully applied.

Double ball bearings are used in lieu of single, as the D. E. H. F. is essentially a roadster. Special care has been taken to make them strong, easy running, and durable. Spherical orbs of hardened steel to the number of fourteen, each measuring $\frac{5}{16}$in. in diameter, are placed in the front bearings; they work in deep grooves cut

in a collar which screws on over the axle; they are also separated by a perforating cover or "cage," and the outer case has grooves to receive the balls. Adjustment is made on the Sheffield system, by screwing together projecting lugs at the sides of the case. For the rear wheel a system of single balls, very much on the usual plan, but placed well within the hubs so as to be practically dustproof. Ball pedals also form part of the machine; they are capable of the usual adjustment by means of slots in the detachable crank.

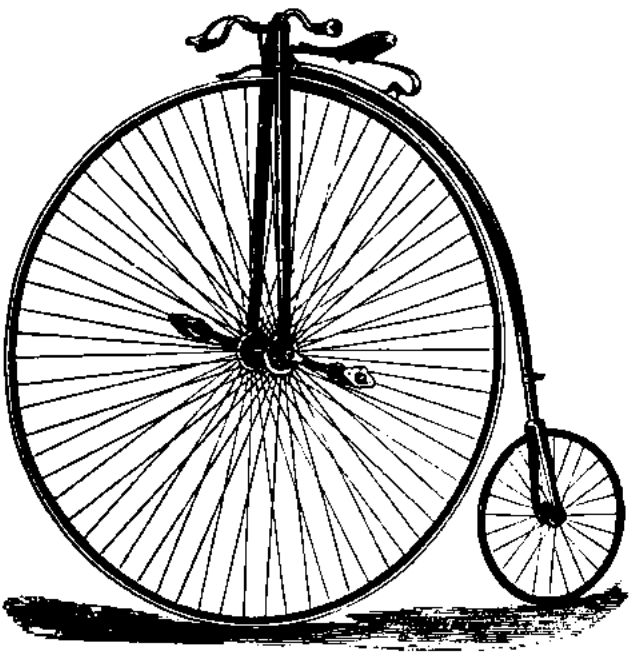


FIG. 51.—THE DUPLEX EXCELSIOR HOLLOW FORK ROADSTER.

The handle bar, of a new design, goes in front of the top of the forks, and the centres are adjusted by turning a ring cap beneath it. The bar, however, screws into each side of the top boss, and either half can be removed for renewal. The step is worthy of notice: it is made in one piece, and bent to fit close round the tail of the backbone, to which it binds by means of a small cone

and socket, while it is additionally held by a screw bolt. The part to receive the foot is roughed, and affords a good purchase in mounting. Thick ended spokes—now an assured success—are put into the wheels; the parts screwing into the gunmetal hubs, which measure 5½in. wide by 4½in. deep, are of 10 gauge, while the spokes themselves are 13 gauge only. This gives the advantage of a strong piece to screw into the outer part of the hub flange; the ends come through, and are, with a special tool, cut off evenly. We need not comment on the workmanship and materials, which are of the very best. There are not many other special features; the tail of the spring is curled round and linked to a boss holding a rubber block (see Fig. 51), giving a very easy motion to the saddle. Another evidence of its thorough roadster qualities is to be found in the tyres, the front being full 1in.—the rear ⅞in.—of best Para rubber; these are a little heavier than the ordinary size, but are of great advantage on a country road in mitigating vibration. The price, part plated (hubs, spokes, spring, &c.), and with ball bearings to the three parts, is, for a 52in., £19 10s.; without ball pedals, and part bright, £17.

No. 69. The Victor D.E.H.F. Roadster.—In general details it closely resembles the machine just described, but is lighter throughout, having smaller tyres, either fluted or red Para, and butt-ended spokes increased in number, but of a lighter gauge. The handle bar, bent or straight, is held in a boss in front of the head, and can be easily detached if required. It is 10s. lower in price than the D.E.H.F., and some 5lb. lighter.

No. 70. The Victor Excelsior Roadster.—The admirers of the open head being restricted in numbers, this type of the Excelsior caters for a larger circle. Its general features are identical with those of the preceding machine, with the exception of one important feature—that of the head. The Stanley, with very long centres, is employed. Price and all other details as in the foregoing.

No. 71. The Duplex Excelsior Roadster.—The leading type of 1882, now relegated to fourth place. It is a "stock" machine, and no deviation from the standard pattern is allowed. The outline is akin to that of the D.E.H.F., with plainer details, but hollow forks to front and rear are preserved, with detachable crank and step; also the ball bearings to both wheels. One alteration is to be found in the spring, which is of a different design to those described, being more of the ordinary type. The finish is "painted and part bright," and the price £14 for a 52in.

No. 72. The Excelsior No. 3 Roadster.—A low-priced machine, to meet the demands of those who wish to purchase from a leading house, but whose means are limited. The head is of the Duplex pattern, but the forks are solid; plain bearings are put to the front and cones to the rear wheel. Painted in two colours, the price is £8 for a 50in., £9 for a 56in.

No. 73. Our Boys' Excelsior Roadster.—A capital "knockabout" steed for the rising generation, being simply a smaller edition of the Excelsior No. 3, very strongly built to withstand the rough usage it is sure to receive from juvenile embryo cyclists. Price, 34in., £6 10s.; 40in., £7; 46in., £7 10s.

No. 74. The Victor Racer.—Although we remember inspecting a beautifully light (for that time) racer, built by Messrs. Bayliss and Thomas, in the early part of 1875, they have not laid themselves out to produce racers until this year. Not to be left behind by their rivals in trade, the Victor has been placed on the path, and it will bear comparison with those well known to fame. It possesses all the usual "points," such as laced spokes, hollow felloes, balls to the three parts, small rubbers, &c., beautifully light, enamelled, and part plated. Price £18 18s. up to 54in., £19 10s. over that size.

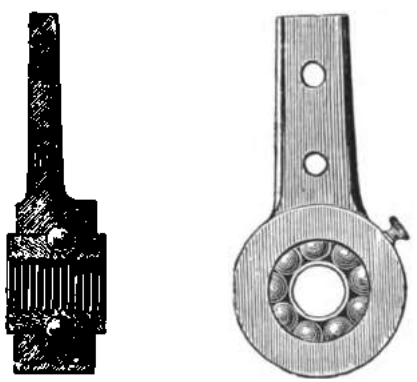


Fig. 52.—The Jumbo Ball Bearings.

No. 75. The Jumbo Roadster (W. Hough).—A remarkably low-priced machine, that has very few, if any, superiors at the price. Prominent amongst the specialities not usually found in machines that cost so little are the single ball bearings.

These are manufactured by Hough, and are so simple that they are not likely to get out of order. The nine balls and parts in which they work are hardened, so that they not only run freely but last well (see Fig. 52).

Fixed cranks are keyed on the axle; either rat-trap or ball pedals can be had, and the wheels have gunmetal hubs, direct spokes, crescent rims, plain rubbers, &c. A strong front brake and simple slide tail spring, together with leg-guard, are fitted to the machine. Cone bearings are put to the small wheel, and parallel to the pedals. The forks are solid, but of course the "spine" is tubular. Choice of painting, in two or three colours, is also given to purchasers of this wonderfully cheap machine, which is priced at only £5 10s.

No. 76. The Jumbo No. 2. Roadster.—Another cheap mount, and a boon to working men who desire quick transit, but are unable to meet the expenditure necessary to procure an ordinary machine. By substituting parallel for ball bearings in the front wheel, and making a few other minor alterations, the price is brought down to £4 10s. for any size.

No. 77. The Special Florentine Roadster.—The best of the quartett of bicycles built by Hough. It has the same ball bearings to front as in the Jumbo, and the option is given of either balls to the rear wheel (which averages 14in. to a 46in., 16in. to a 50in., and 20in. to a 56in.), or a specially

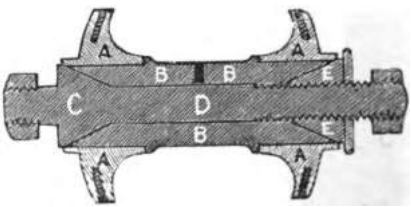


FIG. 53.—THE FLORENTINE REAR WHEEL CONE BEARINGS.

good form of cones, specially made by Hough (see Fig. 53). The front wheel gunmetal hubs are well recessed, in order to permit of the bearings fitting closer. In addition to being keyed on, the steel cranks are further secured by neat caps being screwed over the ends of the axle. Either bent or straight bar is fitted to the Stanley head, and the front forks are hollow. A good saddle, with valise, stop bell, wrench, &c., are included with the machine, which is handsomely painted and

varnished, and half plated, for the moderate price of £10 for a 50in., the price rising and falling 2s. 6d. per inch.

No. 78. The Florentine Roadster.—Minus some of the more expensive details, but retaining balls to both wheels, and the "Humber" shaped Stanley head, &c. The price is £2 10s. less than that of the Special, *i.e.*, £7 10s. for a 50in. It is finished painted and varnished, or all bright.

No. 79. Our Boys' Jumbo Roadster.—This machine is meant for the younger division of riders—say from eight to twelve. The details described in the Jumbo No. 2 apply to it, only it is much lighter, to suit the "feather weights" who will use it. The price is, up to 26in., £2 12s. 6d., or, up to 30in., £3 3s.

No. 80. The Bristol Roadster (T. Morgan).—An inspection of the machine shows it to have the noted Surrey hollow felloe, with ⅜in. and ½in. rubbers. The number of spokes, 12 gauge, is regulated by the size of the wheel—"ten over its height in inches" is the rule laid down by the maker. Thus, a 54in. wheel will have sixty-four spokes, and so on, *pro rata*. The hubs, gunmetal, 4¼in. deep by 5⅛in. broad, are well recessed to receive either Rudge's or Bown's ball bearings, and with the neat detachable cranks and Bown's ball pedals, a very nice-looking wheel, with a tread just under 13in., is made up.

Bayonet-shaped forks (hollow) taper from the bearings, to which they are bolted, to the Stanley-Andrews head, which has a 26in. bar, with cross handles. Instead of terminating in the ordinary knobs, the portions to grasp are turned at right angles (although not claiming to be new, we saw the same shape about ten years ago); they are greatly liked by many riders and a novelty to the majority. The spring is broad, and the tail works smoothly on the oval backbone. 16in. is the general height of the trailing wheel, which has ⅜in. rubber and ball bearings. A good front brake, Lamplugh and Brown's saddle, and neat step, complete a capital machine, which is finished painted (balls to three parts) at £15 15s. for a 54in., rising and falling 5s. per inch; and a 56in. scaled, including a bell, 37½lb.

No. 81. The Conqueror Safety Roadster (Thompson and Spence).—Combining a commendable attempt at safety with a daring departure from the recognised lines of build, the Conqueror presents several remarkable features; the most striking of these is the total absence of the usual cross steering-rod. This is accomplished by altering the construction of the

forks. Instead of running direct from axle to head, they pass behind the former, and are joined to it by a short arm and ball bearings. Below this they are carried 9in., then outwards and upwards, and run up parallel with, and some inches distant from, the forks. At the top they support independent handles, which can be made adjustable in either height or position. This arrangement leaves the bicycle quite open-fronted, so that danger from a cropper need no longer be feared, as, in case of a tip up, the rider is merely thrown forwards, on his feet, clear of the machine, and not mixed up with it, as is generally the case with ordinary bicycles. Of course, if the speed was very high, the rider, when landed on his feet, might, if he did not run on quickly enough, have a scrambling fall, but it would be neither severe nor a cropper; and it would only be an exceptional rate of travelling that could produce this result. This end is gained by the machine having an open front, there being room for the rider's legs to work between the forks and handle supports. When the rear wheel and backbone are raised, the saddle is canted forwards and the rider is slipped off; the feet naturally leave the pedals, the hands instinctively loosen hold of the handles, and, there being no confining cross bar to retain the legs, the rider is merely shot forward, lighting on his feet on *terra firma*. With so long a supporting rod, and divided handles, they are, as might be expected, not so rigid as the ordinary continuous bar, but still they are quite strong enough for general use.

With the remainder of the machine it is not necessary to deal at any length; its component parts do not differ from others. Suffice it to say that it has crescent rims, direct spokes, ball bearings to both wheels, &c. The one we inspected had an ordinary Stanley-Andrews head, but in future this will be cut down, or made, by a disc or plate, with bearings, so as to offer still less obstruction to dismounting, by intent or accident, in front.

When mounting, or in the saddle for the first time, there is a feeling of insecurity; but it is merely fancy, the outcome of ideas long associated with the old cross bar. This false impression soon passes away, and its place is taken by a knowledge of immunity from croppers. The ordinary size of machine, or smaller, can be ridden, and it weighs "pounds for inches," but coming improvements will materially reduce this. The price is not yet definitely fixed, as it is intended to form a large company to work this and other patents of Messrs. Thompson and Spence, but will range from £16 to £20, according to finish and extra details.

No. 82. Keen's Eclipse Racer (John Keen).—One of the first points of this machine to catch the eye is the peculiar

looking hub, which is hollowed and cut away, leaving a sort of shoulder to receive each spoke, these projections giving the appearance of nipples. By this means the benefit of a large hub, without the weight of one, is secured.

The Eclipse racing pedal is decidedly the lightest yet made; it is in the shape of a Maltese cross. On the front end of the cross-piece there is a clip, into which the toe of the shoe fits. They run on ball bearings, only weigh about ten ounces per pair, and are held in the usual adjustable slot in the fixed cranks. With these, riders cannot miss or slip their pedal.

Ball bearings are put to both wheels; the cases of those in front are welded to broad hollow forks, which run up to the Andrews-Stanley head. The steering-rod is very much arched, and the spring lies close to the oval backbone, which is very graceful in outline and neatly tapers down to the small wheel. The last-named is generally 16in. Small-sized rubbers are cemented into hollow felloes, and every part of the machine is constructed with the greatest care and in a manner that does the ex-champion every credit. One part specially worthy of praise is the splendidly close tread, the importance of which has always been recognised by Keen; with a hub 5¼in. wide we found it to measure only 11¾in. With a 5in. hub this would be brought down to within a shade of 11in. The price of the Eclipse, painted or enamelled, with balls to the three parts, is £15 10s.; if part plated, £16 10s., which makes it one of the very cheapest in the market.

No. 83. The Eclipse No. 1 Roadster.—Stronger and heavier in every way, with broader and thicker hubs (tread 13¼in.). A block of soft rubber is put to the end of the spring, and 1in. rubber is employed for the driving wheel. It makes a first-class strong roadster. In general details, save that it has ordinary rubber or rat-trap ball pedals, it is the same as the Racer, which it also resembles in price.

No. 84. The Eclipse No. 2 Roadster.—A strongly built machine, with hollow forks, tubular backbone, &c., and balls to the front but cones to the rear wheel, plain pedals, &c. The framing is of equal merit to the No. 1, but it has no expensive details, and the price is £10 when painted all over, a sum it is well worth.

No. 85. The Period Racer (S. Davis and Co.).—In order to bring the rider close to his work, a decidedly novel plan is resorted to. As will be seen on referring to Fig. 54, the oval backbone, instead of being continuous, stops at 11in. from the head, where it is joined to a light frame in the form of two flat bars, which are bent down on each side of the

driving wheel, and, close to the head, are bent up again to the neck. Running from the end of the backbone to the neck, there is a very stiff rigid spring, coming within ¼in. of the tyre. It is of the greatest importance that this must be perfectly stiff and inflexible, as, were it to bend and touch the tyre, a disastrous cropper would be the inevitable result. The plan described brings the saddle from 1in. to 2in. lower than usual, and consequently permits a larger wheel to be used, to the extent of from 2in. to 4in. High wheels are certainly an advantage, but scarcely so great as some imagine. One disadvantage of this plan is that sharp turns cannot be taken, or the wheel would rub against the side bars of the connecting frame. It, however, permits of sufficient latitude for ordinary purposes. The remainder of the machine includes broad, rigid, hollow forks to both wheels, ball bearings to the three usual

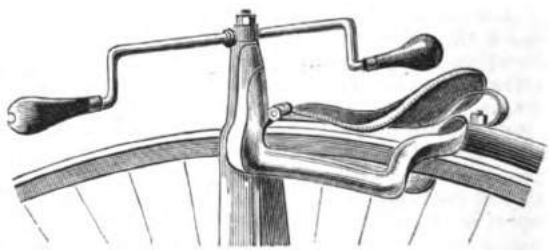


FIG. 54.—THE PERIOD RACER BACKBONE AND SPRING.

parts, ¼in. tyres, 5-gauge spokes, screwing direct into hubs of a sensible size—4½in. deep by 6in. wide—considering the latter, the tread (13in.) is narrow. The machine is enamelled, part plated, and has the usual details. Price £18 18s., any size.

No. 86. The Period No. 1 Roadster. — A stronger machine, with the ordinary backbone and spring, stouter framing, and larger tyres than the Racer; otherwise the same. Price £15 15s.

No. 87. The Period No. 2 Roadster. — Heavier in build, and finished all bright except rims. It has a shackle joint to the fore end of the spring and balls to both wheels. Price £12 12s.

No. 88. The Period No. 4 Roadster.—A plain, common, but strong make, plain bearings, &c. Price £6 10s.

No. 89. The Climax Roadster (W. G. Lewis and Co.).—Although established for ten years, this firm have scarcely done themselves credit in the way of bringing their name before the public. At the recent Sportsman's Show, in London, they were to the fore, and the present machine excited favourable comment. Without any startling deviation from the accepted "lines," it is decidedly worthy of attention. Either Rudge's or

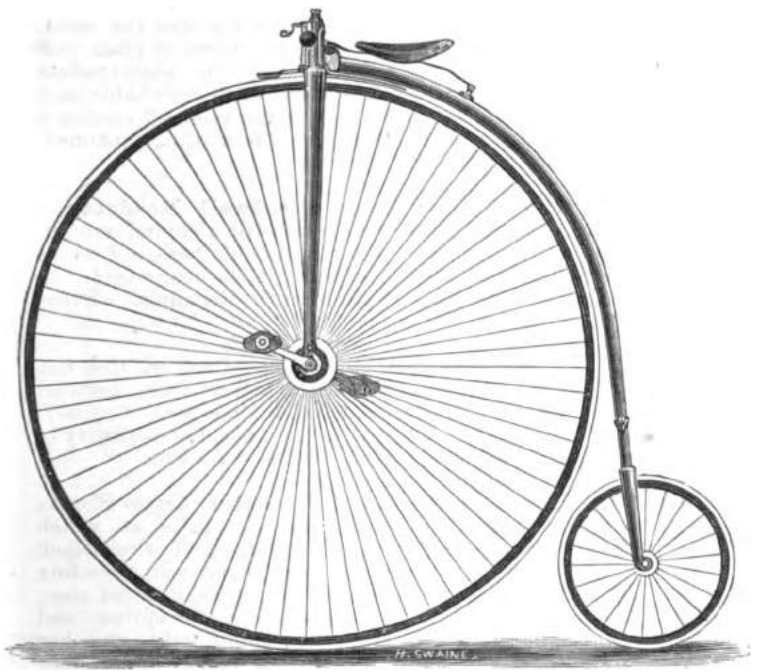


FIG. 55.—THE CLIMAX ROADSTER.

Bown's bearings are put to both wheels and pedals. Hollowness is carried out as far as possible, and the felloes, forks (front and rear), handle bar, and, of course, the oval backbone, are all of weldless tubular steel, the front forks being of a particularly neat shape. Direct spokes run direct into good large hubs (see Fig. 55), and either the patent fluted or moulded tyres

are employed, according to the choice of the purchaser. The machine is nicely japanned, and will be found a really capital roadster, complete, with all improvements. Price £18 18s., any size.

No. 90. The Hollow Fork Britannia Roadster.—A companion steed to, but lower-priced than, the Climax. The handle bar is generally straight, and is either divided, *i.e.*, each half screwing into the central boss, or continuous. The same capital forks are retained, and the wheels are also the same, except that the felloes are solid and the tyres of plain red rubber. Ball bearings are put to both wheels; the (plain) pedals are either rubber or rat-trap. The cranks are detachable, and the spring works on a shackle joint at the tail, and carries a first-class suspension saddle. The price for a 52in., japanned, is £14 10s., rising and falling 5s. per inch.

No. 91. The Hollow Fork Speedwell Roadster.—Lower in price than the foregoing, but still a capital mount. It is chiefly in detail that it differs. Double balls are to be found in front, and hardened steel cones in the rear wheel. In other respects it is like the Hollow Fork Britannia. Price, painted, £11 10s. for a 52in.

No. 92. The Speedwell Roadster.—Last on the list, and least in price, substituting solid for hollow forks, parallel for ball bearings, and lap-welded for a weldless steel "spine;" and having shorter handle bar, keyed on cranks, lower quality of tyres, &c. The price is cut down to £8 10s. for a 50in.

No. 93. The Advance No. 1 Roadster (James Beech).—Another example of the remarkably low price at which machines can be turned out in the capital of the Black Country. All the ordinary features are embraced, including fluted rubber tyres, hollow forks to both wheels, crescent rims, detachable cranks, adjustable step, Arab cradle spring, and suspension saddle. The machine is strongly built, and has either Bown's or Rudge's bearings to the wheels and pedals. Direct spokes and large gunmetal hubs are used, and it is finished painted, with the bright parts plated. Price, any size, £11 7s. 6d.; if plated all over, £12 10s.

No. 94. The Advance No. 2 Roadster.—Both wheels have Bown's Æolus bearings, plain pedals, hollow forks, bent handle, detachable cranks, lap-welded backbone, plain spring, terminating in a barrel slide. The sundries include an alarum. The machine can be had either bright or painted. Price, any size, £8.

No. 95. The Working Man's Advance Roadster.—Strong, if roughly built; no fancy finish, but meant for hard work. With roller bearings to the front wheel, cones to rear, solid forks, hollow backbone, front brake, spring saddle, valise, bell, &c., £4 10s. is the sum charged for any size.

No. 96. The Pilot Roadster (Hickling and Co.).—The wheels of this well-known roadster have unusually well-shaped hubs, of a good deep colour, well bellied out inside, recessed

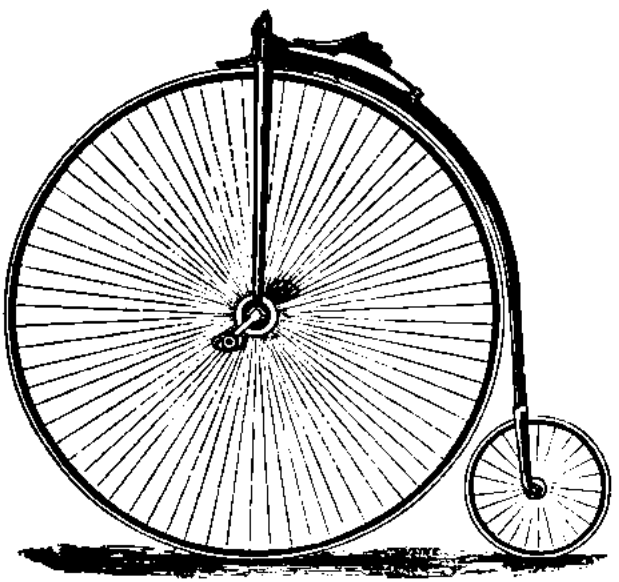


FIG. 55.—THE PILOT ROADSTER.

outside, and with straight edges; they are nearly the full width, 5⅝in. by 5in. deep, and receive seventy-two spokes of 11-gauge, screwed direct. The tyres (⅞in. and ¾in. for the respective wheels), are, in addition to cement, wired into the crescent steel felloes, and this process is very carefully carried out, so that the wire is not likely to cut upwards through the rubber—an objection that used to be very frequently urged against this principle of securing tyres. With so firm an attachment no fear need ever be felt about rubbers becoming loose.

The front wheel has double ball bearings, adjustable at the side, and the bearing case, instead of having the shank, or upright portion, in the middle, has it on the outside; this allows the bearing to be put right inside the hub and the forks to be brought close down beside it. The cranks are generally fixed, and rat-trap pedals are used. Fine broad hollow forks, instead of seeking a line of beauty in a finely-drawn taper, keep very nearly the same width all the way to the bearings, the shank of which is slipped inside, and a neat attachment secured; they possess great strength and rigidity. The head is a good pattern of the Stanley, and an excellent dust cap is fitted over the opening. The handles, instead of being straight or of the "crumpled horn" type, bend down more than an inch at the ends, but in a flowing curve rather than with a sudden turn, and the appearance is decidedly improved (see Fig. 56). A good strong brake is used, and the lever brought well out towards the horn knobs, so that it can be grasped without removing the right hand from the end of the steering rod.

The steel backbone is kept hollow all the way down, and the usual semi-hollow back forks are in every case adopted. Bown's ball bearings are fitted to the 17in. rear wheel. Lastly, with this machine is introduced a simple but efficacious spring; the tail is jointed to a boss on the backbone by a hinge bolt, and is a fixture, so far as any sliding movement is concerned. The front end is free, and passes under a shackle, joined to the neck, but rests on a small plate, which is supported by a block of rubber. The elasticity of the spring allows the end to slide forwards a little, enough to break the jolting; but it has another and more important motion, only to be discovered by getting into the saddle. We have frequently spoken of the advantages derived from a rolling saddle; the same effects are to a great extent produced by the Pilot spring. The whole machine is made in the firm's best style, and is decidedly the foremost of the several varieties they turn out; it is a thorough roadster, about 40lb. or 42lb. for a 54in., and costs, with balls to both wheels and pedals, bright parts plated, and detachable cranks, £19 15s.

No. 97. The Globe Roadster (R. Collins).—Without putting forward any novelty, all the accepted "cardinal points" are adopted. Bown's ball bearings are used throughout, and patent fluted tyres are cemented into hollow felloes. Good sense is shown in retaining a large gunmetal hub, which receives the direct spokes. Very broad hollow forks support the Andrews-Stanley head, which is provided with an efficient dust cap. A brake of unusual power is fitted. The spring has the Humber curl at the tail, and, being topped by a Long Distance saddle, is consequently very comfortable. The other

details include detachable cranks, hollow rear forks, &c., and the price, enamelled and part plated, is £17 for a 52in., rising and falling 5s. per inch.

No. 98. The Nancy Lee Roadster (South London Machinists' Company).—Considering all the extras included, a remarkably cheap mount. The wheels have hollow felloes,

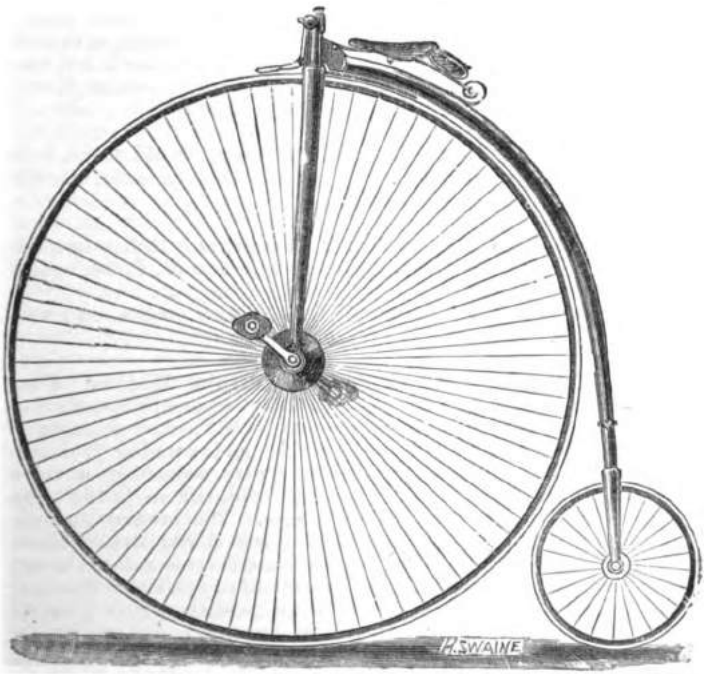


FIG. 57.—THE NANCY LEE ROADSTER.

fluted tyres, seventy to eighty direct spokes, with large gun-metal hubs, 5in. deep by 6in. wide, hence the feet are rather far apart. Bown's Æolus balls are to be found in the pedals, in addition to both wheels. Bayonet-shaped hollow forks are put to both back and front. The Andrews-Stanley head and front brake are of the ordinary type, and the spring is a modification of the Humber. The oval backbone curves gracefully to the rear wheel (see Fig. 57). A choice of three forms of saddle,

including the Long Distance, is given. A first-class King of the Road or Salsbury hub lamp. Cyclist's wallet, continuous alarum, wrench, oilcan, &c., are included. The net price is, all enamelled or part bright, only £12 12s.; if with plain pedals, crescent rims, and ordinary tyres, £10 12s. 6d., which includes extras worth about £1.

No. 99. The Eagle No. 1 Roadster (J. Sprunt and Co.).—A low-priced London-built machine, with ordinary rubber tyres (⅝in.), hollow front forks, bolted to Bown's bearings, detachable cranks, plain bearing rubber pedals. The brake has a long spoon, dust cap to head, ordinary spring. Price, painted, with bright parts plated and balls to both wheels, £10.

No. 100. The Eagle No. 2 Roadster.—Solid forks, balls to both wheels and simple barrel slide to spring; otherwise like the foregoing. Price £7 10s.

No. 101. The Eagle No. 3 Roadster.—Roller or plain bearings to front and cones to rear wheel, solid forks, rubber pedals, &c. Price £5.

All this group have gunmetal hubs, direct spokes, and very long handles.

No. 102. The Shakespeare Triple Hollow Fork Roadster (D. Carter and Co.).—This machine is founded on the same principle as the celebrated D.H.F., and consists of three small tubes, placed side by side, and running from the bearings to the handle bar. Riders may remember a triple hollow fork machine, in Liverpool, in 1878, but in it the tubes were placed in the form of a triangle. The present machine made its first public appearance at the last (1884) Stanley Show, and by its general merit and careful construction created a very favourable impression amongst Metropolitan cyclists. The long centres of the open head work between bridges, which join the forks, and are held for adjustment by the top dome-headed screw. The spring works on a barrel slide, on the oval or round backbone. Fluted hollow forks are put to the small wheel. Light-gauge spokes screw into large gunmetal hubs. The hollow handle bar is either bent or straight. Ball bearings are put to the three parts, and the wheels have hollow rims and fluted or moulded rubbers. The machine is a genuine first-class roadster, finished painted and part bright. Price, 52in., £18 10s.

No. 103. The Mercury No. 3 Light Roadster (Mercury Machinists' Co.).—An exceedingly neat, light, and high-class roadster. The wheels have the popular laced spokes, wire of a light gauge being adopted, with hollow rims and small size (⅝in.)

rubbers. The framing is also light, both forks being hollow, and the light backbone either oval or round. The spring is a light form of the Humber, and the Stanley head has Andrews centres and front brake. The whole machine is lightly and well built, and has a very neat appearance. It is enamelled, with the bright parts very well plated. Price, any size, including ball bearings to the three parts, £17 10s.

No. 104. The Non-Vibrating Safety Roadster (S. Hall).—A praiseworthy attempt to overcome the vibration and mitigate the shaking of machines when on rough roads. This desirable result is obtained by placing springs under the axle, so that the whole weight rests upon them. Outside the ordinary forks there are auxiliary forks. These, at the top, join a sleeve or case, in which the head slides, with the "give" at the bearings. The outer forks, whose mission is to give extra rigidity, are attached by a hinge joint to the bearings. The inner, or main forks, are solid at the bottom, where they each join two guard rods, passing on either side of the axle; below this there is an extension of the bearing case, with chambers to receive the rods, which are joined by a light cross piece, to prevent them rising too high. Underneath this cross rod there are two very powerful coil springs. The weight of the rider and frame of the machine rests entirely on these springs; hence the rigid connection is broken, and instead of a bumping jerk in passing over an obstacle, only an undulating motion is felt. The amount of play allowed to the front wheel is $\frac{1}{10}$in., and $\frac{1}{4}$in. to the small wheel, which works upon a somewhat similar principle. The slide rods are covered with an oval leather or rubber tube, to prevent dust entering. Unluckily for the inventors, they could only show, at the recent cycle exhibitions, this plan applied to an old machine which had been knocked about in experiments; therefore it did not create so favourable an impression as its merits deserved. We have had it put to a severe test, and it answers capitally. The remainder of the machine is of the ordinary detail—a well-built strong roadster, with 1in. rubbers. The patent can, if desired, be applied to existing machines.

No. 105. The Adjustable Safety Roadster (J. Hawkins).—Riders whose cycling experience will carry them back to the early days of the wheel movement will, on seeing the Adjustable, be struck by the resemblance it bears to the old Phantom, not only in appearance but in the fact that it steers by both wheels. The framing is complicated. Rods run back from the bearings of the front axle, forming a loop round the wheel, which is joined by light rods coming down from the shoulders of the fork. These support the pedals and chain

pulley on the crank shaft. This lower frame, by adjusting the upper rods, can be raised or lowered to suit riders of different heights. A backbone, much longer and stouter than usual, runs to the rear wheel; this is just half the size of the front—20in.—has a Stanley head, and is steered in unison with the driver by the 30in. steering rod. A chain runs from the crank pulley

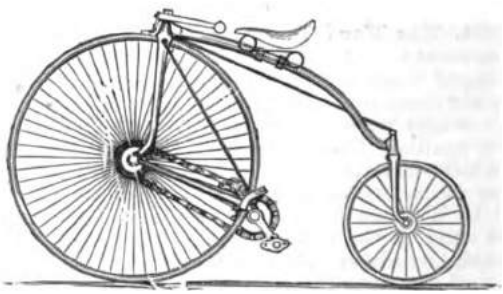


FIG. 58.—THE ADJUSTABLE SAFETY ROADSTER.

to a smaller one on the 40in. front wheel, gearing up considerably (see Fig. 58). By using two chains a speed and power gear may be formed. We fear, for the sake of the inventor, that the machine is not likely to find many admirers in these days of simple neatness in cycle construction. The price is, painted, and with usual details, £18 10s.

No. 106. The Desideratum Safety Roadster (Bramley and Co.).—Yet another addition to the ranks of geared-up dwarf machines. It has the usual features of that class. The driving wheel, however, is extra small—36in., geared to equal 50in.; the cranks, pedals, and lower chain pulley are supported by a continuation of the forks below the axle, which brings the feet very close to the ground. It has ball bearings, and is painted and part bright. Price £12.

No. 107. The Automatic Safety Roadster.—Somewhat on the same principle as the Autistemi, which we described and condemned in "Bicycles of the Year, 1883." In front of the handle bar there is an arrangement very like the old Timberlake ratchet brake. On winding down this, two rods with rollers at the end fall down and spread out like the arms of an octopus. When in this position the Automatic can be mounted; by a skilful evolution, a start can be effected. the rods, by turning the steering bar, gathered up, and the

machine ridden off. By exercising care and reducing speed to a minimum the arms may be let down without dismounting. This is, we opine, another case of misapplied genius, as we do not think it likely that any rider would encumber himself with 8lb. or 10lb. extra weight which is not likely to accomplish the end in view. It can be added to existing bicycles for £2 10s. The remainder of the machine does not call for special notice.

No. 108. The Belgravia Roadster.—A good ordinary machine. A very large number of spokes are put into the front wheel hub, which is surely the minimum size likely to be used, being only 2in. in diameter. Having reached almost a vanishing point, we trust a reaction will now set in in the size of hubs. In this case it is strengthened by a ring 4in. in diameter, through which all the spokes pass. The wheel seems very strong. Numerous improvements are adopted, including all the best points, balls throughout, hollow forks, &c. One novel feature is added—the backbone is utilised to carry a large supply of oil. It is poured in high up and can be drawn off low down to replenish the lamp! It is finished painted and part bright. Price, any size, £12.

No. 109. Carr's Two-Speed Roadster (Walthamstow Cycle Works).—One of the latest attempts to gain two speeds and free pedals with the bicycle, although the maker was awarded a premium at a workman's exhibition for an invention having a somewhat similar object in the "boneshaker period."

In general appearance, the machine resembles the Devon, but it is far more complicated in detail. The hubs are in one piece, with a tube connecting them, which forms a sleeve over the inner axle. To this inner spindle or axle the left crank is attached. On the *right* side, from the hub, a sleeve extends through the bearings over the spindle; to this is attached a 3in. pinion wheel, having forty teeth; a strong oblong case covers this and supports a 2½in. pinion with thirty-five teeth. Beyond this there is a short crank to make it of equal length with the other. The smaller pinion is attached by a hinge joint, which runs forward, like an extra lever, following up the idea of the beam in Watt's engine.

When in ordinary driving the Planet pinion is out of gear, a small rack clutch attached to the case gears into the pinion wheel or spindle and locks the parts together, making it work like any ordinary machine.

In front of the head there is a small lever, like the reversing handle of an engine, with a spring catch acting in a three-stop quadrant. The lever is connected by a light rod running down inside the fork. At the bottom of the *left* fork a small piece is

cut out in order to give room for a screw stud, held by a nut, to run through the fork lengthwise from front to rear. To each end of this stud a stop is attached by a bell crank to a sliding collar on the spindle. The collar is of two sizes and is slightly reduced next the boss of the crank, which forms a shoulder, against which it works. When the lever is in the upper "stop" the machine drives at its normal speed. On moving into the second "stop" the collar frees both pedals, which are therefore "free," and form foot-rests. Moved into the third, or lower, the collar is slid along the spindle and the planet pinion is thrown into connection. This gears the machine up to 70in., more or less, as required. The parts are somewhat complicated, and require detailed drawings to make them understandable. The future will alone prove if Carr has solved the problem of geared-up large machines. Ball bearings are put to all parts, and the machine has the usual details. Price £20.

No. 110. The Devon Safety Roadster (the Exeter Bicycle and Tricycle Co.).—One of the oldest and simplest of safety bicycles. We need not traverse the oft-travelled road of general details beyond saying that they include balls to front wheel—if added to the levers and trailing wheel it would be a great improvement—hollow front forks, moulded tyres, crescent rims, gunmetal hubs, direct spokes, &c. It is with the special details that we have to deal. First and foremost these include the safety arrangement of pedals. Instead of being attached to the ordinary pin, they are joined by a short arm to the adjustable slot of a bent lever, which is pivoted to the pin. The latter can be adjusted in the usual manner, and the front end, extending some inches beyond, is pivoted to a long light rod, which runs up to near the top of the shoulders, where it works freely on a bolt.

By this arrangement, as in the 'Xtra, the pedals (which have a rocking motion) are always behind the axle, hence the pressure exerted does not tend to overbalance the machine in front, and it is therefore almost proof against croppers. The backward position of the pedals permits the saddle being put further back, and, with more rake, secures a much safer seat for the rider. Moreover, the brake can be applied with full strength, and a higher—consequently more comfortable—spring used. In steering the feet give but little help and the work must be done by the hands. Minor details of the machine can be altered to suit individual requirements. It is finished painted and part bright. Price £16; if with the Swindley patent centres, £17; or part bright, £2 extra.

No. 111. The Brixton Merlin Safety Roadster (the Brixton Cycle Co., Limited).—This bicycle differs widely from

any other dwarf machine in the market, power being generated by a most ingenious and original method.

Revolving free on the axle, at each side of the wheel, there is a drum, containing Thresher's patent clutch, which is in action something like the Cheylesmore, and round it is coiled a leathern strap, 1¼in. broad by nearly 24in. long; it is firmly secured to the drum, and is always coiled once or twice round it; the other end is fastened to the pedal lever (see Fig. 59). When the pedal lever is depressed, the drum is locked to the axle, and, therefore, the full power applied to the wheel.

FIG. 59.—THE BRIXTON MERLIN SAFETY ROADSTER.

Attached to the pedal lever there is a strong coil spring. The downstroke stretches this spring, and on pressure ceasing there is sufficient "storage of force" to at once raise the pedal. The extra power required to expand the spring does not add perceptibly to the work.

The whole action of the pedals is quite unique. They are quite independent of each other, and, if wished, both can be

pressed down together, or any length stroke taken—from a "pat" of 1in. to the full throw of 13in. Attempts have before this been made to gain a quick return action, but they have always proved failures; here, however, it is successfully carried out. The action of the spring lifts the pedal very much quicker than it would rise in the ordinary manner. This permits of the next stroke being commenced before the previous one is finished. There is thus no dead point or pause between the strokes, which continually run on.

An increase of speed can, generally speaking, only be gained by a corresponding augmentation of power and friction, which annihilate all the advantages reaped; hence the non-success of all geared-up bicycles. In the Merlin there is a great increase of speed, or, rather, the wheel is geared up without any greater friction, while the labour required to drive it is not proportionate to the results obtained. There is only a minimum of friction; even the coiling of the straps is done by a spring, which does not affect the running of the machine. As the straps uncoil more than one round of the drum, they therefore propel the machine a greater distance, and the 40in. or 46in. becomes equal to 60in. By using longer straps and keeping a reserve of three coils on the drum, power can be increased for hills or heavy roads, or altered at will.

A flat bar, secured to the boss of the bearings, runs down below the axle, with a slight bend to the front. Two studs project from this bar, one at the bottom, the other 13in. higher. These regulate the length of the stroke, or are the limits which cannot be exceeded. Both are clothed with thick rubber, to prevent a jar if the lever strikes them. The pedal levers are 15in. long, the front ends being secured by long conical pins to the ends of two rods running out from the frame, which act as supports, and curve downwards to a point some 8in. or 9in. in advance of, and 4in. below, the axle. At about the middle they are attached by a broad plate and screw to the straps. The last 4in. of the bar is curved upwards, and at the end there is a flat pedal of the Facile order. It merely consists of an iron bar, rubber clothed, with a raised flange at each side to keep the feet from slipping off, and is adjustable.

As regards ordinary details, the wheels are from 40in. to 46in. front, and 17in. rear, having moulded rubbers and crescent rims. The front hub is small and very narrow, but not much breadth is required, as the weight is not applied from above—more from behind and low down; besides, so low a wheel is not liable to 'buckle." Bown's bearings are applied to both the back and front wheels. The tread is the narrowest of any bicycle in the market, being only 8½in.; this, in a great measure, accounts for the power the rider can put forth, in addition to the work being directly beneath. There is another point; in ordinary machines

the rising pedal to a certain extent has to lift the foot, which acts as a check; here there is nothing of the kind, all the power expended being utilised. The rider can also take every advantage of any falling ground, as, the wheel being free on the axle, the pedals may remain at rest any moment. Price £15 15s.

No. 112. The Waverley Roadster (The Otto Company, Limited).—Mr. Otto, the talented inventor of the Otto bicycle, has produced another startling novelty, which is claimed to give "elastic spokes." The principle adopted is to make each spoke act as a spring by corrugating it—that is to say, instead of being straight, it is passed through a machine which gives it a series of bends or corrugations, producing a "wavy" appearance—hence the title. The advantage is that each spoke acts as a spring, and the vibration, instead of running directly along the spoke from felloe to hub, and thence all over the machine, partly flies off at each wave in the spoke, so that very little reaches the hub. Those who have tried it—but we have not yet heard an impartial verdict—speak of it in glowing terms, and state that the absence of vibration is most remarkable. The invention is as yet too new to pronounce a definite opinion upon, and before doing so a practical test is required.

Another idea is carried out to prove a new theory in wheel construction. Mr. Otto contends that the ordinary construction of a cycle wheel is that of two wrongs trying to make a right. In other words, the spokes running into each hub endeavour to pull the wheel out of truth, or to alternate sides. Mr. Otto constructs his "wheel of the future" with a central hub, into which spokes run straight from the rim, and are screwed up very tight and rigid. An equal number (making seventy-two in all) screw into each side hub, but these latter are much slacker than usual. The contention is that the central row of spokes hold the wheel straight, and that the side ones merely prevent it from buckling, or becoming untrue. There is, however, a more important point gained—or ought to be gained—that of an exceedingly narrow tread. This will be understood when we state that the total width of the hub is only 3¼in. wide by 4½in. deep. Of course, with proper fitting, this ought to permit of a tread only 10in. for an ordinary bicycle. This would be an immense advantage, and make a wonderful difference in speed in either short or long distances. If the principle of the wheel is only correct, it will on this account alone, putting the "wavy" spokes on one side, be an assured success. Unfortunately, the machine we inspected was only an experimental one, and the makers did not do justice to their improvement; indeed they, by want of close fitting, quite annulled any benefits arising from their narrow hubs, as the tread was 12in., or even wider than the Royal Mail, Humber,

Rawson, Rudge, Keen, &c., and other good makes, with a much wider hub. When they learn the secret of close fitting, and not until then, can the Otto hub be considered on its merits.

Of the rest of the machine we cannot speak, as the details were not complete at the time of going to press, but it will be of the usual pattern of a first-class two-wheeler. If they can put a racer (or roadster) on the market with a 10in. tread, and equal in all other respects to established machines, particularly as regards lightness and rigidity, a brilliant future awaits it.

No. 113. The Otto Safety Roadster.—Within the last three years great alterations have been made in various portions of this machine, which is now a marvel of ingenious construction. It will be remembered that the Otto differs widely from every other bicycle in the market, the arrangement of the wheels being totally different, as, in place of a small wheel following a large, two large wheels are placed side by side, the rider sitting between them, above and behind the axle. The pedal shaft being near the ground, and driving power communicated by bands, the *tout ensemble* looks like a rear-steering tricycle minus the small wheel, this effect being heightened by a safety tail or backbone. The axle extends right across the machine, both large wheels free running upon it.

The wheels are of ordinary construction, red rubbers, crescent rims, &c., but have the new "wavy" or anti-vibration spokes—described in the Waverley—from which great things are claimed; the outer gunmetal hubs are of the general size, and slightly recessed, so that the nut does not project; the inner hubs (*i.e.*, those next the rider) are skeleton, and much larger—11in. in diameter. These are provided with a projecting flange, which has a deep groove (¼in. wide), and lined with soft rubber, so that the driving bands—endless steel ribands, with cross ribs—will "bite" better. A stout tubular rod runs from the axle to the pedal shaft (at each side), but is not continuous, as would appear from a cursory glance, as it only extends to within a few inches of the pedal shaft, from which a rod runs up it, and slides freely inside the tube, a coil spring acting against the end of the latter and the boss of the shorter rod. The tube hiding the spring from sight and keeping it in a fixed position, unless when acted on by another light bar, which is attached to the lower portion of the handle bracket, and joins the short arm within 3in. of the pedal shaft. This bar or rod is really one of the most important points in the machine, and forms the actual attachment between the pedals and wheels. Identical handles are placed at each side, and immediately below them the principal mechanical action is found.

The fitting of the intricate portion is beyond praise, and reflects the highest credit on the manufacturers. By turning

the handles outwards the connecting rod is drawn up, and, of course, with it the pedals are also brought nearer the axle, which has the effect of loosening the band, and allowing the pedals to remain at rest in running down hill. If the handles are turned inwards the pedals are thrust farther away, and the bands tightened—either side acting independent of, or in conjunction with, the other. Check guards are placed on the boss of the handle supports to prevent them being turned too far. The pedal shaft is 27in. long, and the ends work in either plain or ball bearings; the cranks have a 5in. throw, the pedals

FIG. 60.—THE OTTO SAFETY ROADSTER.

&c., being as in ordinary machines. On each extremity of the shaft an 11in. chain pulley, which forms a lower drum wheel, is placed. These are of the same size as those on the inner hubs, or, by altering the respective sizes, the machine can be geared up or down, and have similar grooves (also rubber-lined), to receive the steel bands. They are, however, of very novel construction, being formed out of only two pieces of metal joined together. Spokes, rim, and hub are all one. The whole is extremely light and very strong (see Fig. 60).

A new strap brake has been adopted, which can be applied with

great force, quite locking the wheels, if necessary. In appearance the handles are double, a second and smaller pair being placed within the main ones. The latter are for the purpose of applying the brake; and they are so contrived that the connection with the brake does not interfere with their proper working. The lever handle is easily reached by the fingers, and can be held without strain or inconvenience; it is linked by a short flat rod, which works through a guard, to the arm of the strap lever. It works on a large flange, projecting from the driving drums. In steering the brake should always be applied slightly—tightened on the inner, and slackened on the outer, side of the circle.

The axle on which the wheels run is a fixture, and from the centre of it the backbone, which has a more graceful curve than formerly, runs down; the end of this is now provided with a rubber tyred wheel, about 3in. in diameter by 1in. broad. This is an improvement, as it greatly lessens the bump felt when the machine is tilted backwards. At the point where the tail joins the axle a large hollow screw is fixed, over which is fastened the plate supporting the saddle, by means of a very broad curl spring and coil spring in front; it can, of course, be suited to any height, and is exceedingly comfortable.

A good amount of luggage, hung from the axle, can be carried—far more than on any other bicycle, a special round leather case being provided for this purpose. Where a too difficult hill is met with—but all ordinary inclines can be readily scaled with ease—the backbone may be turned over, forming a handle, by the aid of which the machine may be pushed or pulled up. The steering power of the Otto is unrivalled; it can be spun round in its own length, and no sweeping curve is required to negotiate a corner, as the machine may be swung round directly. It also works backwards as easily as forwards, and is not liable to upset, for one wheel may run over a brickbat without disturbing the equilibrium. The general measurements of the Otto are: Total width, 38½in.; wheel tracks, 30½in.; between handles, 21in.; while the length to tip of tail only exceeds the size of the wheels by a few inches. A strong 54in. roadster weighs 90lb., and costs £22. The weight, however, is not felt in the least, so it need not be set up as a detriment to the many attractions of the Otto.

No. 114. The Rudge Racer (D. Rudge and Co.).—The wheels of this machine have laced spokes. They are between 14 and 15 gauge, and are linked through a light steel hub, 5in. by 4½in., and carried back tangent-wise to the hollow rim, which is made from rolled tube, and holds a ¼in. rubber. The steel axle is solid but light, and the cranks, which are keyed on fast, only give one fixed throw to the pedals, generally 4¼in.;

but this is regulated to order, or even the usual adjustment can be provided if wished. As a proof of the splendidly close-fitting, we may mention that the machine we measured was only 11½in. from centre to centre of pedals, this being "record" for a machine with a 5in. hub, and one that gives a rider an incredible advantage over a wide tread. As a matter of course, the noted Rudge ball bearings are used to all three parts, the new racing pedal being particularly good. The front hollow forks are broad from the bearing case, to which they are bolted right up to the shoulders, where they join the Stanley head, which has long centres, and is beautifully made. ⅞in. is used for the handle bar, which is curved a good deal. The spring lies very close to the round backbone, which terminates in hollow rear forks. Altogether the machine stands in the front rank of racers. The price for all sizes is £18 10s.; this includes being coated with Harrington's enamel, and a few bright parts, hubs, pedals, and handle bar, nickelled. The machines we scaled were a 56in. 27lb., and 51in. 25lb. For the present season they are some 4lb. lighter.

No. 115. The Rudge No. 1 Roadster.—The same description may be applied to this, save that it is generally stronger throughout, has fluted tyres, ⅞in. and ¾in., fixed cranks, adjustable slot for the ball pedals, a good spring, working in a slide at the tail, and an efficient spoon brake. It is enamelled, with all bright parts nickel plated, and the price complete is £18 10s., at which it must be ranked as very cheap, being the same as the Racer. We found a 52in. to scale 35lb.

No. 116. The Rudge No. 2 Roadster.—A machine which competent judges will, on a careful examination, pronounce to be "remarkably cheap." It is indeed worth "pounds" more than the vast majority of other machines at the same price. It differs in several points from the Racer and Roadster No. 1, having direct spokes, gunmetal hubs, ⅞in. tyres, good front brake, straight handle bar. All hollow parts—the backbone, front and rear forks—are of the best weldless steel. A short but pliable spring is, at the tail end, hinged to a dove-tail slide. Ordinary details complete the machine, which is, in workmanship and material, equal to its higher priced *confrère*. Rudge's ball bearings are put to the three parts (plain pedals £1 less), and is finished, painted, with bright parts. Price only £13. If with Harrington's enamel, Arab spring, and detachable cranks, £14.

ACCESSORIES.

Introduction.

THE improvement in lamps is the most noticeable feature in accessories. Now every lamp of any merit can be both lit and the wick turned up from the outside. Salsbury side "prisms" are also noticeable, as they entirely do away with the usual back lights.

Saddles have also made a great advance, and the application of lever tension quite overcomes the previous objection to suspension saddles.

In general sundries, Dunn's Patent Odometer is perhaps most noticeable as a very perfect form of distance recorder. Wrenches have received an important addition in the "Lion-mouth." A number of cheap enamels have lately been put on the market, and although they do very well for restoring a common machine, or touching up a damaged one, they are, of course, not equal to the splendid enamel put on by Harrington. Increased consumption has brought about improvement in the burning quality of oils, and the "Comet" brand may be singled out for honourable mention. On the whole, however, accessories offer but little subject for remark.

Bells and Alarums.

No. 1. The Challis Stop Bell (Challis Brothers).—The body of this bell is of the sleigh-bell pattern, and either 1¼in. or 2in. in diameter. It is supported by a spring bracket, which holds it at an angle, so that the clapper hangs near the side and rings with the slightest vibration. In order to render it silent, the clapper—a heavy metal ball—is secured to a copper wire cord, in turn fixed to the shoulder of the bell. There is, on the upper shoulder, a round hole, slightly smaller than the ball, and inside a spring on each side; the space between these is considerably less than the width of the ball, which has to be pulled sharply up, and is held securely by them against the hole in the

"roof" of the bell. When required, the clapper is instantly

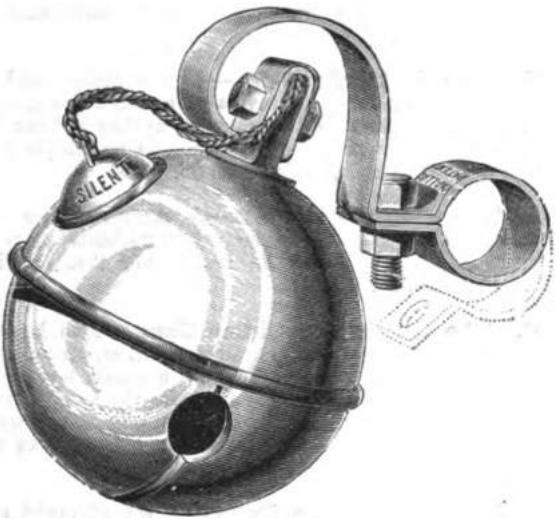


FIG. 1.—THE CHALLIS STOP BELL.

released by a touch of the finger. The appearance is shown at Fig. 1. which is nearly full size. Price, 2in., 2s. 6d.; 1¾in., 2s. 3d.

No. 2. The Robin Hood Whistle.—A horn tip formed into a whistle; nice looking, and very good for giving a loud shrill blast.

FIG. 2.—THE KING STOP BELL.

No. 3. The King Stop Bell (J. Harrison).—Conical in

form (see Fig. 2); the clapper is connected with a small lever on the top of the bell, on turning which it cannot ring. Harrison is the oldest maker of bells in the trade, and turns out every description.

No. 4. The Butterfly Bell.—The cheapest and most simple alarum yet made. It consists of a small gong, 2¾in. in diameter, containing within the dome a spring striker which produces a good clear note. Every part is so simple that it cannot well get out of order. Price 1s. 6d.

No. 5. The Stop Sleigh Bell.—A thumb spring at the side of a hole in the bell holds a large ball "silent," or releases it as required. The bell can be had either 2in. or 3in. in diameter. Price 2s. 6d.

No. 6. The Continuous Chime Gong.—Two large 4in. gongs, placed face to face, with a double hammer, strong spring, and rack inside, so that, on pulling up a small lever on the outside, the hammer rings both ways, *i.e.*, on the lever returning as well as on being drawn up. This alarum, in the large size, is sold at 8s. A smaller size, 2¾in., is made at 4s. 6d.; or with a single, but continuous blow, 3s. 6d.

No. 7. The Club Chime Bells.—A set of eight or ten bells, each of a different tone for as many machines; when rung in concert or regular order, they produce a pretty effect. Price £3 3s. per set. Capital for use by a club.

No. 8. The Facile Stop Bell (H. Lees).—Introduced

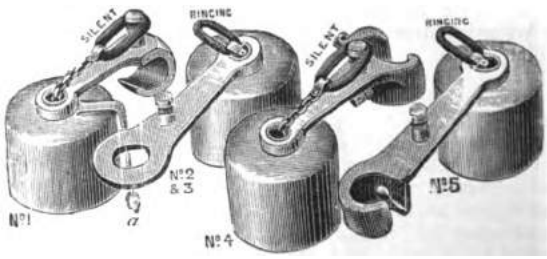
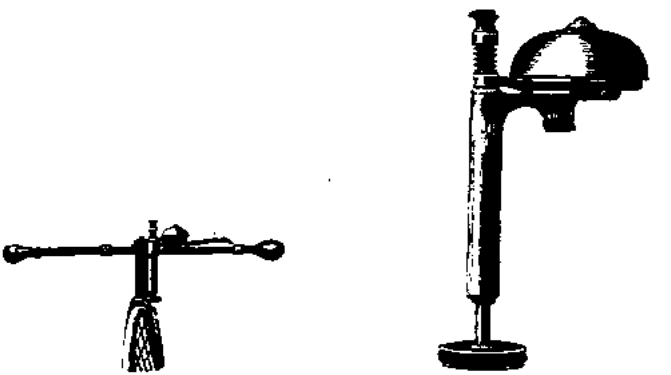


FIG. 3.—THE FACILE STOP BELL.

early in 1882, the Facile rapidly became a favourite, owing to its simplicity and agreeable tone. Its appearance is clearly set

forth in the illustration (see Fig. 3). The bell, which has straight walls and a flat roof, has a small opening through the top, and passing through the centre of this there is a light chain carrying a weighty ball; this chain is in turn connected with a stout rubber ring. In fixing, the bell should be slightly slanting, so that the clapper rests against the side, it will then be sure to ring on the smoothest road. By pulling up the ring and hitching it over the pin, the bell is made perfectly silent. Fig. 3 shows No. 1 for fixing to handle bar of bicycle; Nos. 2 and 3 go over centre pin; No. 4, for tricycles, to fit oval or flat rods; No. 5 to fit any round rods. The bicycle bells are 4s., the tricycle 5s. The small finger alarum (*a*) can be had for 6d. extra—it is very effective.

No. 9. Harrison's Automatic Continuous Alarum (Wm. Harrison).—In this case, as with the Arab Alarum, the front wheel is called upon for force to drive the alarum. A



Bell with Lever (C). Bell without Lever (D).

FIG. 4.—HARRISON'S AUTOMATIC CONTINUOUS ALARUM.

short arm, screwed to the handles by a clamp, supports a large-sized gong, which is rung by a lever, moved by a projection on a rod running down a short tube, and has on its lower extremity a small rubber-tyred wheel (as in Fig. 4). The rod slides up and down the tube, but is held "up" by a coil spring at the top. Four methods are adopted for bringing it into play: A, by touching a spring, which causes the rod to drop and the small wheel to touch the side of the tyre; instantly a loud "ring-a-

ting" is set up, the strokes being almost continuous—some 2500 to 3000 beats per minute; on pulling up the catch the noise ceases. B, a lever is carried out like that of the brake, only on the left side; by pushing it down the wheel is lowered. C, the same, only the lever is pulled up (see Fig. 4). D, no lever; the rod has to be pressed down from the top (see Fig. 4), but to effect this one of the hands must be employed. With this alarum in operation, cyclists need no longer fear their way being blocked, as it raises such a din that the attention of everyone near is involuntarily attracted. The price ranges from 6s. 6d. (for type D) upwards.

Distance Recorders.

No. 10. Stanton's Log.—Cyclists naturally like to know how much ground they have covered during a day's ride. To this end, several descriptions of "distance recorders" have been introduced, Stanton's being one of the best known. It has a watch-like case, and measures 2¼in. broad by 1¾in. deep. The face has one long index hand, and is only divided into miles, but fractions can be easily determined by the position of the pointer. Short rods run up from the side and hold a clamp, which goes round the axle. Inside there is a loose ball, which, as it runs round, turns a wheel, and so acts on the works. By placing it close to one side and taking off the guard next to it, a hub lamp can be used in conjunction with it. Unfortunately it only records up to sixty-five miles—a very short distance. It would be a decided improvement if it ran up to 100 miles, as then mistakes would not be so likely to be made. It can at once be turned back to zero, but in future it ought at least to go as high as 100 miles. Price £1 15s.

No. 11. The Miles Distance Recorder (M. D. Rucker, jun.).—This little instrument has now been before the public for some years. It is rather smaller than the usual pattern, and of a different shape, being oblong. The method of recording is also dissimilar. The clasp, or barrel, at the top is firmly secured to the axle, and a projection on it acts on a train of small wheels inside the case, which hangs down, and does not, as is generally the case, turn with the wheel. The distance is shown upon a dial in miles, up to 100, and furlongs. We have heard most favourable accounts of it, and it appears to be very accurate. The price is £1 1s., and it can be obtained from nearly any agent.

No. 12. Underwood's Odometer (H. Keeling).—Somewhat like a small round alarum clock in appearance, with a large

hand making one revolution to every ten miles, a smaller one carrying the score up to 300 miles—a decided improvement on those which only go up to fifty or sixty miles. It fixes on the

FIG. 5.—UNDERWOOD'S ODOMETER.

axle (see Fig. 5), is very cheap, and is highly spoken of by those who have tried it. It is sent free by post, price 9s., or if plated, 12s.; the size of the wheel must be given when ordering. This excellent little recorder has been severely tested, and has passed through the ordeal most satisfactorily. A new pattern, much improved, and scoring the miles up to 1000, has lately been introduced; it is made and finished in better style, and the price is £1 1s.

No. 13. The Ordnance Odometer (Dunn's Patent).—With the Ordnance Odometer an entirely new method of scoring is adopted, and one that will commend itself to every rider. It can be attached to either bicycle or tricycle, to the hub or head; it is in the latter position, fixed in front of the handle bar, that it is particularly valuable. When in this position, the travelling band, which runs round the pulleys (see Fig. 6), is visible through the glass top, and very easily read, as the band is marked off by furlongs into one mile; each of the former being 1¼in. long, the distance, to within a yard or so, can be seen at a glance by the aid of a fine pointer. With one of Iverson's Cyclists' Watches placed over the head of the machine the rider can "clock" each mile, and race against time to his heart's content.

The instrument has three hands, possessing an advantage never attempted by any other instrument of the kind. The short hand marks the miles up to 10; the second, the tens up to 100. These can be reset, by a watch key, to zero at any time. The third hand is secured to the mechanism, and registers the hundreds up to 1000 miles, quite independently of the adjustable hands. The advantage is manifest. Before starting for a

run, the adjustable hands are put at 0; say the ride has been 43¼ miles, it is clearly shown. The adjustable hands are reset, but the fixed one continues to keep a progressive tally of the total distance traversed, so that, without referring to any book, or calculating the various runs, they are mechanically and correctly added up. The rider thus knows, at any moment, his total riding of the season, or since he commenced to use the Odometer.

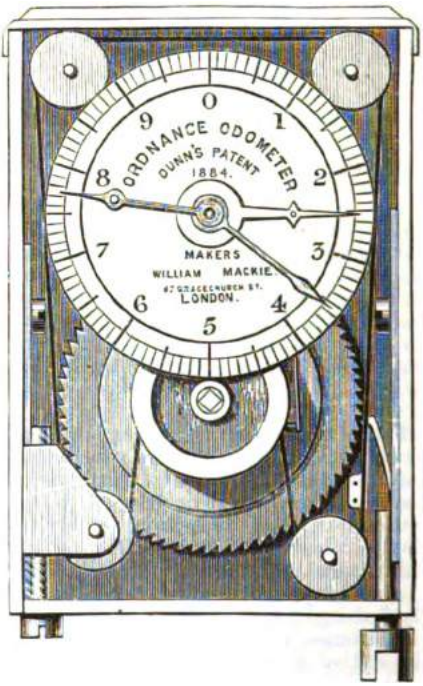


FIG. 6.—THE ORDNANCE ODOMETER

The internal working parts are more simple than might be supposed. The large wheel with slanting teeth actuates the clockwork, and is in turn acted on by a pawl attached to the plunger which passes through the lower part of the case. The plunger is connected with a light rod passing down on the inner

side of the fork. The end is acted on by an eccentric on the hub, which, with each revolution of the wheel, pushes up the slide rod, and consequently the pawl moves on the ratchet wheel one notch. The action is certain and exact; fast or slow, every revolution is sure to be recorded. There is no necessity to go into the technical details. The left-hand bottom pulley is adjustable, to permit of any possible slackness in the band being taken up.

One very important feature must not be overlooked, especially as it is a new departure in distance recorders. Hitherto measuring machines have been made for a given height of wheel, generally in even numbers, such as 50in., 52in., or 54in.; but wheels are seldom *exactly* the estimated size. Thus, a wheel supposed to be 54in. will often be found to be only 53¾in., or perhaps 54¼in. Then, again, the weight of the rider makes a difference, according to the thickness of the tyre. All these difficulties are surmounted by Dunn's Patent, as it is adjustable for about 2in.; thus, one normally for 54in. can be made to answer for a 53in. or a 55in. The bicycle should be *ridden*, not pushed, over a measured mile, and adjusted until it records exactly. This is important, as an error in calculation of about a quarter of an inch in the diameter of a wheel becomes nearly an inch in the revolution, equal to over eleven yards per mile, for a 50in. wheel. We tested one of these instruments round Stamford Bridge Ground, the headquarters of the London Athletic Club, where there is a cinder path four laps to the mile, and found it correct. It has been adopted by the Southern Counties Cross Country Association as a standard for measuring the steeplechase courses of the various clubs affiliated to that body. It is well and strongly made, and can be easily attached to a machine. The price is £1 12s. 6d., or if fitted to hub (a lamp can be used as well), £1 10s.

No. 14. The Disto-meter (A. H. Hernu).—Designed to be used in conjunction with a hub lamp, which bars most forms of meters. A clamp, having on its outer face a very deep pitch endless screw, is fixed round the axle. The meter is attached to the lamp, behind the barrel, and is connected by a short pillar, having a cog at each end, with the endless screw, which actuates the mechanism very correctly and regularly. The dial, which records up to fifty miles, can be set at zero at any time. The one we inspected was one of the first made, and we have not yet had an opportunity of testing it. The method employed to record revolutions compels their registration, and renders a "misfire" virtually impossible. Furthermore, it can be seen from the saddle by glancing down, and its weight helps to balance the lamp. It can, of course, be used without the lamp.

Lamps.

No. 15. The King of the Road Hub (T. Lucas).—For several years the King of the Road has been in the very front rank as a light giver. Five years ago the maker brought it under our notice, and we subjected it to several experiments. Since then there has been a continuous improvement, and the lamp is entirely altered in design. During the past year many new beneficial reforms have been introduced. Not the least is the new Lightning Lighter—to overcome the difficulty in igniting stubborn wicks. Outside the door there is a small tube (see Fig. 7) holding a reservoir which contains paraffin. Attached

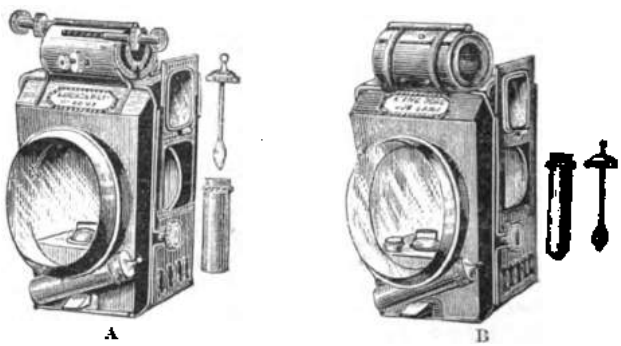


FIG. 7.—THE KING OF THE ROAD HUB.

to the screw log there is a stem, terminating in a sponge or cotton pad. This is applied to the wick, which being annointed with paraffin, is easily lighted. It need scarcely be said that the King adopts the, now almost universal, improvement of lighting and turning up from the outside, without opening the door. The former is accomplished by sliding up the glass window on the near side, when a match can be introduced. Just inside the door there is a curved striker, or roughed plate, on which the match is rubbed. The wind-up burner also projects on the left side, so that the wick is under easy control.

Inside there is a large brilliantly bright reflector at the back, with small hole in the centre for red danger glass; it is of German silver, and screws out for polishing. The oil reservoir is of extra large size, and flanges projecting from the bottom

slide in grooves in the frame; efficiently preventing rattle. The feeder closes and opens by a slide—no loose screws to be lost.

At the top there is a strong barrel, which, as in the old plan, hinges in the centre, to permit the lamp to open wide out, so as to pass into the wheel easily. Within the barrel there is a stout German silver spring, leather lined, which forms the bearing of the axle; this is regulated by a set screw and lock nut, which passes through a projecting shoulder at the back of the drum. A slide holder for matches is given with each lamp. At the top of the drum there are adjustable guard rods (see A). A late improvement does away with these and improves the appearance of the lamp (see B). A split-sleeve is put over the axle and firmly secured to it; on this are two raised flanges on rings, which work on bearings inside the drum, and the spring fitting between them, the lamp is kept in the centre of the wheel.

All parts of the lamp are made of the best material, the parts are rivetted and lapped together so that they cannot possibly come apart, however great the heat they are subject to. The whole inside of the lamp virtually forms a reflector, and a splendid light is, by the bright internal cone, thrown upon the thick bevelled 4½in. glass. The price is, japanned, 14s.; plated, 19s.

No. 16. The King of the Road Head.—It will be seen by glancing at Fig. 8. that with this lamp the top barrel is done away with, its place being taken by a double dome, and there is a

FIG. 8.—THE KING OF THE ROAD HEAD.

strong clamp, with rubber buffer at the back to attach to the head clip. The prices are: No. 1 (3¾in. glass), 11s.; No. 2 (4½in. glass), 13s. 6d.

No. 17. The Captain Hub.—A small-sized, but capital lamp, very well suited for boys' bicycles. The barrel is held by an automatic spring; it turns up, but does not light from the out-

FIG. 9. THE CAPTAIN HUB.

side, and the barrel has guide rods (see Fig. 9). It has a 2½in glass, and is of the same quality in every other way as the King. Price 7s. 6d. japanned, or 11s. nickel plated.

No. 18. The Acme Hub (Henry Matthews).—A large fine

FIG. 10.—THE ACME HUB.

light giver, which attracted very favourable notice at the last

Sportsman's Exhibition in London. The wedge shape is adopted (see Fig. 10). It has all the "modern improvements." The barrel hinges in the centre, and has an adjusting screw to regulate the pressure on the axle. At the bottom of the lamp there is a powerful spring clip to secure the door. Both the German silver at the back (which is removable for cleaning) and the cone leading the rays to the bevel glass greatly increase the power of the light. The side lights slip up, and are removable for lighting, a rougher plate inside facilitating the striking of the match. The wick is, of course, turned up from the outside. The whole lamp is well and strongly made, and it is extraordinarily cheap at 10s.

No. 19. The Acme Head.—Same in details, but with the usual alterations to adapt it to its purpose. In both, an extra large wick, which is secured against slipping down, is adopted, and they give a splendid light, besides being most reliable; indeed, the steadiness with which they burn, even over rough roads, is a special feature. The "head" is very cheap indeed, only 8s. 6d.

No. 20. The Monarch Head and Winner Hub (H. Millar).—A pair of capital lamps, somewhat similar in design to those just described. The former has a large oval glass, the latter a round one. They have all the usual points, side lighters, windup burners, &c. The hub lamp is generally provided with a smoke dome to prevent the heat injuring the axle or barrel.

No. 21. The Victor of the Path Hub (Salsbury and Sons).—The numerous kinds of lamps made by this firm have been entirely re-designed, or rather the old patterns have lapsed, and their place has been taken by others far superior in every way. It is the chief of these that we now describe. The outward appearance—from the back—is shown at Fig. 11. In order to obtain ready access to the interior for lighting, the reflector is hinged at the top; when open, the match can be struck on a roughed plate at the back of its oil-holder. A vertical slide bolt holds it securely when closed. When fitted with prisms there is no hole in the reflector. These prisms are sure to be in great demand, in fact every lamp ought to be fitted with them, and it would be far better, so greatly do they add to the value of the light-giver, if the makers were to fit them in all cases, even if the price had to be slightly increased. The prism consists of thick coloured glass, with a projecting ridge in the centre; this catches and diffuses the light so brightly that it can be seen from the back far more clearly than the old style, and gives radiant "port" and "starboard" lights on left and

right hand respectively. The prisms are fitted to old lamps for 1s. 6d.

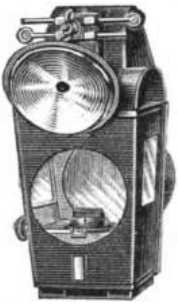


FIG. 11.—THE VICTOR OF THE PATH (Back View).

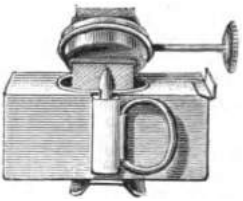


FIG. 12.—OIL RESERVOIR OF THE VICTOR OF THE PATH.

FIG. 13.—THE VICTOR OF THE PATH (Open).

The oil reservoir is of large size, and has a hinge burner to

admit of its being easily filled; the small pinions on the wind-up rod are kept in position by a coil spring, which effectually prevents the wick from slipping down. A clip at the side (see Fig. 12) fits into a groove in the body of the lamp, and is securely held in its place by a spring at the bottom, which fastens over the door catch (see Fig. 13). The wind-up rod passes through a slot cut in the side of the frame, and has the usual milled wheel at its extremity. Ventilation is amply provided for by a series of holes in the bottom of the lamp, but without causing draught. The top of the lamp, above the double dome, is provided with a strong hook or clasp, adjustable to fit various sized axles. When the door is closed, a small bow spring presses against the reservoir, keeping it steady; on pressing down the double catch, this spring throws the door open, and the lamp can open right out, so as to easily pass between the spokes (see Fig. 13). The top hook is leather-lined. Under this there is a sliding bracket plate—also padded with leather; this is regulated by a thumb-screw working in a slot, and can be firmly set at any required height. Behind this hook, which replaces the old barrel, there are two slide rods (see Fig. 11) tipped with leather, capable of being extended right and left to fit the hub; they are both immediately fixed by the thumb-screw—a far quicker and more efficient plan than that formerly in vogue. Owing to the shape of the hook, it at once fits on the axle, and even if open cannot possibly fall off, nor can any part tumble out. Every portion is joined by rivets, so that no heat can affect it. In short, it is one of the best lamps ever hung in a wheel. In order to prevent, or rather counteract, a natural inclination that all hub lamps have to swing, a balance rod has been added; this consists simply of a light rod, which is fixed into the top of the lamp, and, projecting 7½in. above, it terminates in a metal ball weighing nearly half a pound. The combined weight and leverage causes the lamp to remain upright and show the light where it is wanted, instead of occasionally flashing up in the rider's face and expending a large amount of its effulgence in the air. The lamp is neatly japanned. Prices, according to size (inclusive of the prisms): No. 1, 12s. 6d.; No. 2, 13s.; No. 3, 14s. 6d. If it has to fit on a wheel hub where there is a centre lubricator, the price is 10s. 6d. for No. 2. The balance rod is 1s. extra to any hub lamp.

No. 22. The Invincible Head.—Internally, the arrangements are the same as in the foregoing. Outwardly, the lamp is of a simpler design, having an oblong frame (see Fig. 14) and ordinary smoke dome; the door is hinged at the top and has the same capital catch at the bottom. A good plan is adopted in the rear, the reflector being made to slide to one side to permit of lighting (see Fig. 15), there being a striking plate as in the

Victor. The reflector is prevented from coming right out by a spring stop, which also locks it when closed, but on pressing this the reflector can be removed for cleaning. Having the prisms, there is no hole in the centre of the reflector, which therefore, focuses and throws back the rays of light much stronger than when mutilated in the ordinary way. A short corrugated iron

FIG. 14.—THE INVINCIBLE HEAD (Front View).

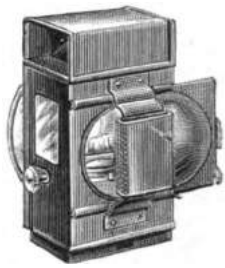


FIG. 15.—THE INVINCIBLE HEAD (Back View).

holder bends over the reflector and holds a strong rubber-lined socket for the bracket. The Invincible, in common with all the Salsbury group, is very silent. It is made in three sizes: No. 1, 10s. 6d.; No. 2, 11s. 3d.; No. 3, 12s.; the last-named measures 6¼in. high by 3¼in. wide, and has a 3½in. glass, with large cone reflector inside.

No. 23. The Premier (Ray, Neale, and Bourne).—A very showy looking lamp, with ornamental cowl dome, and large (3¼in.) round glass with bevel edge and internal reflector. The wick is regulated from the outside, and the total height of the lamp is a shade under 6in. Price, enamelled, 7s.; plated, 10s.

No. 24. The Eclipse.—Decidedly the best by this firm and a really first-class light-giver, built something after the model of Cooper's, only that the body of the lamp is joined to the barrel by spiral springs and rods which slide in tubes down the front of the lamp; this permits of side lights, which are denied in Cooper's. The action gives a very easy motion to the lamp, and allows it to burn steadily—a desideratum in this case, as there is a large double wick and a grand 4in. glass. It has a capital reflector, outside wick adjustment, and all the usual details—including a red light at the back. The price of the large size is 12s. 6d., of the small 8s. 6d.

Maps and Road Guides.

No. 25. The Tourist's Route Map of England and Wales (The Bicycle and Tricycle Supply Association).—This map is decidedly the best we have seen, and is simply invaluable to touring men. Being of handy form, it goes easily into the M.I.P. or Clytic bag, and having a canvas back, it is not liable to tear, but folds into a stiff cover. All the main and most of the cross roads are clearly shown, and the distance between the chief towns marked in small figures; also the mileage from London. By means of these guides any route can be found—in fact, we have traced many thousands of miles on one of these maps, and found it, on the whole, very correct, although, of course, in so elaborate an affair, where such a multitude of figures and names is concerned, a few minor errors will creep in. As an instance, Goole and Redditch do not appear, while the distance from Halstead to Colchester is fourteen, not seven miles. Many main routes are marked in red and numbered; a *résumé* is given at the left side; but the distance might have been added, as this would have been a great boon to those who follow any of these particular roads. The merit of the whole, however, more than atones for any shortcomings, and after the scattered series of county maps, it will be found of great practical value. The price is only 1s.

No. 26. The Cyclist's Pocket Road Guide (R. E. Phillips).—This consists of 160 cards, 4¼in. by 3in., each containing an independent route, varying in length from 29 miles to 174½ miles, but averaging about 60 miles. The towns and villages are given in a central column, together with the principal hotels, the Cyclists' Touring Club houses (*i.e.*, those hotels in which the tariff drawn up by the Cyclists' Touring Club is accepted) being specially denoted. The distances are given on each side, the right reading down the card, the left the reverse way, thus saving the trouble of working out the return journey; cross roads are also mentioned, and the towns, with distances lying on either hand of the main road, are printed in the margin. The key to the whole is issued separately in the form of a small book (price 3d.), which contains an index to about 3250 towns, a list of the routes, a number of specimen tours, and—most important of all—a description of the contour and general condition of the roads, the dangerous hills being carefully pointed out. Another good point is a skeleton map of England, Scotland, and Wales, with all the routes marked and numbered. By this means any route can be easily found, and the required cards

selected. These are readily carried in the pocket, and can be referred to even while in the saddle. The whole eight score cards are valued at £1 1s., in a neat case, or 5s. per set of forty. Those who only require a limited number can purchase single cards of any required route, at 2d. each. The whole form a very handy road guide. We can recommend their use to all riders.

No. 27. Harrison's Finger-post Road Maps.—A series of first-class county maps taken from the Ordnance Survey. The roads are shown remarkably clearly, with mileage. The maps are bound up in a stiff cover, which contains several routes, with distances, and a good index. They are far superior to what are usually termed "county maps," and will prove a good addition to the library of the rambling rider. With tours the price is 2s.; without, 1s.

Oils and Oilcans.

No. 28. The Comet Oils (R. S. Darville and Co.).—At the outset we must comment on a very commendable feature in these excellent oils. To prevent mistakes, those for lubricating are coloured *amber*, while those intended for the lamps are coloured *ruby*. This effectually obviates the amusing, but provoking, blunder we have seen made of using the wrong oil, and a rider uttering "persuasive" language at his lamp for not burning when he has fed it with oil only intended for the bearings. Special care has been taken to insure the Comet oils being of very fine quality and to adapt them to their respective purposes. They cost 1s. for a half-pint bottle, 6s. for a quart tin, or a quart tin of each variety can be had, carriage free, for 10s. 6d. The last-named is by far the most satisfactory method of purchasing.

No. 29. The Combination Cycle Oil (F. Newbury and Son).—This disposes of the difficulty we have just referred to in a yet more simple manner, by making the one oil serve two masters—the lamp and bearings. It is sold in shilling bottles.

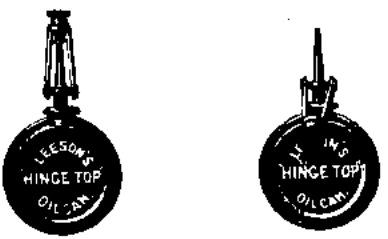
No. 30. The Avilla Oil (Tringham's).—No oil is better known to wheelmen, and its widespread use is sufficient testimony of its acknowledged merits. Both light and lubricating oil can be had separately, in shilling bottles, from any dealer or cycle agency.

No. 31. The Combination Oilcan (Waller).—Really an oil reservoir or holder in the form of a tin case, which, inside, is divided into—1. A large space for burning oil. 2. A smaller ditto for lubricating oil. 3. A third receptacle for matches, lamp pricker, &c. Very useful, as it keeps these requisites together. Price 2s. 6d.

FIG. 16.—THE LAMP COMPANION.

No. 32. The Lamp Companion.—An oblong tin case with rounded corners and edges. It measures 5in. by 1¾in. by 1¾in. and holds sufficient to fill four large lamp reservoirs. There is a screw cap (see Fig. 16) on the top, held by a chain. It will, indeed, be found a most useful companion, for most riders know the trouble, often experienced on a long tour, of getting good oil. The price being only 1s., it ought to form part of every rider's outfit.

No. 33. The Hinge-top Oilcan (J. Leeson).—We have often referred to the annoyance of leaking oil and to a comparative cure, but it is preferable to make doubly sure by preventing the cause. By using Leeson's patent hinge-top can an end is put to the trouble. It will be seen by referring to Fig. 17, that



Shut. Open.

FIG. 17.—THE HINGE-TOP OILCAN.

attached to the nozzle there is a ring, and hinged to this a light frame carrying a set screw with pad, which presses against the point of the tube, and on being screwed tight prevents the illegitimate flow of oil; there being no screw on the top of the nozzle, it can be inserted in oil holes without damage. Price, nickel plated, 2s. 6d.

No. 34. The Oilcan Pocket.—A sixpenny trifle, but most

useful—a case into which the oilcan exactly fits, preventing the lubricant holder from soiling surrounding articles.

Pedals and Bearings.

No. 35. The Rat-trap Pedal Slipper (J. Butler).—A light skeleton steel frame shaped to fit a pedal, and two strong spring clips on the lower side slip over the central bar and hold it securely in position. On the upper side there are rows of teeth like, but not so sharp as, those of the ordinary rat-trap (see Fig. 18). These serrated edges afford a capital foothold, and, moreover, as the plate rests on a bed of rubber, the tread

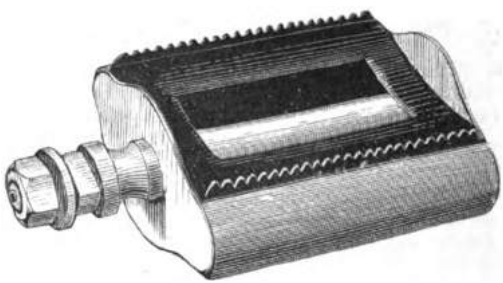


FIG. 18.—THE RAT-TRAP PEDAL SLIPPER.

is more elastic, and a certain amount of vibration is annulled. Of course, the clips can be at once removed, and are put to one side only; they weigh only a couple of ounces each, and ought to form part of the outfit of every rider who uses rubber pedals. Price 3s. 6d., or if plated, 4s. 6d.

No. 36. Garrood's Grip Pedals (J. C. Garrood).—All agree that there is a decided waste of power in cycling in the action of the cranks, as force can only be applied during a portion of the descent of the pedal, while the ascent merely helps to lift the leg. Now, it is very evident that if the up stroke could in any way be utilised to assist propulsion, the result would be a decided gain in speed. With the pedal under notice the desired principle is carried out capitally. The body of the pedal is as usual; but from each side there is a graduated

projecting flange, which allows the sole of the boot or shoe to pass underneath it, but prevents it from going too far. The feet are thus held firmly, even over rough ground, and in racing there is no fear of the feet flying off; we have seen more than one race lost from this very cause. At hill work these pedals are extremely valuable, as the legs, on being drawn up, bring the pedals with them, and so help to drive the machine; indeed, it makes considerable difference, more than appears in a mere paper argument. In very fast spurting they come out perhaps strongest, and will add a good many yards to a man's speed in a mile, especially when it comes to the last rush for home, for then every little thing tells, and if the pull up helps the push down, the rider who can command it has a decided advantage over his opponents.

Although the feet are held firmly enough to accomplish the desirable results we have enumerated, they are not bound, for by any sudden wrench, the foot is readily removed, and becomes immediately detached in case of a fall. These flanges are not made separately, but must be had with their own pedals, which cost, japanned black, 19s. 6d., polished, £1 2s., or with ball bearings, £2 5s. per pair; if the clips are only required on one side the price will be 3s. less, or if both, on right and left, are to be plated, 4s. 6d. additional. Although designed to fit any foot, those who wear an extra small boot should state the fact when ordering. Only one side of the pedals has the "grips," so that the other can be used in ordinary cases. Although most suitable to central-geared machines where regular pedals are used, they can doubtless be fitted to other descriptions.

No. 37. Ball Bearings (W. Bown).—We have so often referred to Bown's bearings that, in case there may be any readers who are unaware of their nature, we annex illustrations of them.

Commencing with A, Fig. 19, we have the outer case of the bearing, which is composed of steel—a great improvement on the gunmetal which was formerly employed. A hardened steel collar, with raised cones projecting from it, forming a groove in the centre, is secured on the axle; in this recess a number of balls are placed (see B, Fig. 19). On the inner side, attached to the case, there is a coned ring, and on the outer side, next the crank, a similar ring, but adjustable. This screws into the body of the case and, drawing the opposite ring towards it, brings the cones together to form, with the raised cones on the collar, a bearing for the balls, which, therefore, only touch at four points (see C, Fig. 19). The rim of the outer cap is indented with a series of notches; into this a small clip is fitted, and is held by a small set screw in a lug projecting from the case (see A, Fig. 19). On slacking this and removing the clip, the collar can be turned round to

take up any wear, and make the required adjustment—a very little movement is sufficient—the clip and set screw are then replaced. We have for several years spoken in terms of praise of this excellent bearing, and can now only indorse our former opinion. They are used for attaching to the end of the fork. They

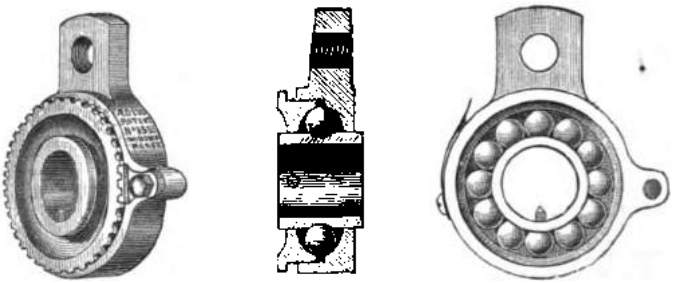


FIG. 19.—BOWN'S BALL BEARINGS FOR CRANK SHAFT.

make a marvellous difference in the case of running of a machine compared with plain bearings, and are well worth the extra price, where such is charged.

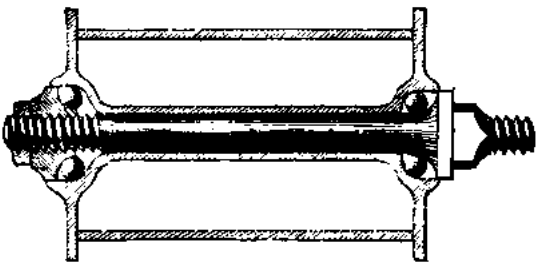


FIG. 20.—BOWN'S BALL PEDAL.

Every good machine ought to include ball pedals, and one of the best known types is Bown's, of which the illustration (see Fig. 20) explains the details. The shoulders of the pedal pins

are rounded into a cone; between these and corresponding shoulders inside the frame of the pedal the balls work. Adjustment is made by a cone on the extremity of the pin, held secure by a lock nut. The use of ball pedals makes a very perceptible difference in working the machine, and ought to be always fitted when practicable. Racing rat-trap pedals, as shown in the sketch, only weigh 14oz. per pair. Those for roadsters are rubber-clothed and heavier.

Saddles.

No. 38. The Lever Tension Saddle (J. B. Brooks and Co.)—Designed to counteract the effect of stretching, and consequent loss of shape, common to all suspended saddles. This new form of saddle brings us very near perfection in this indispensable portion of the cycle. As will be seen from Fig. 21, the saddle is a most comfortable shape, the turn-down flaps at the sides being very easy to the legs, and effectually preventing rubbing of the fork. The leather is held by four copper studs—three at the

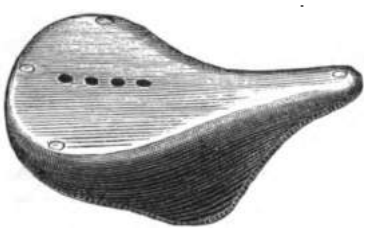


FIG. 21.—THE LEVER TENSION SADDLE.

back and one in front—with ventilating holes in the centre. The under part of the saddle (see Fig. 22) is built on a new plan. It has the usual corrugated semi-circular support at the back, and a somewhat similarly formed plate in the centre, with the adjusting clamp and nuts in the centre for attaching to the spring.

The central support, however, differs from others. At the front end it is held by a screw bolt. By turning the middle nut the frame is forced further back and the leather tightened, thus taking up any slackness in wear. At the back end, attached to a short cross bar, there is a double curl spring which

passes through two holes in the central frame, and the strength of the spring can be regulated to suit different weights. A

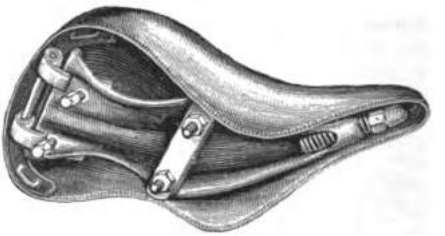


FIG. 22.—THE LEVER TENSION SADDLE, SHOWING LEVER ADJUSTMENT.

couple of staples are also placed at the back for attaching a bag or valise to. The price, 9½in. wide by 11in. long, is 10s. 6d.; if 10½in. wide by 12in. long, it is 12s. 6d.

No. 39. The Flexible Saddle.—Very similar in appearance to the foregoing, but without the patent tension plate for stretching the leather. It is therefore lower in price—7s. 6d. for the small size (8½in. by 10in.), 9s. 6d. for the medium (9½in. by 11in.), or 10s. 6d. for 10½in. by 12in. There are also extra large sizes: 12in. wide by 11in. wide, 11s. 6d.; 13in. by 13in., price 14s.

No. 40. The Flexible Distance Saddle.—A light, comfortable saddle, with flexible leather (see Fig. 23) that adapts

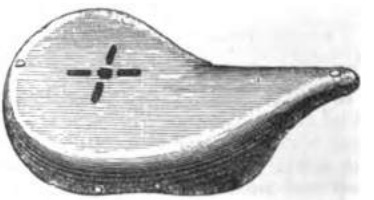


FIG. 23.—THE FLEXIBLE DISTANCE SADDLE.

itself to the shape of the rider. Price, 9in. wide by 11in. long, 10s. 6d.

No. 41. Woolley's Patent Spring Saddle (Thomas Warwick).—The upper part of the saddle is ventilated, and forms a comfortable seat, but underneath there is a bow spring, running lengthways. The rear end of this has a certain amount of play, through a staple affixed to the back of the saddle frame, and in the centre carries a clamp with screw bolts for attachment to the ordinary cycle spring. This spring adds greatly to the elasticity, and also permits a certain amount of side roll. These saddles are made in various shapes and sizes, some being a happy blending of the seat and saddle, giving plenty of room without interfering with the free play of the legs. Those with the back roll are very comfortable. This type is 11s., the others being 9s. A back rest (4s. extra) can be added to any of them.

No. 42. The Gentlemen's Eclipse Saddle (Lamplugh and Brown).—Although "there is nothing like leather," the best of hide *will* stretch, and what was once a most comfortable saddle become practically useless, owing to loss of shape. It was

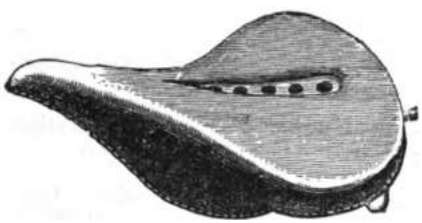


FIG. 24.—THE ECLIPSE SADDLE.

to avoid this evil that the improvements now described were designed. From the ordinary point of view—as illustrated in Fig. 24—it is of a capital form, with good side flaps and well ventilated in the centre. Underneath there is a light corrugated iron frame, forming a crescent ⋃ at the back with a Y-shaped central support. In the centre the Y has the usual clamp for attaching to the spring. At the extremity of each arm of the Y there is an adjusting screw held by a lock-nut; these permit the sides to be independently adjusted, in case of one wearing down more than the other—a capital plan that will at once commend itself to every rider. The centre is kept in its place by a coil spring (see Fig. 25). At the three

ends of the Y there are nuts and screws (see A B and C D, Fig. 25) for extending the length of the Y frame, and so

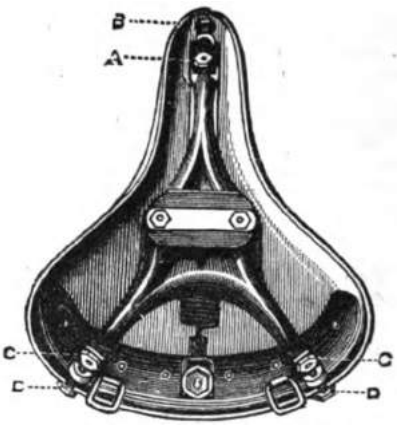


FIG. 25.—BOTTOM OF ECLIPSE SADDLE, SHOWING TRIPLE TENSION

stretching the saddle and keeping it in position. The size of the saddle is 11in. by 9in., and the price 16s.

No. 43. The Long Distance Saddle.—This type of saddle is perhaps better known than any other single pattern. It was used by most of the performers in the remarkably long road rides of 1883, and is spoken of in the highest terms of praise by all. It is particularly pliable and quickly adapts itself to the shape of any individual rider; it is exceedingly light and most comfortable. The appearance is also attractive. A plain saddle —without adjustment, and measuring 11in. by 9in.—is only 8s. 6d.; if 12in. by 11in., 13s. 6d.; or with the single adjustment, the triple not being suitable to this light form, 9s. 9d. and 14s. 9d. The new single adjustment, which makes a marvellous improvement in any saddle, can be added to old ones for 1s. 9d. each.

No. 44. The Ordinary Saddle.—A plain, but good, saddle without either tension or suspension. Price 3s., or 3s. 6d. covered with hogskin; if made with basil, 2s. 6d., or 2s. for a child's.

No. 45. The Racing Saddle.—Hard and firm, very much

turned up at the back, in order to give a purchase when pushing at the pedals. Price 4s.

No. 46. The Incomparable Saddle (D. Mason and Sons).—The leather is suspended by a scallop-shaped support underneath and a crescent plate at the rear (see Fig. 26). Attached to the scallop there is a similar plate, and by a screw these can be separated, which has the effect of raising the back part of the saddle in order to throw the rider more forward. A light flat iron plate runs from front to rear, and serves to brace up the saddle lengthways. Small coil springs are also put between the plates, and the whole makes what promises to be a popular

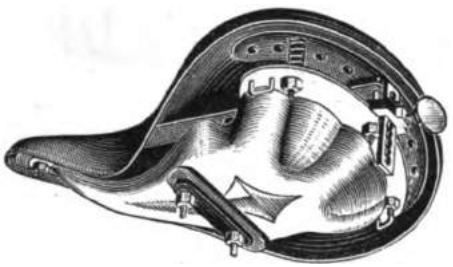


FIG. 26.—THE INCOMPARABLE SADDLE.

saddle, especially as it is sold at a moderate price—8s. 6d., or if made of hogskin and stuffed with horsehair, 12s.

No. 47. The Detachable Saddle Clip (Harrington).—

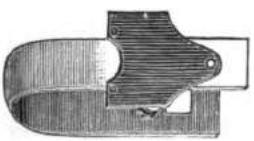


FIG. 27.—PLATE ATTACHED TO SPRING.

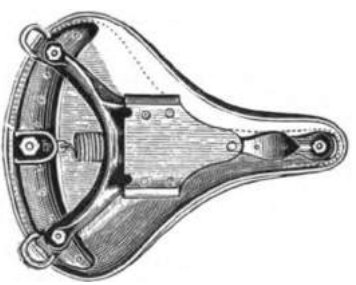


FIG. 28.—UNDER PART OF SADDLE.

Detaching a saddle generally involves not a little trouble, while

if it is left out in the wet not only does the rain spoil it but it offers a temptation to anyone to make off with it. By this simple plan—invented by Mr. Harrington, patentee of the Arab springs—both these evils are avoided. Attached to the spring there is a metal plate (Fig. 27)—it is shown as fitted to an ordinary "turnover" spring—this has a hole cut in the front part. Firmly secured to the bottom of the saddle—see Fig.

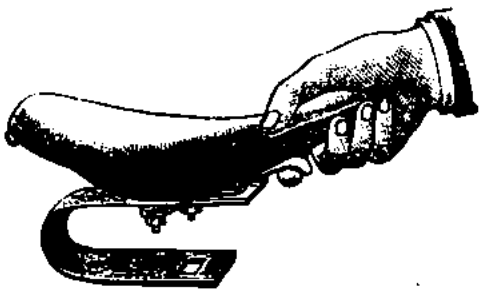


FIG. 29.—WITHDRAWING SADDLE.

28—there is a steel plate with the edges turned over to form a groove exactly fitting the plate on the spring. Beneath this there is a very strong clip with a latch for the finger to grasp. On placing the saddle on the spring, this spring forces the bolt down through the hole in the fixed plate, and the saddle is rigidly maintained in its position. To withdraw it, all that has to be done is to grasp the saddle as in Fig. 29, press the clip, and the saddle can be pulled off instantaneously. We need not enlarge on its manifold advantages. The price of fitting to any saddle is 7s. 6d.

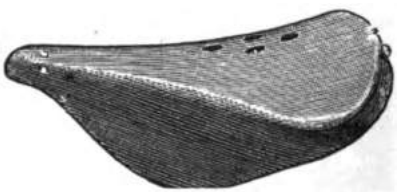


FIG. 30.—FOSTER'S PATENT TENSION SADDLE.

No. 48. Foster's Patent Tension Saddle (H. Matthews).

—Another mark of improvement in saddle construction. The details can be understood on referring to Fig. 30, which shows the ordinary appearance of the saddle. It is made of the best

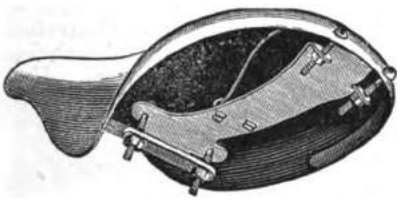


FIG. 31.—UNDER PART OF FOSTER'S PATENT TENSION SADDLE.

leather, and so suspended that the rider is quite away from any metallic contact. It can also be adjusted by screws at the back (see Fig. 31), to take up any stretch that may have occurred. It looks most comfortable.

Springs.

No. 49. The Arab Cradle Spring (J. Harrington).—Each spring consists of but a single piece of steel rod, either $\frac{10}{11}$, $\frac{11}{11}$, or $\frac{12}{11}$, according to the rider's weight. It is, by powerful machinery, bent into the shapes shown at Fig. 32.

FIG. 32.—THE ARAB CRADLE SPRING.

The construction of the spring permits free play in all directions, allowing enough side roll to put extra power into the down thrust of the pedals, while in ascending hills the rider can go forward to his work, or sit back when running down inclines. The price is 15s.

No. 50. The Atalanta Spring (G. Petts).—Old-time riders will recognise in it a resemblance to the defunct Cornish saddle, a pattern popular long before the days of "suspensions" or other modern improvements, and which we described in *The Bazaar* about nine years ago. The present pattern, however, is, to all intents and purposes, original. The illustration (Fig. 33) so fully explains the design that but little description is necessary. The body seat of the saddle is as usual. Underneath, it is attached to a short spring, which is hinged to a shackle in front, where it rests on a rubber buffer, held in its place by a pin. At

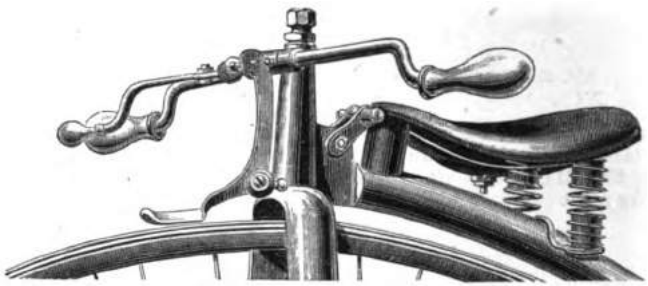


FIG. 33.—THE ATALANTA SPRING.

the rear there is a stout spiral spring at each side. These inclose rubber blocks, which receive the weight when the spring is compressed. They are supported by a double arm, which is screwed to the centre of the oval backbone. Rubber thus forms the chief link between the rider and the machine, and a delightfully easy seat is secured. It can be fitted to any machine for 12s. 6d., and only the backbone need be sent in order to have it attached.

No. 51. The Special Cambrian Spring (Morris Brothers).—A departure is made from the ordinary lines in the construction of the spring, which, as is shown in Fig. 34, is made of spring steel—all in one piece—the size being ¼in. by $\frac{5}{16}$in. The ends are held in the customary manner by a bolt passing through the neck; the bars then run backward, rather low down, and pass through the bosses (B), which are held by a small plate resting on the backbone. By altering the position of this the spring can be made more elastic by sliding it towards the head, or more rigid if moved rearward. At the back (C) the two bars curl up, then bend forwards, downwards, and slightly upwards; the loop

forming the support for the saddle. A rubber buffer (D) is placed under the fore-end to prevent bumping, should the weight of the rider be too great for the spring. This is an important point, and should always be stated when ordering.

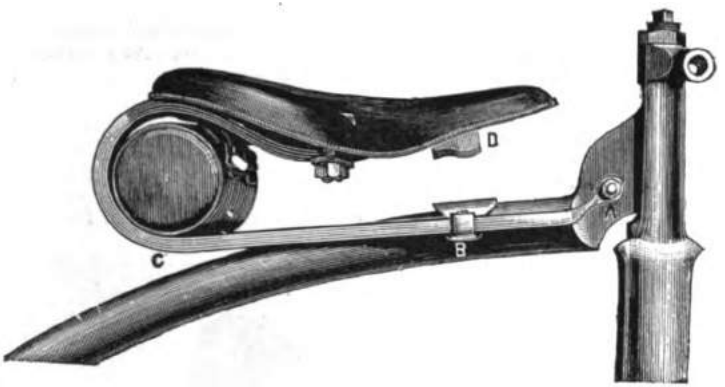


FIG. 34.—THE SPECIAL CAMBRIAN SPRING.

The spring is most successful, and can be applied to any machine of the Humber type—or to a specially made ⌐ rod. The price, separate, is only 10s. It is fitted to all Cambrian machines without extra charge.

Tools and Materials for Repairing and Cleaning.

No. 52. The Cyclist Tool Chest (J. Hawkins, jun.).—The most complete collection of cyclists' requirements that has been put before the public. All riders know the litter and mess made in cleaning a machine; how this is missing, and that wanting, while something else cannot be found. It was with the idea of combining in a small space all really useful articles that Mr. Hawkins, who has gained considerable fame as a long-distance road rider, introduced this chest, which is a good-sized plain and strong box, measuring 2in. long, 10¼in. high by 10in. broad. It contains a complete outfit, and there is plenty of room for riders to add extra articles *ad lib.*, according to their own individual fancy. Amongst a long list of articles, one of the chief is the lifting jack, which will be found invaluable in

holding up tricycles when removing a wheel or cleaning. The tweezer help consists of a very long pair of tweezers, with slip ring, to secure any article held, such as a wash leather, sponge, &c., for cleaning the inner hubs or parts difficult to get at. The brushes are also most useful for washing the rims and tyres, while the burnishing cloths, pliers, &c., all come in handy. The smaller articles are too numerous for individual mention, and the box is well fitted up in compartments. Any of the articles can be had separately at moderate prices.

No. 53. The King's Own Tool Bag (J. Lucas and Son).—About the same shape and size (see Fig. 35) as an ordinary valise, but it contains a very useful set of tools that are likely to be required while on the road. One of the chief contents is the King's dram flask—a tin receptacle to carry a dram, not for the

FIG. 35.—THE KING'S OWN TOOL BAG.

thirsty rider, but for the lamp, and also a small reservoir of paraffin; the latter is for touching up the wick in order that it may light more readily. This flask is placed in one of the two pockets into which the bag is divided, with a small oilcan with screw top. The other contents include a double lever padlock and chain, a pair of pliers for cutting copper wire, a supply of which is included. The latter is useful for effecting *pro tem.* repairs. The valise, which also has room for spanner, measures 7½in. by 5in. Price 10s. 6d., with fittings.

No. 54. The Don Tool Case (Lamplugh and Brown).—The first handy tool carrier introduced. It carries an array of spanners, oilcan, and similar requirements. When the strap is

undone it opens out—having side flaps—threefold. It measures 7in. by 3¼in. by 1¼in. when closed. (See Fig. 36.) Price 4s.

FIG. 36.—THE DON TOOL CASE.

No. 55. The Lion-mouth Wrench (R. S. Darville and Co.).—About the most effective wrench yet introduced. All

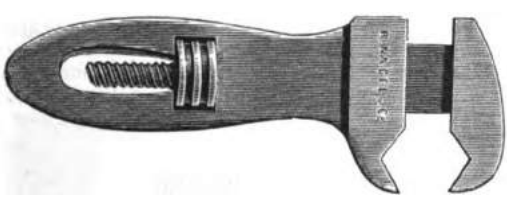


FIG. 37.—THE LION-MOUTH WRENCH.

riders know the difficulty of getting a good grip of a nut with the ordinary wrench, owing to the jaws spreading, and insecure hold which could be obtained, as only two sides could be grasped. With the Lion-mouth a greatly improved state of affairs will prevail. It is made of fine grained steel and is very strong. As will be seen by the illustration (Fig. 37), the

jaws are cut to fit any hexagon nut of moderate dimensions, and firmly grasps *four* sides, not only preventing the possibility of a slip, but also saving the nut from wear, as the sides are not twisted. It is of German origin, and will prove a welcome friend to the English rider. Closed it measures 4¼in. long, and costs 3s. 6d., or, if plated, 5s.

No. 56. Spoke Brush.—A long narrow strong brush for cleaning spokes, rims, &c. Price 2s. A most useful adjunct to every cycle.

No. 57. Watt's Spoke Buff.—A veritable "boon and blessing" to all who have bright or plated spokes. A short wooden handle, with a fork at the small end lined with wash-leather. This fits tightly over the spoke, or thin emery cloth will go between, and it is easily rubbed up and down, the friction rapidly polishing the spoke. The price is only 7d. by post.

No. 58. Anti-Elbow Grease (Adamson).—A substance for smearing on the bright or plated parts of machines to prevent their rusting and to assist in polishing. When machines are put by for any time, it keeps the parts liable to tarnish or rust, in good order.

No. 59. Refulgens Enamel (Middleton). — A capital preparation. It can be had in assorted colours at 1s. or 1s. 6d. per bottle, and does not chip or crack.

No. 60. The Excelsior Polishing Paste (A. Taylor).—A capital preparation for restoring the pristine brightness to "faded" or tarnished plating. We have experimented with it on some prize cups—trophies of the path—and found it answered admirably. It is put up in sixpenny and shilling boxes.

Tyre Menders.

No. 61. Prout's Cement.—A well-known and highly commended cement, which can be procured in penny sticks at nearly any oil shop. It is most useful for re-attaching loose rubbers to the rim, in which case a hot iron, or, better still, Snell's tyre mender, should be applied to the felloes to melt the rubber; then drop in some of Prout's, very hot, and tie up.

No. 62. Snell's Tyre Mender (Snell and Brown).—This consists of a hollow T, the upper piece forming a segment tube

perforated with a series of holes on the outer surface. There are also holes lower down in the stem of the T to admit air. One end of a long indiarubber tube is attached to the "Mender," and the other is put over the gas burner; the gas is then turned on, lighted at the holes on the face of the segment tube placed under the rim, and held there until the cement on the felloe be *thoroughly melted*, when the rubber can be replaced and tied on until the cement has hardened. All complete the "Mender" costs 5s. in iron, or 7s. 6d. in brass.

No. 63. Phillip's Safety Tyre Binders (R. Langton and Co.).—All riders know the nuisance and, in fact, danger, of a loose tyre, and the fruitless efforts that are made to temporarily secure it. With these handy little "binders" any mishap of this kind can be rectified at once. The binders consist of pieces of steel wire hardened and twisted into a corkscrew form, in such a manner that they cannot be uncurled and, however much stretched, always return to their original form. The method of using is to twist one end round a spoke, and then simply wind the wire round tyre and felloe, and as it has a natural tendency to close tighter, it draws or binds them together. A dozen of these extremely useful—almost invaluable—little protectors roll into each other, and so occupy a very small space, while their weight is practically nothing. They are made in various sizes, from $\frac{1}{2}\frac{3}{2}$in. and $\frac{1}{4}$in. to $\frac{1}{2}\frac{1}{6}$in. and $\frac{1}{4}$in., smaller or larger, to order. The price is only one shilling per dozen. They do not cut the tyre, nor are they likely to become cut or broken, but acting on a yielding substance—the rubber—they give and do not cut in as would an ordinary wire bound round. In grass racing they should be found particularly useful. Those riders who wish to gain a great advantage over their rivals on a grass course, especially if it be wet or slippery, should attach a dozen "binders" round their wheels, when the result will be a good twenty yards or more in the mile in their favour—indeed, it would often make all the difference between winning and losing.

Various.

No. 64. Patent Hollow Ventilated Handles (J. Kelsey).—A new departure in handles, introduced in 1883. The bars are fluted on the inner side and bent round into the usual pear shape (see Fig. 38). In this form they are cool, the air passing freely through them, and are comfortable, while, owing to the shape, a good firm grip can be taken. They also look very well

on a machine, especially if the colours harmonise; thus, if the steering rod be plated, the handles ought to be enamelled, but

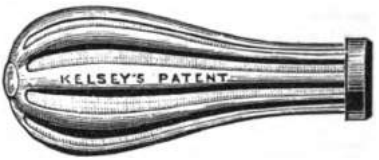


FIG. 38.—PATENT HOLLOW VENTILATED HANDLE.

enamelled bars or support, and plated handles, look best. They cost, plated, 5s. 6d.; enamelled, 5s.

No. 65. Waterproof Saddle Cover (Goy).—Riders who are unprovided with Harrington's clip, and are, therefore, frequently compelled to leave their machines out in the wet, will find this handy little article invaluable. It merely consists of an elastic waterproof cover (something like a lady's bathing cap), which is stretched over the saddle, making the "pigskin" impervious to rain. It rolls up into a very small space, and is easily carried in the pocket. Price 1s.

No. 66. The Cyclist's Pocket Case.—A wonderfully compact little case, only measuring 4¼in. by 1⅝in. by 1¾in. Although of these circumscribed dimensions, it contains a razor in safety slide case, a tube of Euxesis shaving paste, and a "mirror" on the back of a slide which holds a comb. Price, complete, 5s.

No. 67. The Goy Padlock.—A handy little padlock and chain to secure the machine when left outside a roadside inn or other place where it is likely to find a new owner. At field days—Hampton Court, for instance—it is especially valuable, as it can be easily carried in the tool bag, and if the chain is slipped round the front or rear wheel rim and fork, the machine cannot be moved unless carried. Price, by post, 1s. 4d. With the Yale lock, price 3s. 6d., it is doubly secure, as only the special key will open it.

No. 68. Hullet's Cyclist's Canteen (Alfred Parkes).—We bring our present volume to a close with the description of a very ingenious canteen, due to the inventive ability of Sergeant Hullet, late of the 49th Regiment. The canteen, which was intended for military purposes, is also adapted

for cyclists, especially when "on tour." It consists of a tin or brass receptacle, measuring 7½in. in diameter by 3½in. in depth. It is neat in appearance, and is shaped on one side to fit the body, or it may be attached to the machine. The lid, held by a slip hinge, can be taken off, and it forms a pan plate, or may be utilised for other purposes. The body of the case is divided into various compartments, which hold knife, fork, and spoon, a small bottle, condiments, food, &c.; or two days' rations of condensed food can be carried. The lower part of the can forms a receptacle which holds a pint and a-half of liquid. A good supply of sandwiches can be carried inside the lid. The whole only weighs about 2lb., and the price is 7s. 6d.

INDEX.

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ROADSTERS—*continued.*

RACERS.

ACCESSORIES.

ACCESSORIES—*continued.*

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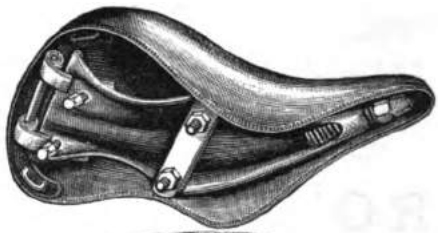

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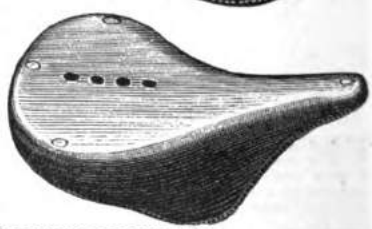

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Tricycles of the Year, 1884

(SECOND SERIES):

CONTAINS DESCRIPTIONS OF THE NEWEST INVENTIONS AND IMPROVEMENTS IN TRICYCLES.

DESIGNED TO ASSIST INTENDING PURCHASERS IN THE CHOICE OF A MACHINE.

WRITTEN FROM PERSONAL EXAMINATION

By HARRY HEWITT GRIFFIN

(*London Athletic Club, N.C.U., C.T.C., &c.*).

FIFTH YEAR OF PUBLICATION.

LONDON: L. UPCOTT GILL, 170, STRAND, W.C.

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Tricycles of the Year,

1884

(SECOND SERIES):

BEING

A CHRONICLE OF THE NEW INVENTIONS AND IMPROVEMENTS INTRODUCED EACH SEASON, AND A PERMANENT RECORD OF THE PROGRESS IN THE MANUFACTURE OF TRICYCLES;

DESIGNED ALSO TO ASSIST INTENDING PURCHASERS IN THE CHOICE OF A MACHINE.

ILLUSTRATED.

WRITTEN FROM PERSONAL EXAMINATION

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PREFACE.

FINDING it impossible, in a work issued early in the year, to give full particulars of all the notable Tricycles of the Year 1884, and for the reason that many of the best machines were not then perfected, we were compelled to divide it into two parts. The First Series, issued in April, contains descriptions of 114 of the principal makes then on the market; and the present book the "Second Series," describes those machines not dealt with in the "First Series," and since introduced, thus bringing the book up to date.

Almost every known make will be found fully described in one or other volumes. If any machine that a reader may have heard of be not included, it is because we have not had an opportunity of *personally inspecting* it. We have altogether omitted the old-fashioned and dangerous types of open-fronted single driving rear steerers, as they do not call for notice, unless to caution novices against purchasing them. It is amongst this class of riders that they find a ready sale, the low price at which they can be produced being generally a sufficient bait; the consequence is, that one sees more of this type about than of any other.

Public opinion has pronounced pretty definitely in favour of front steerers, but, at the same time, there is a growing demand for open-fronted tricycles; and that most awkward, and, indeed dangerous, obstacle, the high steering rod, is, in loop-framed machines, disappearing, by being put in its proper place, below the frame, where it acts quite as efficiently, and is not only less likely to be damaged, but is much safer, and adds to the appearance of the machine.

Another apparently minor, but really most important, point, that makers would do well to study, is the method of applying brake power. The old-fashioned lever ought to be no longer used. It did well enough with the type of machine we have just condemned, but is altogether out of place on a machine supposed to have "all modern improvements." A brake to be really useful (in addition to being efficient *when* applied), should *always* be under the control and within the reach of the rider. Even to the most uninitiated, it seems, as it is, a point of great weakness for a rider to have to release one handle and seize another before brake power can be applied. Many makers are loth to make a change, but increased public favour would soon be the result. Some manufacturers have, with great success, applied the brake by simply turning the left handle—the most natural method. Surely others can follow their example.

We must again point out the importance of being accurately "fitted" by a tricycle. The saddle should be so adjusted that it is above the rear pedal when horizontal, and the height should be such that the middle of the foot—immediately before the heel—can comfortably reach the pedal when furthest away. This measurement, when riding with the toe, gives a comfortable amount of allowance, the limbs being neither cramped nor unduly stretched. The handles ought to be fixed as fancy dictates—the most natural and easy position. With these points attended to, and with a good saddle (seats are only fit for invalid machines) and an easy spring, cycling may be really enjoyed. It is non-attention to these points that causes many would-be riders to be disappointed with cycling.

Even the high speed rates mentioned in our First Series have been considerably improved upon, and although Lowndes' ten miles in 32min. 33⅗sec. has not been altered, C. E. Liles (amateur tricycle champion at all distances) has ridden twenty-five miles in 1h. 28min. 58sec., and H. J. Webb has covered fifty miles in 3h. 11min. 15 sec., and 100 miles in 6h. 43min. 32sec.

Even these figures are sure to be improved upon next year—if not before.

The popularity of Tandems continues to increase, the greater speed, lighter weight, and easy convertibility—compared with Sociables—causing them to rapidly supersede the last-named machine.

One sign of the times is that makers are now producing their next year's novelties—in order that public opinion may be tested before definitely placing them in the market. The very latest type that is being taken up is that introduced by the Greyhound early in 1883; that of a ⊢ frame with bicycle handle bar —open back and front steering. Three or four firms are now designing machines—generally racers—of this type for 1885; prominent amongst whom is the Coventry Machinists' Company.

In conclusion, we again state that we have not the slightest interest in any maker, dealer, machine, or anything connected therewith. Our opinion is therefore unbiassed, and is the result of many years' careful study of the cycle and its surroundings. From the first we have always maintained one line of action—only to describe those machines which we have *personally examined*; therefore every weight, measurement, or similar detail has been verified before being quoted. In this respect "Tricycles of the Year" differs from any other work which professes to be a "guide, mentor, or friend" to the embryo cyclist.

Should any reader desire further information on any point we shall at all times be most happy to render help; and any queries sent to this office will be readily answered, free of charge, through the correspondence columns of *The Bazaar, Exchange and Mart* newspaper.

HARRY HEWITT GRIFFIN.

170, STRAND, LONDON,
30th Aug., 1884.

INDEX.

ROADSTERS.

RACERS.

ACCESSORIES.

INDEX TO FIRST SERIES.

Particulars of the following machines were given in the First Series of "Tricycles of the Year," and it will thus be seen that we have not only described all the principal machines in the market, but have brought the information down to the latest date.

ROADSTERS.

RACERS.

Tricycles of the Year, 1884.

SECOND SERIES.

No. 1. The Imperial Club No. 1 Roadster (The Coventry Machinists' Company, Limited).—The test of several seasons has proved that the popularity of the present machine is well deserved. It was one of the earliest front-steering double drivers, and is of the typical pattern usually associated with that class. The general scheme of construction can be gleaned from a glance at the annexed illustration (see Fig. 1). It will be seen that the driving wheels are of equal size, and are connected by a continuous axle, to which the right one is fixed—the left running free. Both are equally driven by the gear, which is placed on the left side; it is something like the well-known Starley's balance gear, and equally distributes whatever power is put into the pedals between the large wheels, at the same time permitting independent action, to allow of their negotiating corners or making turns with ease.

The frame is composed of weldless steel tube. It is bent round in front, where it supports the backbone of the pilot wheel; the latter has a socket head, castor-shaped forks, to facilitate steering, and a large mud guard. The ends of the pedal shaft work in ball bearings, held in cases below the frame. These cases can be adjusted in order to take up any slackness in the chain. On the left end of the crank shaft there is a cog wheel, or rather pulley, round which the endless chain circulates. It is by regulating the size of this pulley, in relation to the one on the

axle, that the machine is geared up or down; thus, if the lower be larger, the wheels are geared up, *i.e.*, the wheels make more than one complete turn to a revolution of the pedals. Increased speed is, therefore, obtained, but by the employment of greater power. If the lower pulley be the smaller, the machine is geared down, *i.e.*, the wheels revolve slower than the pedals, and power (easier pedalling) is gained, but speed lost; and the feet must be

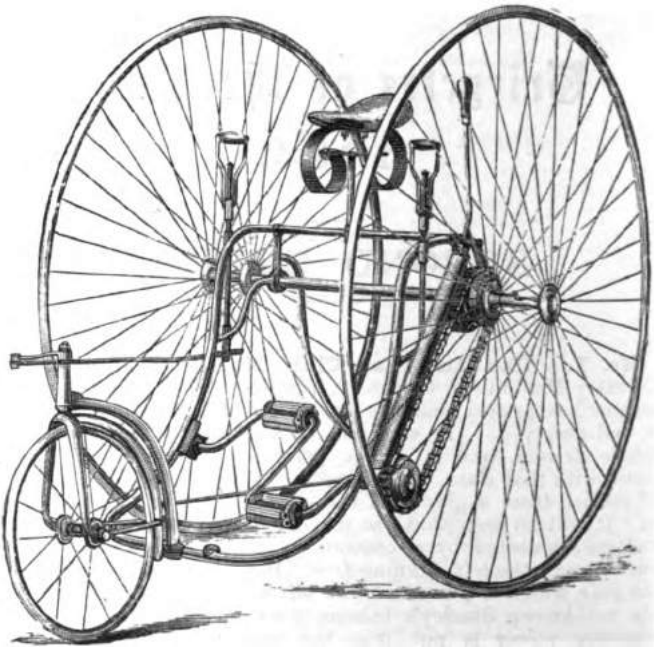


FIG. 1.—THE IMPERIAL CLUB NO. 1 ROADSTER.

moved very much faster to produce the same rate of travelling. To continue with the frame. It is joined to the axle by ball bearings. From the cases of these, upright arms run to the main cross piece, which connects the side tubes and bent arms, and curve down in front to the latter, thus adding materially to the rigidity of the frame. Attached to centre of the cross piece there is a ring boss through which passes the "plunger,"

as the rod which supports the spring is called; by means of this the height of the saddle can be regulated to a nicety. The spring is either as shown in Fig. 1 (a double curl), or the new spring saddle, or the Arab, shown at Fig. 2, can be had. The last named illustrates one of the most recent additions to these machines, that of a sliding seat, so arranged that the rider can alter his position as required: thus, in descending hills it is advisable to be well forward, in order to steady the steering wheel by putting more weight upon it.

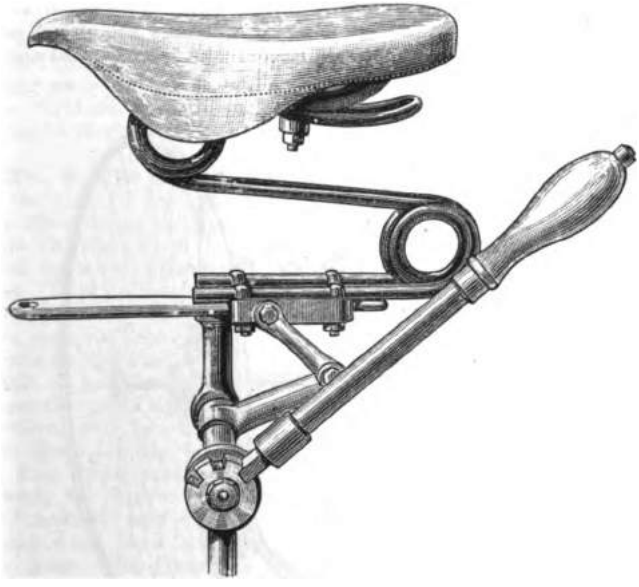


FIG. 2.—THE COVENTRY MACHINIST CO.'S PATENT SLIDING SEAT.

Any kind of spring or saddle (a Brooks' is shown above) can be used, and the extra charge is £2.

The drum or box containing the driving gear has a broad flange, round which is placed a leather lined steel riband. By pushing forward the lever, this is tightened and a powerful brake applied—so strong in action, that the machine may be brought to a stand on a very steep hill. On the right side, steering is effected by means of the handle communicating by a rod with an arm running out from the head of the small wheel

When specially ordered, this rod, instead of forming a dangerous barrier by blocking up the right side, is carried below the frame, where it acts quite as efficiently, and makes a wonderful improvement in the whole machine, rendering the saddle easy of access from either side. General details do not call for much comment. The wheels have direct butt-ended spokes crescent rims, and moulded rubber tyres. The whole machine is made in the best possible manner, and may be relied on in every way. The standard size is 48in.—generally geared level—but this is of course altered to suit individual tastes. The extreme width is about 40in. The machine is beautifully painted in three colours, the fittings are plated, and ball bearings are applied to the frame, pilot wheel, pedal shaft, and pedals. Price £25 10s.

FIG. 3.—THE IMPERIAL CLUB NO. 2 ROADSTER.

No. 2. The Imperial Club No. 2 Roadster.—The details are similar to the foregoing, with the exception of the frame, which, as will be seen in Fig. 3, is of a different design.

The cross tube is done away with, and the side tubes bend over, and are attached to, the bearing cases on the axle. From this position they are carried down behind, thus forming two safety tails, which are also very useful for carrying luggage, and wheeling the machine, when turned upside down, up unrideable hills. The Γ pin of the seat slides through an adjustable ring on the sleeve (or outer tube) which covers the axle. The alteration in the framing makes it more suitable for ladies, or persons of short stature, as the saddle is considerably lowered. In price and all other details it is the same as No. 1.

No. 3. The Imperial Club No. 3 Roadster.—A lower priced machine of similar make to either of the foregoing; but doing away with ball bearings and substituting parallel, using ¾in. rubbers, and painting in two colours only, the cost is brought down to £21.

No. 4. The Imperial Club Racer.—Originally introduced at the close of 1882, the machine was then a marvel of lightness—a 46in. being well under 50lb.—and it is satisfactory to record that the first racer built is now being used regularly on the road by a well-known rider, and shows no symptoms of giving way. It is built either like No. 1 or No. 2. The former is, however, generally adopted (see Fig. 4). A very neat, light, and effective gear has been chosen for double driving. The flange attached to the axle, forming the right wall of the drum, has a row of cog teeth, as has the hub of the left, or free, wheel facing it. Between these there is a light frame, holding, on separate pins and free to revolve, two bevelled cogs, which join the respective flanges, and form, on the top, the pinion for driving. The outside of the drum, and even the cogs, where practicable, are hollowed, for lightness. The axle (formed of ¾in. steel rod) is "naked," and extends across the machine, the right wheel being fixed to it and the left free, except when acted on by the gear. The frame, as may naturally be inferred, is of fine gauge tubing, the outward diameter being ¾in., and consists merely of a cross piece at the back, 21in. long and 5in. above the axle, to which it is joined by arms and ball bearings; from the former there are also short stay rods to brace and strengthen the main frame. The legs run almost straight down to near the ground, when they bend forwards in front and support a light backbone for the front wheel, generally 16in. high, with a sort of hollow diamond-shaped forks, socket head, and ball bearings.

The pedal shaft is of hollow steel tube, bent so as to give a 4½in. throw to the skeleton rat-trap ball pedals, and is carried in ball bearings behind the frame legs. This places the rider as much over his work as he is on a bicycle. The entire

machine is a gem of workmanship, finish, and elegance of build, and well worthy of inspection. In order to secure addi-

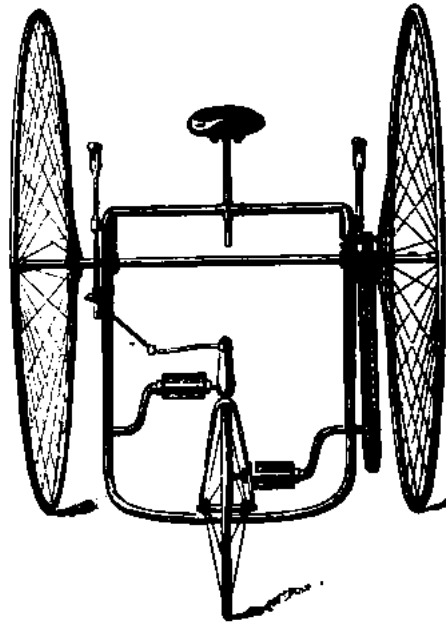


FIG. 4.—THE IMPERIAL CLUB RACER.

FIG. 5.—HOLLOW FELLOE OF IMPERIAL CLUB RACER.

tional lightness in the wheels, the felloes, which hold ¼in. tyres, are hollow (see Fig. 5), and a light gauge spoke, screwing

direct into gun-metal hubs, is adopted. As a rule, the machines are 46in. or 48in., and geared up to from 56in. to 60in. The handles are fixed (the right is for steering), but the seat can be adjusted. The following measurements are more than usually interesting; they are taken from a 46in., geared to 55in., with a 16in. pilot wheel: Total length, 64in.; between wheel centres, 33in. Width, 39in.; wheel tracks, 32½in. Weight, 47½lb. Price £28 10s.

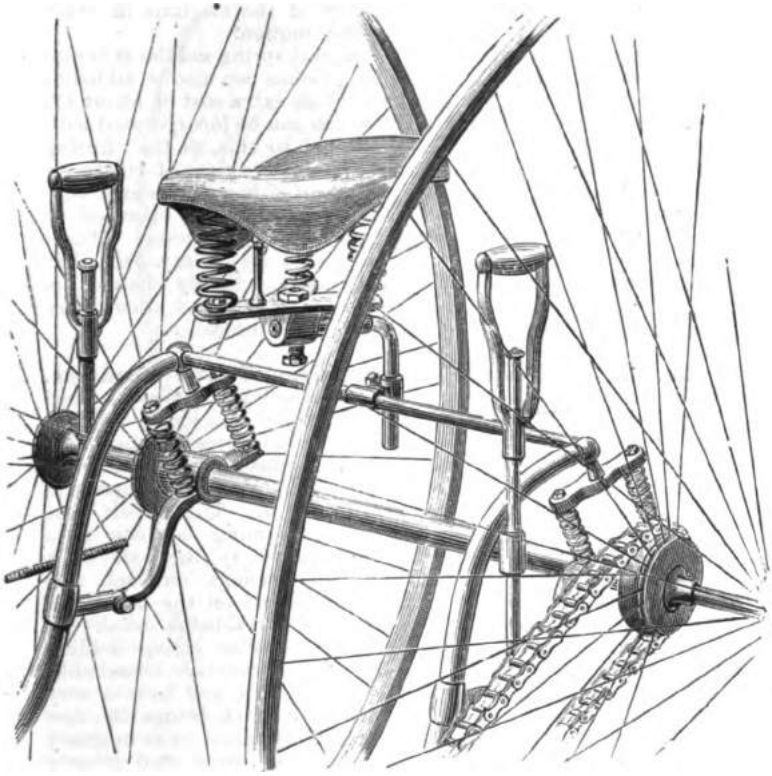


FIG. 5.—THE SPRING FRAME IMPERIAL CLUB ROADSTER.

No. 5. The Spring Frame Imperial Club Roadster.—An 1884 novelty, called into existence to suit those who object to,

and suffer from, the jolting and vibration inseparable from cycling. But little description is needed in addition to the illustration (see Fig. 6). It will be seen that the frame is that of the No. 1, but the upper rigid arm, connecting the frame with the bearings, is replaced by a strong double coil spring, attached to a cross piece of the upper frame. On these springs the entire weight of the rider rests, and as, owing to the lower arm being hinged, a certain amount of "play" is allowed, the frame "gives" to inequalities of the road, instead of bumping. This, however, does not affect the rigidity of the machine in other ways, but produces a delightfully easy motion.

We have already referred to the capital spring saddle; it is also clearly shown at Fig. 6. The spring frame can also be added to any No. 1 Imperial Club Roadster, at an extra cost of about £2. Another important improvement which can be incorporated with any type—but is more especially suited to this, as the "Spring Frame" is mainly designed for the less active class of riders—is the hill-climbing gear. This consists of a box on the axle, containing two sets of different sized cogs; these are operated on by a second chain, which is controlled by a small lever. Thus a 50in. may, for ordinary work, be geared up to, say, 54in., but when a hard hill is reached, it can be immediately changed to, say, 36in., which gives immense power, and makes almost any slope easy of ascent. Price £2 more than the No. 1.

No. 6. The Central Geared Imperial Club Roadster.—During the latter part of 1883 public opinion was pronounced very strongly in favour of central-geared machines, so that nearly all the large firms added one of this type to their list. Naturally, the Coventry Machinist Company is in the front rank, and its representative of this class will bear comparison with any. The design is shown at Fig 7. The wheels, &c., have been already described. The framing consists of a very stout central tube, which is attached to the axle by a strong double armed clamp and ball bearings, on each side of the upper chain pulley, which is placed on the middle of the axle, the driving gear being at the left side, as usual. At the lower bend of the tube there is a similar clamp holding bicycle cranks, shaft, and pedals. The cranks are detachable, and the pedals adjustable, by the usual slot, and have a very close tread, *i.e.*, they are close together, which brings the feet into a more natural position than can be obtained on an ordinary bicycle; consequently, the action is less tiring and greater power can be put forth. The pedals are also well under the saddle, which gives a vertical position to the rider. Brake power is applied by a handle on the left side, and acts on a flange of the central driving pulley. It is a notable feature in all these machines that the steering is unusually steady and silent.

Popular as the Imperial was, it has been fairly surpassed by the Central Driver. A convenient rubber clothed foot rest is placed in front, and the whole machine calls for the highest praise. It is finished like the others—painted or enamelled, part plated, and with adjustable ball bearings to the frame, crank, shaft, and pedals. We have not actually scaled one of these machines, but they are, and can be made, much lighter than the ordinary Imperials. Price £25.

FIG. 7.—THE CENTRAL GEARED IMPERIAL CLUB ROADSTER.

No. 7. The Sandringham Club Roadster.—A type of the most fashionable pattern in 1884 (see Fig. 8). It is of a pronounced "Humber" design, but with several "points" peculiar to the Coventry Machinist Company's machines. To begin with: riders enjoy the benefits of the unexcelled Club spring, similar to that on the Club bicycle (see Fig. 9); this completely isolates the rider from all metallic connection, and consequently "kills" vibration. When the spring is topped with a Brook's or Long Distance saddle, the rider enjoys a luxuriously comfortable seat; or, in place of this, the new spiral spring saddle, shown in Fig. 6, can be had. The frame is identical with that of its prototype.

The axle is covered with a sleeve or tube, in the centre of which is fixed the driving pinion. This communicates by the sleeve with the gear box, which is at the left side, and on a similar principle to that of the Imperial Club, and, of course,

FIG. 8.—THE SANDRINGHAM CLUB ROADSTER.

double driving. The wheels need no particular description, being of the ordinary bicycle type, with direct spokes, crescent rim, moulded ¼in. rubbers. From behind the centre of the axle there runs an upright pillar. Above the axle this serves

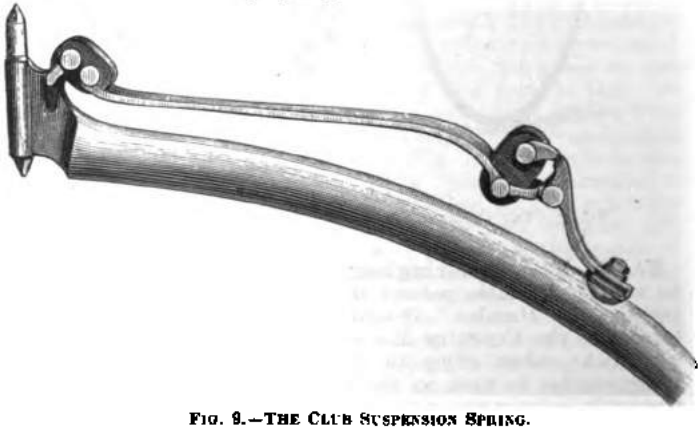


FIG. 9.—THE CLUB SUSPENSION SPRING.

to support the 26in. steering rod the same as that of a bicycle, which is either straight or curved, generally the latter, as it allows more room for the legs. A powerful band brake, acting

on a flange of the driving pinion, will check the speed under any condition; it is applied by the ordinary lever in front of the handle. A strong double arm—a prong going on each side of the upper pulley—joins the pillar to the sleeve of the axle; below this it bends backwards, running down behind the chain. At the bottom a stout clamp clasps the pillar, and, by means of a double arm, supports the lower pinion, which is on the short axle carrying the cranks. These are detachable, and the pedals have ball bearings. Being turned out by the Coventry Machinists' Company, workmanship, material, and finish are naturally of the highest order.

Hitherto the greatest objection to the Humber has been the want of a comfortable foot rest, as, owing to the shape of the machine, there is no convenient place for the feet. This difficulty can be obviated by using the Cheylesmore clutch action to the pedals (which is fully described and illustrated in our notice of the Cheylesmore (see pp. 12, 13). With this addition the pedals are always available as foot rests, consequently, the feet need not be removed from them; experience has, however, proved that the strain is too great for the Cheylesmore clutch, if it is intended for very hard work. Putting aside the other points, this and the suspension spring ought alone to make the machine a favourite. Price, with ball bearings to pedals, frame, crank, axle, and small wheel, painted and part plated, £24, or with clutch action to the pedals, £25.

No. 8. The Sandringham Club Racer. — Weight reduced to a minimum, as in the Imperial Racer; hollow rims, light spokes, no brake, and other items which constitute a path machine. It forms an admirable mount for competitive purposes, being exceedingly light and very fast. It is enamelled plain black, plated fittings, ball bearings to all parts, &c. Small wheels, 42in. or 44in., are generally put in (but tall riders ought certainly to have higher ones, say, 48in.), geared very high, equal to 60in. or 62in. Price £28 10s.

No. 9. The Cheylesmore Roadster.—Although the oldest machine on the company's list, it is still in great demand, and is indeed one of the few successful rear steerers remaining in the market (see Fig. 10). Since last year the only changes worth recording are the lengthening of the backbone (which materially improves the steadiness of running), the final abolishment of the old-fashioned seat in favour of the saddle, and the alteration of the position of the pedals, which are now much more under the rider. These alterations add greatly to the attractions of the machine. One of its best known features is that of the clutch action (see Fig. 11) to the pedals, which permits of "two entirely different motions without any change of gear."

This is the result gained by using the patent arrangement for communicating the power from the pedals to the chain, and thence to the wheels. On each end of the crank axle, 24in. apart, there is a circular disc, termed a clutch box; outside of these are placed the teeth over which the chains work. Inside the box, opened by removing the inner plate or face, there is a recess ¼in. deep by 2¾in. in diameter. This box runs quite freely upon the axle, attached to which there is an irregularly-shaped hardened steel flat clutch, with four shoulders and corners (see Fig. 11); between each of these shoulders and corners there

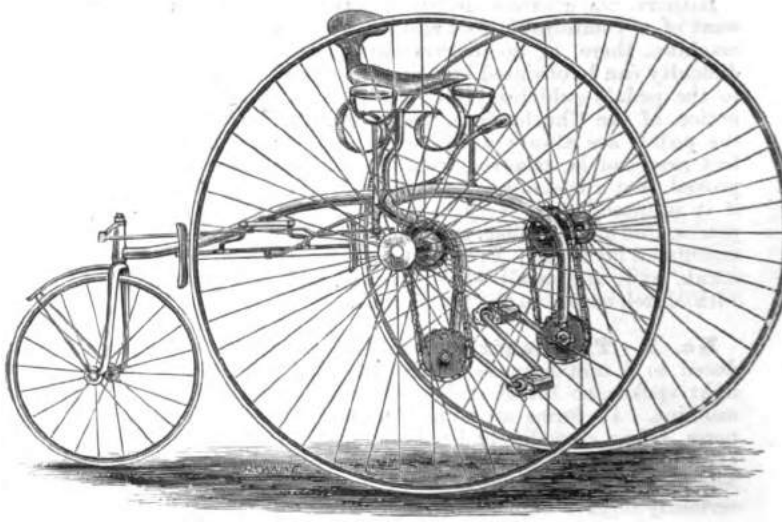


FIG. 10.—THE CHEYLESMORE ROADSTER.

is a recess sufficient to permit of a flat ball-roller, *i.e.*, a steel hardened roller, nearly as broad as long; but as the shoulder rises gradually, the roller cannot pass between it and the edge or wall of the recess, while the "corner" prevents it going in the other direction. When the pedals are turned, the rollers are instantly jambed between the shoulders and the edge of the box, where they offer a firm resistance, making the tread even and regular; when pressure is taken off the pedals, the rollers fall back, and, so to speak, nestle under the protecting wing of the corner, thus allowing the feet to remain at

rest while the machine is running down hill. By this plan advantage can always be taken of falling ground without the necessity of removing the feet. The wheels also overrun the machine, and on the level this saves a great amount of labour, as the foot action need not be so continuous; even if the feet be kept still, the machine will run on till the momentum is exhausted.

Although a double driver, it turns with facility to either side, as both the wheels are loose on their independent axles, and the inner wheel, in describing a circle, automatically remains nearly at rest while the outer one travels round it. If the rider should be tired of the ordinary action, the pedals may be worked with a see-saw motion up and down; but only the

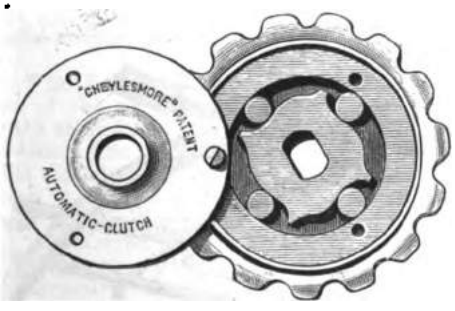


FIG. 11.—THE CHEYLESMORE CLUTCH GEAR.

front down stroke is utilised, and therefore only one leg propels the machine; any length stroke, from one of 2in. to three-quarters of the whole throw, may be taken, but from half to two-thirds the usual down stroke is most convenient. With these advantages comes the comparative drawback of there being no back pedalling; but although no retrograde movement can be imparted by the pedals, the machine will run backwards either when drawn, or when the wheels are turned by the hands from the saddle. By an extra payment of 10s. an arrangement can be added whereby, on turning a small handle, the clutch is locked and back pedalling made possible.

In ordinary cases the pinion wheels on the flange of the hubs and clutch boxes are the same size—4½in.—producing equal speed. Speed gear is fitted, or it can be geared down —*i.e.*, a 44in. wheel made equal to 38in.—for ladies; or strong riders may have it geared up to increase a 44in. to 50in. or higher. The pedal shaft is placed behind the legs of the frame.

and consequently under the rider, so that he has very vertical action (see Fig. 10). The pedals themselves are of rubber, run on ball bearings—a great improvement—and have a 6in. throw. The frame is small and light, and the backbone has a most graceful swan-like curve, as it descends to the socket head of the 20in. rear wheel, which is also provided with ball bearings and a good mud guard. Direct spokes and gunmetal hubs are generally put in as "wheel centres," making a great improvement in the appearance over the old type of machine, or the hubs are of steel and plated.

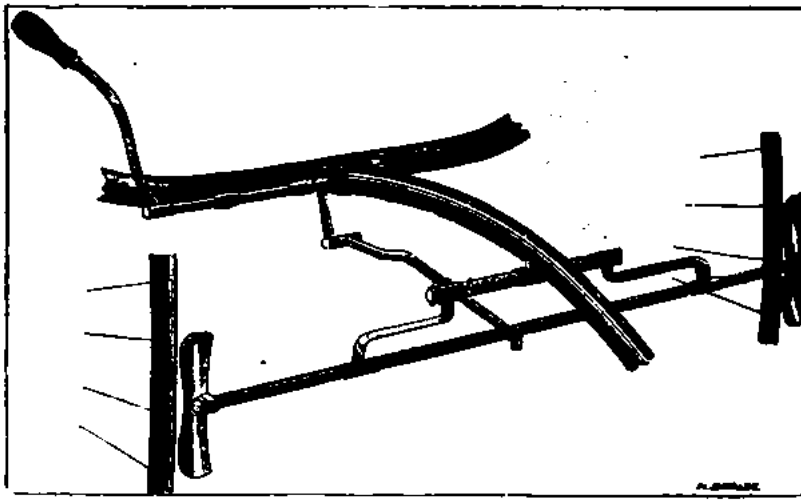


FIG. 12.—PATENT CHEYLESMORE SWING LEVER BRAKE.

There is one very special feature that must not be passed over—the new patent swing lever brake. It is about the best brake yet applied to the tyres of a tricycle, and is fully explained in the sketch (see Fig. 12). The spoons are double, and are affixed on the ends of a long cross rod; this is attached to a frame which is hinged on a short bar on the backbone. A connecting rod runs from the main bar to a short cranked arm, which by another horizontal piece of iron is connected to the lever handle, so that on pulling up the latter the spoons

"swing" dead on the wheels with great force—enough to stop the machine anywhere. The only improvement suggestible is to add a quadrant ratchet, to retain it in any required position, and this can be had as an "extra," cost 5s. It is a decided advance on any other wheel brake as regards power and smoothness of application.

The saddle is the same as in the other machines. The entire machine is splendidly made, presents a very handsome appearance, and, owing to the labour-saving driving gear and plentitude of ball bearings, runs very easily, and will be found most suitable for general purposes. The measurements of a 46in. are: Total width, 39in.; wheel tracks, 32½in.; total length, 74in. It is finished in the usual style, painted or enamelled, with plated fittings; brackets are attached to the frame legs to receive lamps. The weight of a 46in. is about 91lb., and the cost, with ball bearings, &c., is, for a 48in., £25, or if with brake ratchet and back pedal action—two important desiderata—£25 15s.

No. 10. The Ladies' Cheylesmore Roadster.—A light reproduction of the regular Cheylesmore. Dress guards are placed over the chains, and the wheels are generally 40in., or, for tall ladies, 44in. The special nature of the foot and pedal action in this machine renders it specially suited for ladies, as they can keep their feet at rest when running down hill. A seat is shown in the illustration (see Fig. 13), but a saddle can be used if preferred. It is so open in front that mounting and dismounting are particularly easy; the appearance, too, is certainly attractive. Another improvement, especially useful to ladies, but which can be fitted to any machine turned out by this firm, is the ratchet brake. This consists in a ratchet attachment fixed on the left side of the machine, so that when the brake is applied with the required force, it will remain in position without being held or throwing any strain upon the hand. The additional cost is only 5s., a sum it is well worth. The machine is finished in the same way as the regular Cheylesmore, and the price is, including extras, 40in., £24 15s.; 44in., £25 15s.; without, £2 5s. less.

No. 11. The Folding Cheylesmore Roadster.—As indicated by the title, the chief point in the machine is its capability of folding. In general appearance it resembles the Cheylesmore. The semi-circular tube forming the upper part of the frame is hinged in the centre, and is attached to a light lower frame, which works in two slots held by thumb screws. On slacking these and lifting out the pedal shaft, which fits into grooves on the ends of the frame legs, and is easily removed, but cannot accidentally come out, the wheels may be drawn together, when the machine assumes the position shown at Fig. 14, being re-

duced in width to about 27in., enabling it to pass through any ordinary door. When closed, the wheels remain parallel, so that it can be wheeled about. The pedal shaft and lower chain pulleys are the only loose parts removed. Otherwise, it is the same as the Cheylesmore, save that it costs £2 10s. more, or £27 10s. for a 48in. (£26 10s. for 44in), complete, with all the same details.

FIG. 13.—THE LADIES' CHEYLESMORE ROADSTER.

No. 12. The Cheylesmore Sociable Roadster.—In this we have a sociable which worthily enjoys great popularity, and,

although it has a pilot steering wheel, it must be considered as practically open fronted (see Fig. 15). The frame is light and

FIG. 14.—THE FOLDING CHEYLESMORE ROADSTER.

graceful, being mostly composed of inch tubing, slightly larger where strength is most required, and may be said to chiefly consist of the main axle, solid, which is the entire width of the machine (61in.); above this there is a stout tube running parallel

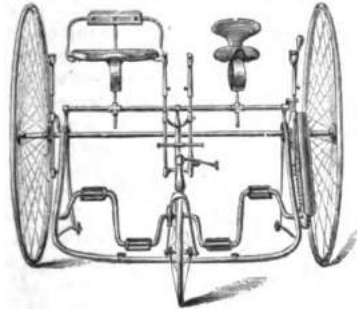


FIG. 15.—THE CHEYLESMORE SOCIABLE ROADSTER

with it, and joined by a very light arm to the case holding the ball bearings, which attach it to the axle. The main side tubes

are also secured to the bearing case, and by their neat curves impart an elegant appearance to the machine.

Taking the point where the frame joins the axle at the bearing case at the back the tubes run down and form two "tails." to prevent over-balancing. In front, the tubes run nearly straight down, and are braced to those at the back by stay rods; the tubes are carried low, within less than 6in. of the ground, and bending round at right angles, join another tube, which runs down the middle of the machine, in a central boss; from this the backbone of the front wheel rises and joins the socket head of the "pilot," which has solid forks, bending backwards so as to draw the wheel castor-wise, and make it more sensitive to the steering, which is effected by a light rod from a convenient handle at the right side of the left rider. The central tube supports, by branching arms, the middle handles. All the handles are worthy of special commendation, being adjustable, of an exceptionally good pattern, neat in appearance, and effective in use. They can be easily fixed at the required height by small screws at the side, sufficiently strong to withstand any strain likely to be thrown on them. The brake is very powerful, and is applied to both wheels by a special-shaped spoon, on pushing out a lever on the left side.

Driving power is united, but the right side is designed for ladies, as it is fitted with the Cheylesmore clutch gear, so that the work done is optional, as the feet may remain at rest when desired and the driving be done entirely by the rider on the left. On the left the gear is of the ordinary nature, *i.e.*, double driving. In front there is a neatly-arranged foot rest—a rather long cross bar resting on a rubber block; it can be used by both riders, but is not required on the right side, as the pedals suffice. Ball bearings are put to all required portions, the four ends of pedal stages, the three places where the frame is joined to the axle, to all three wheels, and even to the pedals; the latter are, however, a luxury. The wheels, to which direct spokes are fitted, have Hancock's fluted rubbers, steel (plated) hubs, with a neat cap on outside to hide the nuts, and other parts as usual; the saddles are adjustable. The whole is splendidly made in every detail, and generally finished painted, the fittings being nickelled. By making the machine very wide, increased steadiness in the running is gained. We have not recently weighed a sociable, but some time ago we found a 50in. to be 141lb.; it looks lighter now, however. If ordinary action is fitted, instead of the Cheylesmore, and ball pedals are not used, the price is reduced a good deal from the quoted figures. Measurements, with 46in. and 18in. wheels: Length, total, 66in.; centres, 34in. Width, total, 61in.; wheel tracks, 52½in. The frame is 4lin. wide, and the upper tube is 5in. above the axle. Price complete, as described, including ball pedals and brake

rack, £33 5s.; without, £30. The speed and power gear can be added for £5 extra.

No. 13. The Cheylesmore Convertible Sociable Roadster.—Very similar to the machine just described, but with the additional advantage of being convertible into a single machine. By an ingenious plan, the axle, top frame, and pedal shaft can be divided (see Fig. 16), and the front wheel and backbone removed to the centre of the remaining frame. The operation is readily accomplished and does not weaken the machine. In the single form it somewhat resembles the Imperial

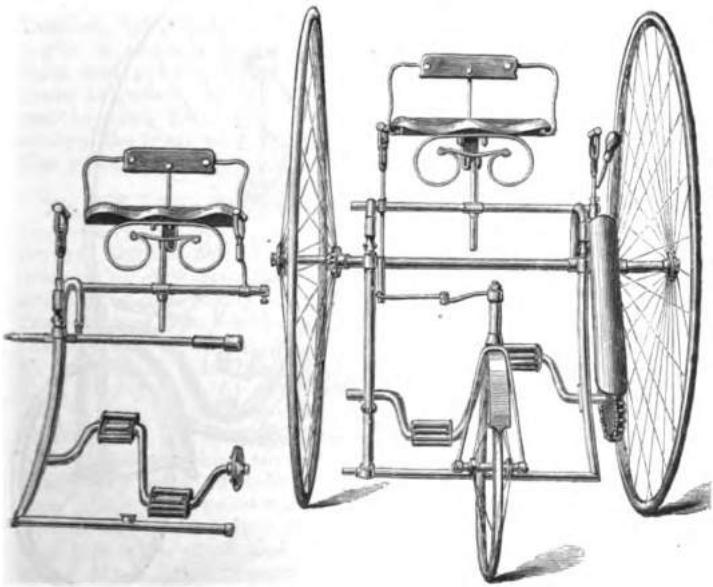


FIG. 16.—THE CHEYLESMORE CONVERTIBLE SOCIABLE ROADSTER.

No. 1, but is heavier. Of course, it is a double driver in either form, and has all the features of No. 1, being finished as perfectly. Price, enamelled and painted, part plated, ball bearings to axle (three places), pedal shaft (three places), and pedals £37 3s. (without ball pedals £34 3s.). Of course, any or all of the extras already described can be added, and a special stand (7s. 6d. extra) can be had for holding the machine when undergoing the process of separation.

No. 14. The Club Tandem Convertible Roadster.—This machine is the latest of all the productions of the Coventry Machinist Company, having only been introduced at the end of July, 1884. It forms a notable addition to the fast-increasing ranks of tandems, and is sure to make its mark, both upon the road and racing path. The machine is really a quadricycle, not a tricycle, at least, in its double

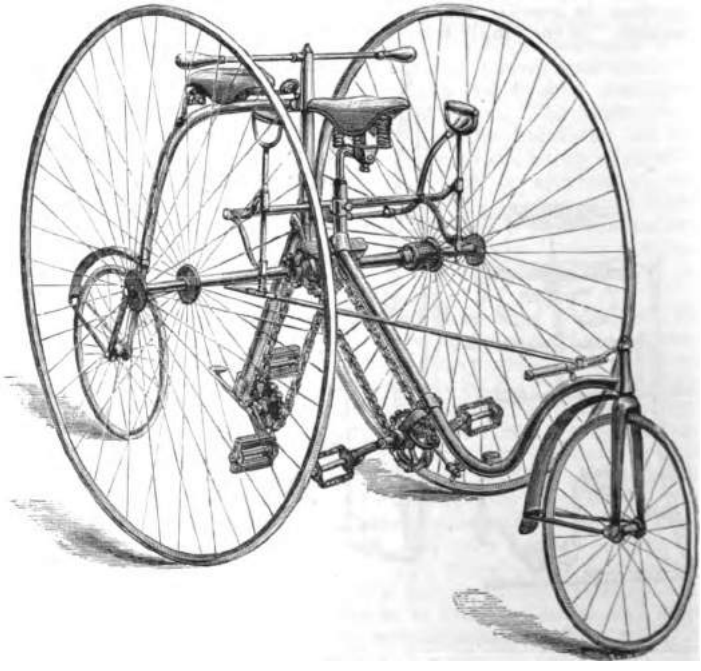


FIG 17.—THE CLUB TANDEM CONVERTIBLE ROADSTER.

stage, as there are four wheels. It is formed by a combination of the Sandringham and Central Geared Club, as may be seen on referring to Fig. 17. The front, or permanent portion, is virtually a Central Geared Club, the only difference being that there are two chain pulleys on the axle, and the prong, or double arm, which joins the front tube to the frame, is larger and stronger, and is provided with two holes

for attaching the rear portion by. The latter is a Sandringham, minus the front wheels and axle. The prong of the pillar attaches to that of the front portion, by bolts passing the holes already mentioned, which form a hinge joint; but for this, the machine would be seriously strained when passing over rough or uneven ground. The backbone and trailing wheel give the rear rider a firm and safe seat—a point not always obtainable in a tandem. Steering is retained by the front rider, the one in the rear having a bicycle handle to pull against, but it is not intended for guiding purposes. The rear portion, which weighs but a few pounds, can be readily detached. From all appearances, there is a brilliant future before the Club Tandem, but it is too new yet to speak of results. It looks, and ought to prove, a very speedy traveller, while it is exceedingly light and splendidly made in every detail. The second (back) chain is removable by withdrawing a key pin. Further details can be seen from the sketch. When a lady is intended to occupy the front seat, Cheylesmore clutch pedals are advisable. The price, all complete, is £35.

No. 15. The Meteor No. 2 Roadster (Starley and Sutton).—A capital machine, of the Salvo type (front steering double driver), lighter built than formerly, and with that noted gear (Starley's), of which, as it will, in the course of the succeeding articles be frequently referred to, we give an illustration and description. The sketch (Fig. 18) shows the gear as fitted to the *left* side of a machine. The axle, which extends from side to side of the machine, is shown by D. To the further end of this, one of the driving wheels is fixed firmly, as is the bevel cog, C; the other is loose and free to revolve on it, but is attached to the other bevel cog, A, which forms part of the hub. Between these there is a crown pinion, B, or, perhaps, its shape may be better understood if described as a conical-shaped cog. This revolves on a short centre, extending from the inner side of the chain pulley, E. The crown pinion, B, gears equally into the teeth of A and C, but is also free to revolve on its axis. By a little thought, even the most unmechanical mind can grasp the simple details of this mechanism. When power is applied to the chain pulley, and the resistance offered to the wheels is the same as when riding straight ahead, B retains its position in A and C, and all work together as if both wheels and the chain pulley were fixed to a common axle; but, in turning the least to either side, the outer wheel and pinion has to travel further, and, consequently, runs round the crown pinion. Perfect freedom of action in the wheels is thus secured by the gear, which might be more correctly termed a power distributor rather than double driving gear. When the machine is suspended the wheels can be spun in different directions,

or either held while the pedals are worked. Of course, back pedalling can be applied the same as forward. The frame (steel tubing) is of the regulation shape; the ends of the crank shaft work in ball bearings, the case of which is held in a double slot, adjustable to take up undue sag in the chain. The pedals (roller bearings) are triangular in shape, with raised guards to prevent the feet slipping off. The chain is, as usual, on the left side, and has a tin shield over it. By continuing the side tubes to above the point where they are attached to the axle, by roller bearings, and bending them out in front, they form supports for the adjustable handles and lamp brackets.

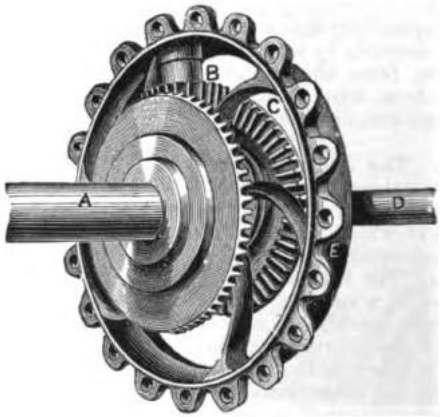


FIG. 18.—THE STARLEY GEAR.

One of those capital saddles, the Long Distance, is supported by an Arab spring, or a seat on an elliptical spring can be had if preferred. In either case they work on a ⌐ rod, so that adjustment to any required position is easily made. An extra powerful brake is called into play by pulling a long lever on the left side. Bicycle wheels, direct spokes, gunmetal hubs, &c., are employed, and a comfortable foot rest is to be found in front. It is a first-class machine in every respect. Price of a 50in., with balls to pedal shaft and front wheel, rollers to the frame and pedals, and with bright parts plated, £22 15s., or with ball pedals, £24 10s. Measurements of a 50in., with 16in. front wheel: Total length, 65½in.; between centres, 32½in. Total width, 41in.; wheel tracks, 31½in.

No. 16. The Rover Roadster.—As will be seen on referring to the annexed illustration (Fig 19), the Rover is the outcome of an alliance between the Humber and the old open-fronted single-driving Meteor patterns, but is, nevertheless,

FIG. 19.—THE ROVER ROADSTER.

an entirely original machine. Taking the framework, we find two equal-sized front wheels, joined by a sleeved axle, from the centre of which the backbone runs straight to the rear, dropping, or rather, curving down to the small wheel. The latter has

Stanley head, &c. Near the centre, the backbone has a stout boss encircling it, in order to strengthen it sufficiently to bear the ⌐ seat rod, which passes through it—the boss, not the backbone.

An Arab spring and suspension saddle form a comfortable and

FIG. 20.—THE ROVER ROADSTER.

adjustable seat for the rider. Behind the axle sleeve, and joined to it by short strong arms, there is, on each side, a stout tube. These, below the axle, slant backwards, and at the lower extremity support a pedal shaft. The ends of this work in ball

bearings, which are in turn held by universal joints, which effectually prevent any twisting or binding of the crank; room for adjustment, in case of the chain stretching, is also allowed for. Above the axle sleeve, the tubes bend backwards, and afford strong supports for the handles, which are attached to them by short arms and made adjustable to any height. The band brake acts on an extra large drum, and is, consequently, very powerful; it is applied by pulling a lever handle towards the rider—a check on the tube prevents its going too far forwards, so that it is always within reach. On the left side, Starley's gear is employed to produce double driving, the chain, &c., working in the usual way, and the machine is generally geared level.

Steering is effected from the right, the connecting rod being carried low down to the rear wheel. The wheels have the usual details, ⅜in. rubbers, direct spokes, very wide hubs (6¾in.), &c., and a good mud guard is placed over the trailing wheel. The Rover has some special points to recommend it, although it is essentially a gentleman's cycle. Mounting is very simple, from either front or rear, especially the latter; likewise dismounting is readily accomplished, as, even when the machine is going at a fair speed behind, the rider can step out in the rear and grasp the backbone with the right hand, to prevent the machine running away; or he can leap out in front. It is in a safe and comfortable foot rest, however, that the Rover excels. Two rough plates are affixed on the top of the axle sleeve, to receive the rider's feet; when placed on these he is in as comfortable a position as if seated on a chair (see Fig. 20). Owing to the position of the rider's weight, either when in this position or propelling the machine, it is not at all likely to tip up, even when straining forwards up hill. By a simple contrivance, a basket, parcel, or lamp can be carried in front, quite out of the way.

Finally, we may say that the Rover is a capital machine, and made in the best possible manner. It may be described as "a semi-open fronted double-driving rear steerer." Finished, enamelled or painted, with plated parts and ball bearings to the rear frame, crank, shaft, and pedals. Measurements of a machine with 46in. and 18in. wheels: Length, 68in.; centres, 36in.; width, 39½in.; wheel tracks, 31in. Price of a 46in., £24; 50in., £24 10s.; without ball pedals, £1 15s. less. Weight, 91lb.

No. 17. The Despatch Roadster.—In price, weight, and general design it is similar to the foregoing, but it is intended to carry small parcels, papers, &c. Projecting from the axle—under which the ends are secured—there are two strong tubes, one on each side, which run out in front and support a large basket, or other suitable receptacle for whatever

matter has to be transported. When a basket is employed, the lid and half the front are made to lift off, and, by placing a small seat inside, and rug, a cosy and safe box seat is made to carry a child, whose weight and position does not interfere with the rider. As the basket rests on straps it "rides" easily, and, consequently, the occupant of the front seat does not suffer from vibration. Of course, the basket is made to suit individual requirements. The price is £1 extra, and the weight increased by 10lb. to 15lb.

No. 18. The Meteor Sociable Roadster.—One of the simplest sociables of the day. Very small 40in. wheels are used, and the system of double driving is similar to that of the (single) No. 2. The pedal shaft, or crank axle, as it is often called, is continuous, and power is applied from the left side by Starley's double driving gear. The framing is very simple. The axle is covered by a stout outer tube or sleeve; to this, by a ring boss, the saddle pillars are attached, and admit of ready adjustment. From the centre a strong "bowsprit" runs out to the front wheel; on this are placed convenient foot rests. Steering is effected from the centre, and as there is no framing in front, the ends of the pedal shaft (which work in ball bearings) are supported by short side tubes. This year's Sociable is a vast improvement on last year's pattern in every way. Adjustable handles are now added, and the two machines cannot be compared. Owing to the 40in. wheels, the machine, which is a little over 5ft. in extreme breadth, can be put into a guard's van, when the riders desire a faster method of transit. Ordinary turnover S springs are generally fitted, but they are not to be recommended, and either the Arab or elliptical spring should be ordered instead. Large—full 1in.—tyres are put to the wheels, and the machine is enamelled black, with plated fittings. With balls to the frame, front wheel, and crank axle, and roller bearings to pedals, the price is £29 10s.; for a 46in., if with ball pedals, £33.

No. 19. The Eclipse Roadster (John Keen).—A few years ago Keen's famous Eclipse bicycle was *the* machine of the day. Championship after championship and record after record was made upon it, and Keen held the title of champion for a longer time (over ten years, off and on) than any other rider; certainly, no professional has had more experience. Of late years he has not devoted so much attention to manufacturing, but all riders were glad to see him exhibit at the late Stanley Show, where the Eclipse attracted considerable attention for its extreme neatness and rigid simplicity. The machine is a central-geared double-driver, a novel driving arrangement being carried out. The light axle is continuous, and in the centre is fixed the chain

pulley; a divided sleeve covers the axle, and on the inner ends are fixed the usual bevel cogs, which, with that of the chain pulley, form Starley's gear; the whole being contained in a very small box compared with the usual "drum." The outer ends of the sleeve are joined by five dovetail keys to the wheel hubs, so that it cannot come loose, and the sleeve, not the axle, drives the machine.

Ball bearings, 15¼in. apart, also attach the sleeve to the cross-bar, which runs from the central tube, and, branching out in front, form supports for the adjustable handles. A stout clamp, which can be altered for adjustment or removed if any part is damaged, encircles the central tube and carries the short crank shaft, in roller bearings, to which are fixed the regular bicycle cranks and ball pedals; the latter have a splendidly narrow tread. The ⌐ pin slides inside the central tube, and has spring and saddle of whatever kind ordered. Another novelty is to be found in the brake, which is applied by a lever to a double eccentric (something after the Westinghouse) inside the driving pulley on the axle. The wheels have the neatness of old; sensible-sized, and handsome gunmetal hubs, with the good plan of allowing "play" to the spokes, which greatly lessens their liability to break, and solid or hollow rims and ⅞in. rubbers. By changing the ⌐ pin the machine can be converted into a sort of rear-steering Humber. It is enamelled and part plated, and is wonderfully cheap at £18 18s. We took the following measurements from one with 42in. driving and 16½in. steering wheels: Length, 62¼in.; centres, 33in.; width, 38in.; wheel tracks, 30½in.

No. 20. The Invincible Roadster (The Surrey Machinists' Co., Limited).—A central-geared front-steering double driver. The frame is something like that of a Humber reversed, and the axle is divided, the gear being held in a central box, outside of which is the pinion for the chain, which passes down behind the middle tube. Strong arms run up from the side bearings to the cross tube above the axle. This cross tube supports the front or central portion of the frame, which is of a rather peculiar pattern (see Fig. 21). Bends and curves are avoided, and the connection between the machine and pilot wheel is in two parts. One portion slants downwards, and at the bottom the cranks and pedals are held by a stout prong, and are adjustable. From the Stanley head of the small wheel a horizontal tube, carrying the foot-rest, runs to the slanting tube—the two being firmly joined together. This gives an immensely strong frame. In all these machines the handles are of an unusually comfortable shape. The machine is, of course, only suitable for gentlemen. The brake is applied by a lever which tightens a band round the central driving

drum. Steady steering is a feature, and is effected from the right side. An Arab spring is placed on the usual ∫ rod to support the saddle, and it brings the rider well over his work.

The wheels are of the same type as in the Sociable, but with ⅞in. rubbers. All parts are adjustable; ball bearings are put "everywhere," and it is needless to say that it is built and

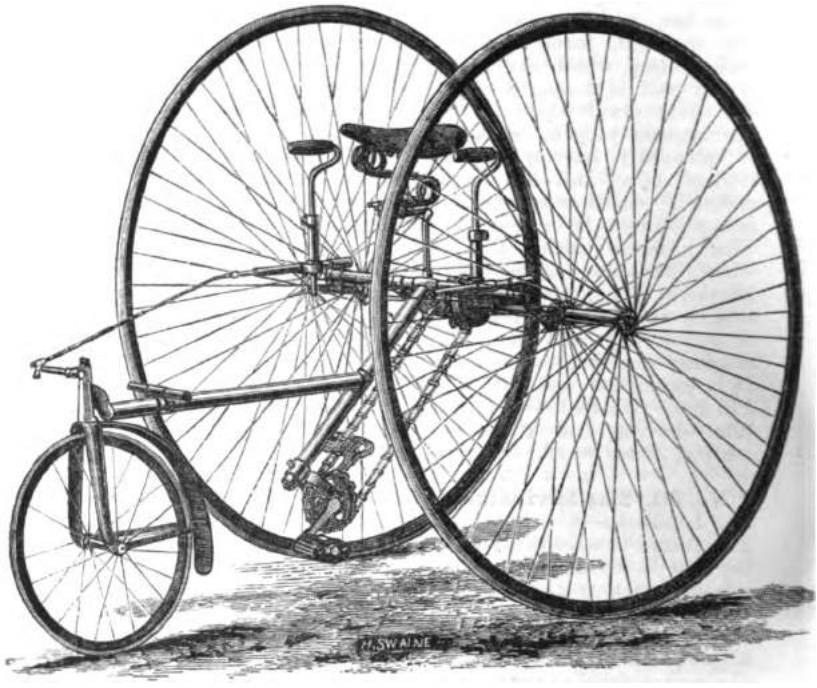


FIG. 21.—THE INVINCIBLE ROADSTER.

finished in the best style, enamel and part plating being usual. The particular machine we examined—one of the first built—was of a rather peculiar size, the driving wheels being 47¾in. and the front one 18¼in. The measurements were: Length, 67¾in.; centres, 34½in.; width, 39½in.; wheel tracks, 31½in. It is one of the lightest roadsters in the market, being under 75lb. Price £24 15s.

No. 21. The Invincible Sociable Roadster.—The first glance gives the idea of heaviness, as the tubing is much larger than usual, being $1\frac{3}{4}$in. in diameter, and the frame of a ⊢ shape, without any extra rods or stays. In front, the central beam runs out perfectly horizontal and farther than usual, giving increased steadiness. To facilitate steering, the (hollow) forks of the leading wheel are turned castor-wise. The steering

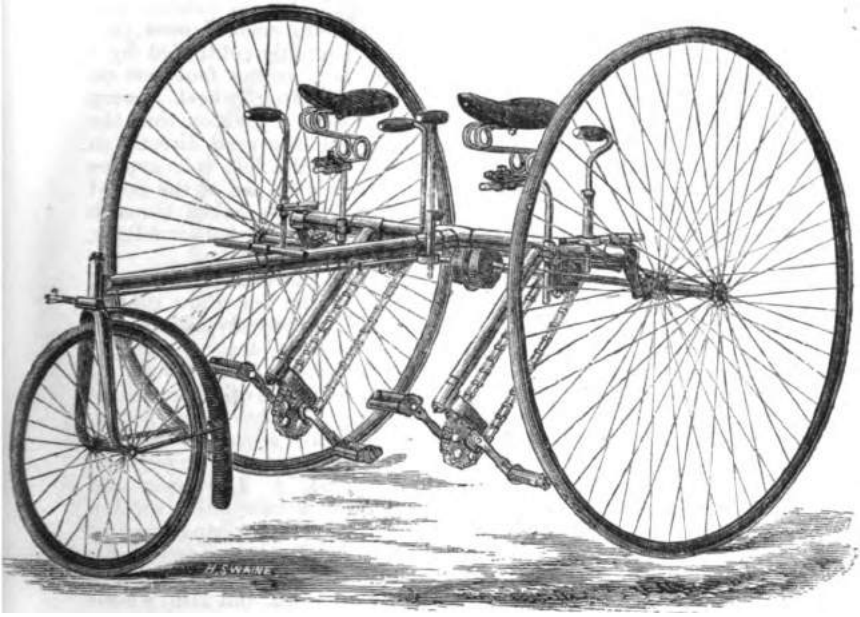


FIG. 22.—THE INVINCIBLE SOCIABLE ROADSTER.

rod is inclosed in a tube below the beam, which keeps it free from dust and grit; it acts on the right side of the pilot, from a handle in the centre.

A new form of double driving gear has been adopted; it is smaller in size than usual, but is efficient in practice, and is placed in the centre, joining together the ends of the divided axle, the whole being inclosed in a drum beneath the large

cross tube (see Fig. 22). From the centre of each half a tube slants downwards; this carries, by the aid of adjustable clamps, the lower chain pulleys, which have bicycle cranks and ball pedals; the upper ones are fixed to the respective halves of the axle; and, although the rider's power is applied independently, it, through the agency of the double-driving gear, assimilates and gives equality of driving to both wheels. The axle is "naked," i.e., without cover, and in comparison with the cross tube, to which it is joined by short arms and ball bearings, looks very small, but it is strong enough. All the handles and seats are adjustable: the latter are held in small bosses projecting from the main tube, and the height is controlled by a neat and easily-worked screw. There is a strong foot rest on the frame, and capital mud guard over the front wheel. Lamp brackets are fixed to the front legs in such a position that the light is thrown where it ought to be—on the road directly in front. A single turn of the handle on the left side applies the strap brake very powerfully. The wheels are of the noted Invincible pattern; light 16 gauge spokes are linked through small hubs and carried tangent-wise back to the hollow felloes, where they are held by inside nipples.

One of the most striking features is the enormous size of the tyres; these measure 1½in. and are of the best Para rubber. They give great smoothness of running, especially over rough roads, and save the machine from a great deal of jarring, although they add considerably—far more than would be thought—to the weight. Harrington's enamel is used, the bright parts are plated, and ball bearings are put to the wheels, frame, crank shaft, and pedals. Although sociables are somewhat out of place on the racing path, the Invincible has performed well in that direction, as on 31st May, 1884, A. J. Wilson and J. H. Pullen, at Alexandra Palace, won a two miles scratch race on one of these machines in 7min. 3¼sec., covering the first mile in 3min. 35sec., both times being the fastest on record for sociables. Many other good feats have also been performed on it. The measurements of a machine with 47½in. and 21in. wheels are: Length, 77½in.; centres, 43½in.; width, 60in.; wheel tracks, 51½in. Price £33 10s. Weight, little over 100lb.

No. 22. The Ladies' Invincible Roadster.—The chief difference between this and the ordinary type (No. 21) is that the frame is bent down low in front, to give room for the dress, where it supports the backbone of the leading wheel. A dress guard is also put over the chain. Owing to its extreme lightness (about 60lb.), ease of running, and absence of complication, it is, *par excellence*, a cycle for the fair sex. It usually has 46in. wheels, geared level, and is enamelled plated fittings, ball bearings throughout. Price £25 15s.

No. 23. The Invincible Racer.—Always noted for extreme lightness, the Surrey machines have fairly surpassed their previous records in that respect. With the present machine the once standard of lightness in bicycles has been reached—that of "pounds for inches"—*i.e.*, a pound in weight to every inch in height of the driving wheel. This is but little exceeded, as with 44in. wheels the weight is well under 46lb. The outline is like that of the roadster, but lighter tubing is

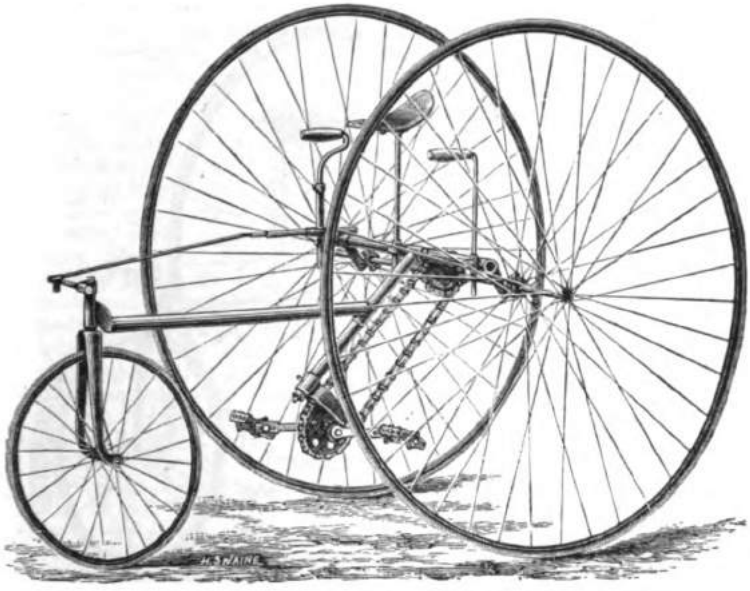


FIG. 23.—THE INVINCIBLE RACER.

used. The axle is solid and ¾in. thick, and is joined at the ends as well as at each side of the central gear box to the cross tube. Of course, there is no brake, but the handles and seat are adjustable. Rat-trap ball pedals, which have a splendidly narrow tread, are fitted. The wheels resemble those of a racing bicycle; the spokes are of a very fine gauge, the ends are held in the hollow felloes by nipples, and after linking through the small steel hubs, cross, tangent-wise, as they return to the felloe. All wheels have ⅜in. rubbers. The steering rod,

operated upon by the right handle, is steadied by being inclosed in a tube—a decided improvement, as the "rudder" is always firm and under control, not jerky, as is so often the case. The Invincible is, in every way, a machine of the very highest order. We took the following measurements from one with 44in. driving and 17½in. steering wheels. Length, 63¾in.; wheel centres, 33in.; width, 38¾in.; wheel tracks, 31in. Weight varies slightly; for light-built riders as above, or for a semi-racer, 52lb. Price £25.

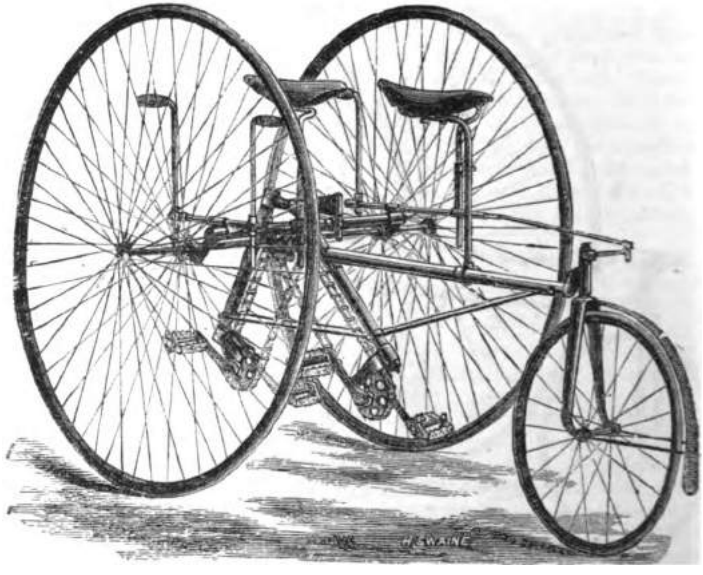


FIG. 24.—THE INVINCIBLE TANDEM RACER.

No. 24. The Invincible Tandem Racer.—In appearance this type resembles the machine just described reversed (see Fig. 24). The axle and driving are the same, the cross tube being a little behind and above the axle, to which it is joined in four places by ball bearings. From the cross tube a central hollow pillar (as in the Roadster Single) slants back, and from it the backbone runs straight to the trailing steering wheel, which it joins by a Stanley head. This backbone supports the pin and saddle of the rear rider. On each side of the boss

which encircles the main cross tube to hold the top of the rear pillar there is a socket holder—a short tube. On the top end of the front pillar there is a very strong ≺ shaped bracket. The extremity of the arms, between which are the two chain pulleys and gear box, have sockets corresponding with those on the cross tube, over which they are placed. On the right side, a bolt, held by nuts, passes through both, binding them firmly together. On the left side, the shaft of the ⌐ pin performs a similar duty. By the way, this pin is cranked at the top, in order to bring the saddle over the centre of the machine. The attachment holds the front pillar firmly, but it is further strengthened by light, but strong, stay rods (see Fig. 24), which run from it to the rear pillar, and from thence others run to near the extremity of the backbone. These make the machine very rigid and prevent any "give" in the framework. At right angles to the main cross piece there are short tubes which support the adjustable handles. These are, from front to rear, 16in. to 17in., and in width about 20in. apart.

The exact distance between the saddles, from centre to centre, varies according to their relative positions, but averages 21in., so that the riders have plenty of room. The wheels, as in all these machines, have very broad hubs, and are immensely strong. Regular bicycle cranks and ball rat-trap pedals are fitted. They have an exceedingly narrow tread, which, taken in conjunction with their being directly under the rider, accounts for the great speed that can be got out of the machine, which has been to the fore in several recent contests. As an instance—a two miles Tandem handicap, at Alexandra Palace, on 24th May, was won by 250yds. by A. J. Wilson and G. Smith, 150yds. start, in 5min. 53sec., and the full two miles covered in 6min. 8⅘sec. But this is far from the speed that will be got out of the machine. Steering is attended to by the rear rider. The other details can be gathered from the drawing of the roadster, the racer being, of course, lighter in every way. We found a 44in., with 18in. steering wheel, to measure: Total length, 70½in.; wheel centres, 39½in. apart; total width, 39in.; wheel backs, 31½in. Weight, 81lb.! Price, with balls to all parts, enamelled, with plated fittings, &c., £30.

No. 25. The Invincible Tandem Convertible Roadster.—Built stronger than the foregoing (see Fig. 24), with lever brake, splash guard to rear wheel, &c.; it can be easily separated at the ≺ attachment, when, by taking away the front brace rods and dividing the chain, the whole front part can be taken away, leaving a double-driving-semi-open-fronted-rear-steerer, very much like the Rover. This tandem is very suitable to ladies, as it is the most open fronted of any machine, the rider having nothing at all in front. It is singularly light

—about 90lb. to 95lb. Price and other details the same as the racer.

No. 26. The Weston Double Steerer Roadster (D. G. Weston).—Another "Humber." The backbone is lower than in its antitype, and has an "American" head—extra long centres working between projecting bosses behind the central pillar, instead of in it, as with a Stanley head. This automatically assists in steering, as the drag of the trailing wheel tends to keep the leaders straight. The saddle rod ("plunger") passes through the backbone, and is, of course, adjustable—as is the handle rod, which is of the ordinary bicycle pattern. The front brake is also applied as in the two-wheeler, and is made conformable to the varying height of the steering bar. The slackness in the chain is also easily counteracted. Altogether it seems a capital example of this popular type of machine. With 46in. wheels, enamelled frame, plated fittings, Arab spring, ball bearings throughout, &c., the price is £23 5s.

FIG. 25.—THE WESTON ROADSTER.

No. 27. The Weston Roadster.—With the exception of being lighter in build and having the top cross tube attached to the axle in only two places, on each side of the gearing, and not at the ends, it is identical with the original roadster described

in "Tricycles of the Year, 1883," pp. 84 to 86 (see Fig. 25). Brake power is applied by a lever on the left side to a flange on the drum. These machines, if better known, would be more appreciated. They are genuine central drivers—not merely "central-geared"—and are of the highest class. Price, inclusive, £23 5s.

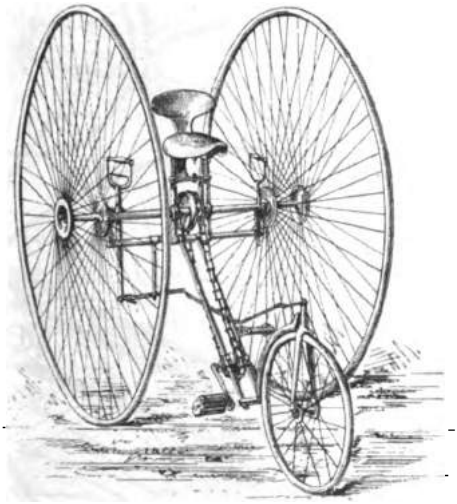


FIG. 25.—THE NON-TELESCOPIC NONPAREIL ROADSTER.

No. 28. The New Telescopic Nonpareil No. 2 Roadster.—A new type that will most likely replace the one described in "Tricycles of the Year, 1883," pp. 42 to 45. The chief changes are in the framework, and the three cross bars, instead of being placed one above the other, are arranged more in the form of a triangle—the lowest being placed at the back, so as to allow more room for the feet. Steering is effected in a remarkably good manner; instead of the awkward and dangerous high rod on the right, the steering handle is, by a swing lever under the frame, connected with a bent rod, which runs between the central tubes to the front wheel, which it efficiently steers. The Nonpareil thus becomes the most open-fronted central geared single in the market. The improvement is very great; and if the steering is not quite so rigid, riders have the great advantage of being able to dismount from either side with equal ease—a privilege that is denied them on other

machines of a similar design—witness the various illustrations. Another good point, the brake is provided with a ratchet to hold

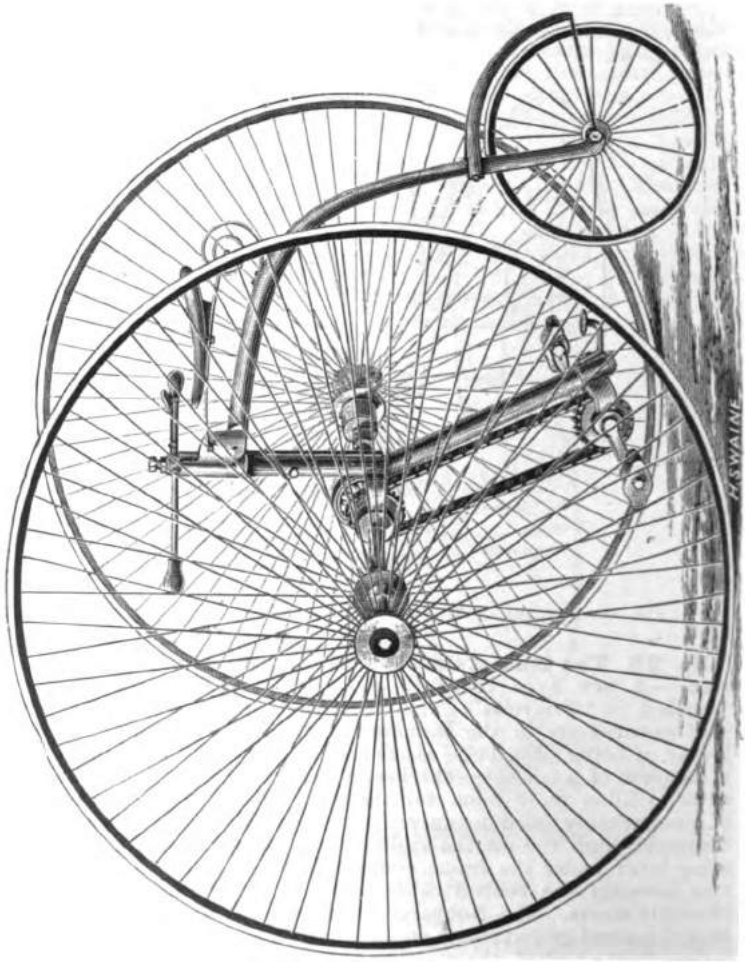


FIG. 27. THE HUMBER TRICYCLE.

it "on" at any required power. The machine, of course, closes as in the other form. The regular sizes are 48in. or 50in.,

and enamelled, with plated fittings and balls to all parts, including pedals, £23 10s.

No. 29. The Non-Telescopic Nonpareil Roadster.—It need scarcely be said—after the title—that this machine does *not* close, but it is built on the same lines throughout, and with plain pedals, costs £21; with ball pedals, £22 (see Fig. 26).

No. 30. The Humber Front-Steerer Racer (Humber, Marriott, and Cooper).—An 1884 "test" machine, which, if it meet with public favour, may be common in 1885. The driving wheels, gear, &c., are the same as the ordinary Humber, but in place of a backbone a tube bends down—like a central gear machine—in front to the pilot wheel. The chief peculiarity is in the steering. This is effected in a way that strongly reminds one of the American Star Bicycle, and the old "Bath Chair" system, by a rod resting on coil springs over the Stanley head of the front wheel and slanting up backwards, terminating in a cross steering rod, for use by the rider. So far as it has been used it has been most successful; one rider—R. Cripps—has won about a dozen races on it. In appearance and safety it does not compare favourably with the more generally known type, which we illustrate (see Fig. 27), so that the numerous imitations may be compared with the original It was fully described in our first series, pp. 12-14.

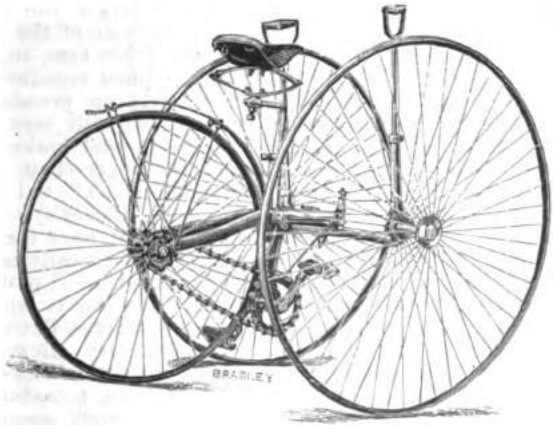


FIG 28.—THE EMPEROR ROADSTER.

No. 31. The Emperor Roadster (Monarch Tricycle Co.).—Quite a new design is introduced with the Emperor—first shown

at the Sportsman's Exhibition, in 1884. In it the rear wheel is utilised for driving. The front wheels are about 44in. and the rear 40in. The former run free on short independent axles attached to uprights, which also support the adjustable handles, and are employed for guiding. In the centre of the tube connecting the wheels there is an upright to secure a ring at the end of the short, straight backbone, thus forming a socket-head. The backbone also supports, above, the ⌜ pin of the saddle; and below, a strong pillar, with arm carrying the crank shaft, on which is a large chain pulley and the pedals, &c. The chain (Morgan's patent) passes on the right side of the wheel to a much smaller (one-third less) pulley attached to the rear wheel. The effect is to gear the wheel up one half. Very strong forks run from the backbone to support the driving wheel. When running down hill the cross tube forms a fine foot-rest, *à la* Rover (see Fig. 28). The Emperor is as yet too new to pronounce definitely as to its merits. A powerful brake is included. Price, with balls to all parts, plated fittings, &c., £21.

No. 32. The Carver Roadster (James Carver).—For several years this once well-known maker's name was associated with "hollow spoke bicycles." After two years' comparative retirement from the wheel world, the present tricycle was introduced in 1884. It is a close copy of the prevalent Humber pattern, with the features of that make, and some special points of its own; chief amongst the latter is the ratchet brake, applied as usual by a grip lever in front of the handle bar. Attached to the latter there is a ratchet arm, in which a spring clip works, so that any power applied remains "on" without straining the fingers in the least; on pressing the clip the check action at once flies off. It will save riders of the Carver many a hand ache. The actual brake power is exerted by a band round a flange of the upper chain pulley. The backbone is high, and therefore the shackle tail spring on it is not adjustable. The driving gear (Starley's) is placed at the right side. The cranks are fixed, but have the usual adjusting slot for the ball pedals. Those who critically examine the Carver will be well pleased with the mechanical perfection with which every part is made and finished—this is especially apparent in the chain and pulleys; in short, the Carver will bear comparison with its rivals of a similar class. If required, the noted "hollow spokes," which consist of thin sheet steel rolled into tubular form, with solid ends, can be substituted for the ordinary solid ones; they are exceedingly strong, but not very much lighter, and can be had on an extra payment of £2. The machine is remarkably light, but looks strong, and ought to be very fast. We took the following measurements from a machine with 42½in. driving and 18½in. trailing wheels:

Length, 60½in.; centres, 30in.; width, 38in.; wheel tracks, 32in. Weight 67lb. The machines are generally highly geared, such as 42in. to 52in., and enamelled, part plated, ball bearings throughout, &c. Price £24.

No. 33. The Sterling D.D.F.S. Roadster (Adam Burdess).—In the work issued in the early part of the year, we noticed several machines by this maker, mostly back pedalling single drivers. Recently a new and much improved machine has been introduced; it is a front-steering double driver with Starley's gear. With these improvements some of the special patents, which are alone sufficient to popularise the Sterling,

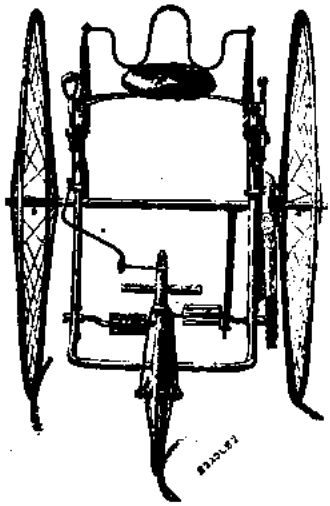


FIG. 29.—THE STERLING D.D.F.S. ROADSTER.

are retained; the chief of these is the suspended saddle, which is so hung from a spring frame (see Fig. 29), as described on page 54 of the First Series, "Tricycles of the Year 1884," that the rider is completely isolated from all metallic vibration. Another good point, one we have often advocated, is the abolishment of the awkward old-fashioned brake lever. By simply turning the left handle, which works in a screw socket, full power can be applied without straining the hands; the same with the steering—it is remarkably steady, and not influenced

by any jerking of the pilot wheel. This screw action applied to the handles is second to none for either brake or steering purposes, especially the former. In all respects it is a capital machine. Price, with ball bearings, £23; without ball bearings or plating, £18 18s.

No. 34. The Englefield Lever Roadster (Blenhiem and Son).—Any change from the almost universally adopted rotary action is a novelty that attracts the attention. The driving gear of the Englefield looks like a combination of the Omni, Merlin, and Overman systems; but is a novelty well worth examination. The axle is continuous, and, by means of a silent clutch action, drives both wheels. The frame is that of a central driver, with a cross tube over the axle. From this, two stout tubes run to the rear, slanting downwards. These in turn

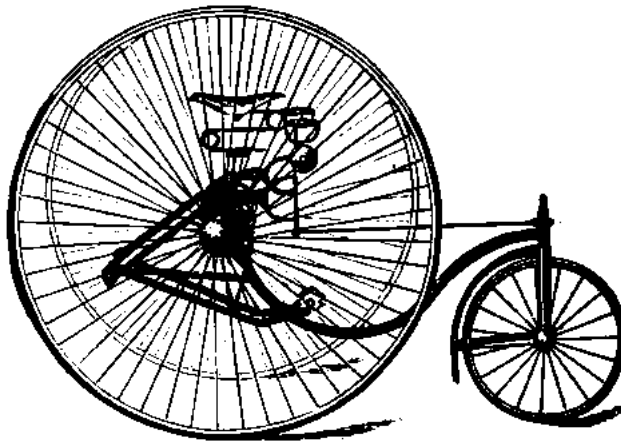


FIG. 30.—THE ENGLEFIELD LEVER ROADSTER.

support a cross piece, which forms the fulcrum on which the ends of the levers work. They run forward, and for the last six or eight inches bend upwards to hold the pedals (see Fig. 30). On the axle there are, eight or ten inches apart, two large chain pulleys; and, midway between these, a smaller pulley, placed at right angles, and held in that position by projections from the frame. The chain passes from one pedal, over the pulley above it, round the small one; then over the other large pulley, and down to the lever below it. The result

produced is that the depression of one pedal raises the other, in addition to propelling the machine. Any length stroke may be taken, or the feet allowed to remain at rest when running down hill. By turning a small handle, the machine can be geared up or down; thus, a 50in. may nominally represent a 54in. for speed, or be converted into a 36in. for power, or intermediate powers. There is no dead point; i.e., pressure applied to the pedals, irrespective of their position, will always impart a progressive action. In the eyes of many riders these points are important desiderata. The Englefield appears to answer, but we have not yet had an opportunity of putting its merits to a practical test, nor has it yet been "about" enough for a public verdict to be pronounced upon it. A safety tail runs out at the back, and the machine has the other usual features, including ball bearings to all parts required—the two places where the frame is attached to the axle and the front wheel; it is finished, painted, part plated, and has an Arab cradle spring, and the usual sundries. Price £21.

No. 35. The Globe Convertible Tandem Roadster (J. and H. Brookes).—The general scheme of construction can be seen on referring to Fig. 31. It is a front steering double driver, with a detaching rear portion—the latter having a trailing wheel.

It will be seen that the lower portion of the frame consists of an oblong composed of tubes; this is really in two portions. The front, or permanent part, is something like the shape of this year's Premier. The side tubes, which are at the top attached to the outer axle, curve forward to form firm supports for the adjustable handles and lamp brackets, and at the bottom they are firmly attached by a ring boss to the lower frame. This, like the sides, consists of weldless tube, and is bent round in front, where it supports the backbone of the pilot wheel, which has a serviceable mud guard, and runs out horizontally, in two tails, each tipped with a small roller to act as safety guards. A Γ pin, with Arab or elliptical spring and suspension saddle, is fitted, and double driving is effected by Starley's gear on the left side, steering, as usual, being carried out from the right. A powerful lever band brake acts over the drum containing the driving gear. The ends of the pedal shaft work in ball bearings held in an adjustable slot on the side tubes. The tread, measured from centre to centre of pedals, is 9in., therefore the feet are in a more natural and close position than is possible on an ordinary bicycle. So far the description completes the single form of the machine.

A most ingenious arrangement has been designed to convert this, or any other suitable front steerer, into a tandem, by aid of some additional framework, shown at Fig. 32. This is some-

thing like the front portion, but the lower frame is much shorter and reversed; the tube has solid ends, which are tapered, and fit into split rings on the main frame, in which they are firmly secured by a key. From the lower frame, to which they are attached by a ring boss, tubes run upwards, slanting to the front, and have lever hooks (see Fig. 31), by which they are fastened to the outer axle, above which they curve backwards, and, like those in front, form handle supports.

FIG. 31.—THE GLOBE CONVERTIBLE TANDEM ROADSTER.

A detachable continuation of the steering rack can be operated on by the rider at the back, or by either, so that guiding can be conducted jointly or separately, but in unison. The pedal shaft works as in front, and there is an independent chain acting on a separate pulley. By withdrawing a key pin from one of the links of the chain it can be taken off, and, by folding back the levers and slacking the split rings, the whole rear portion is easily removed, the operation only taking a minute, or less.

One strong point, that will be a boon to not only to the

initiated, but all riders, is the fact that there are no loose nuts or parts whatsoever; everything remains in its place, and is always there to attach or detach. From the back of the detaching lower frame there is an upright tubular pillar, with, at right angles, a short straight backbone, which, by a socket head and castor forks, supports the small trailing wheel; this follows automatically the front machine without any steering apparatus, and is merely to bear the weight of the rider at the rear, and take it off the front of the machine. This permits the single machine being made lighter than is customary with tandems. With an entirely rigid connection there would be a constant strain when going over any ground that was not perfectly level, by reason of the varying heights of the wheels. To overcome this difficulty, the backbone of the small wheel is jointed, so the hinge permits the trailer to adapt itself to the surface of the road. The upper portion of the pillar supports the ⌐ pin (adjustable), spring and saddle (see Fig. 32).

From the illustrations it will be seen that the rear seat is only open at one (the left) side, but it can be readily mounted, and would suit a lady admirably, or, indeed, it would be a capital tandem for two ladies. Comfortable foot rests are provided. The whole is well enamelled, part plated, and has balls to the axle, ball pedal shafts, and the pilot wheel, only plain bearings to the pedals and cones to trailing wheel. It seems well made, and ought to be very popular as soon as it is better known. Price £24.

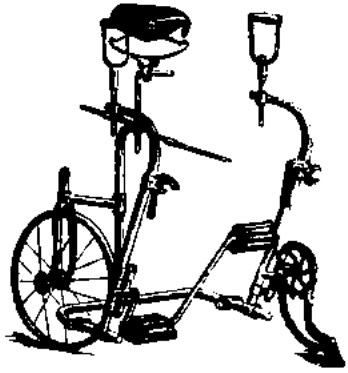


FIG. 32.—THE GLOBE TANDEM ATTACHMENT.

No. 36. The Globe No. 1 Roadster.—Much the same as the single form of the tandem. A front-steering double driver, with two safety tails at the back. Most convenient for carrying

luggage. Strong and light looking, it makes an excellent roadster. All of these machines are coated with Mander Brothers' patent enamel. Price £16. It is generally geared level, with 50in. wheels, but this is altered to order.

No. 37. The Wellington Mascotte Roadster (George Townend).—Encouraged by the success that the juvenile machines met with, Mr. Townend has at last catered for his more adult customers by the production of the Wellington Mascotte Roadster. It is built on familiar lines, a front-steering double driver (Starley's gear), very simple in the frame, with the important improvement of having the steering rod carried below the frame. It is a neat, light, and well-made machine, with balls to all parts, and the usual finish, so that it is decidedly cheap at £20.

No. 38. The Coventry Rotary No. 1 Roadster (D. Rudge and Co. and the Coventry Tricycle Company).—Although the three-wheeled cycle is of considerable antiquity, the modern tricycle only dates from the introduction of the Coventry by Haynes and Jefferis, in 1877, in the early part of which year we inspected and tested the first machine, then driven by lever action, ever built on the new lines. It was originally designed by the late James Starley. Since that time the firm has undergone several changes, and is now known as Rudge and Co. The old lever movement was soon replaced by the rotary, but, save for minor improvements, the first outline remains unaltered. Although one wheel is alone used for propulsion, it cannot be fairly termed a "single driver," as generally understood. We have described the machine fully in the Semi-racer; this only differs in being stronger and a little heavier (see Fig. 33). One very great advantage is that of only having two tracks, making it easier to pick out a good bit of road and considerably reducing the friction. A foot rest is now provided, projecting from the right side. The machine is splendidly made and extremely light; while, in addition to being as fast as any yet produced, it is a capital hill climber, quite open fronted, and cannot tip backwards. Rudge's noted ball bearings are put in two places, to the axle of the large wheel, pedals and crank shaft, and both small wheels, the frame is treated with Harrington's enamel, and the saddle supported by a cradle spine in place of the S one shown in the illustration. Price £22 17s. 6d.; without balls to pedals, painted and with ordinary spring, £21.

No. 39. The Coventry Rotary Semi-Racer. — This machine is not only one of the lightest on the market, but has few, if any, superiors in speed and ease of running. The

theory of construction is an equal distribution of weight between the wheels, in order to gain an accurate balance and perfect steering. This is carried out by making the main driving wheel on the left 48in., and the two steering wheels 22in. The latter are a considerable distance (58½in. from centre

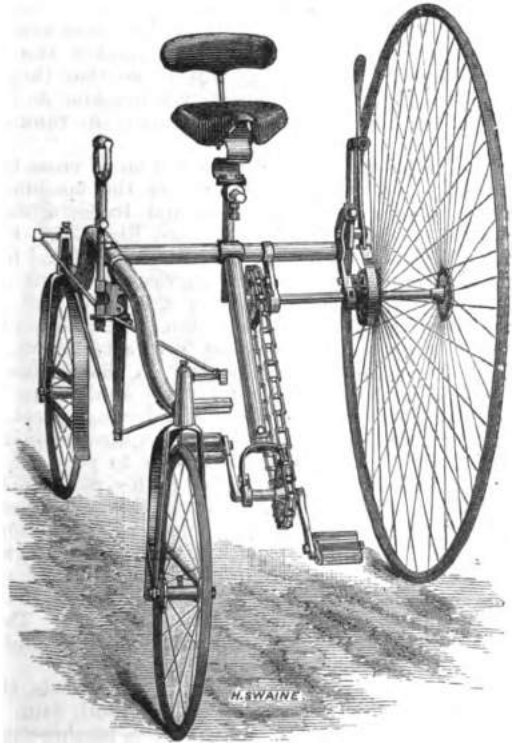


FIG. 33.—THE COVENTRY ROTARY NO. 1 ROADSTER

to centre) apart, and are connected by a long steel tube, which dips down fore and aft, and is provided with necks and centres which work in Stanley heads. It is further strengthened by a light stay rod, braced in the centre by a support coming down from the frame. This imparts greatly-increased rigidity and firmness.

The splendid steering is the great feature of the machine, as one-half the weight rests on the side wheels. They bear firmly on the ground, and are therefore more sensible to the action of the helm than if only receiving a small portion; even if one wheel should be momentarily off *terra firma*, there is sufficient weight on the other for steering. A very light rod runs from a short arm projecting outwards on the rear wheel to one projecting inwards on the front wheel. It is this cross action which gives the very sensitive steering, and makes the slightest touch of the handle act on both wheels, so that they can describe a very small circle. Riders of this machine do not suffer from that erratic wriggle common to many in running down hill.

The frame is as simple as possible; a stout cross tube runs (from the long one on the right) across the machine, and is joined in two places by strong arms and Rudge's bearings to the short axle of the driving wheel (see Fig. 33). From the centre of the cross tube another runs downwards and forwards; this holds a prong which, in turn, carries the crank axle and pedals. The latter are like those of a bicycle, and have an adjustable throw; the tread is only 10in., and Rudge's bearings are fitted, not only to the prong, or fork, attachment, to carry the crank shaft, but also to the pedals. A chain passes round a pulley wheel on the crank shaft, and a similar one fixed on the end of the short axle to which the driving wheel is fixed.

A racer, pure and simple, would not require a brake, but it is, of course, added where the machine is to play the part of a roadster in addition to use on the path; it is of the strap order, steel band, leather lined. It is applied by a lever, and is wonderfully powerful. The seat is held on the horizontal arm of a ⌐ rod, which permits of both a vertical and forward adjustment of the seat. Either an Arab or elliptical spring is used, and suspension saddle. The wheels have the hollow Surrey rims, light ⅞in. rubbers, direct spokes, &c. The whole machine shows the most careful workmanship and finish. Both handles are, of course, adjustable.

The measurements are, with 48in. and 22in. wheels, the same as those of the ordinary Rotary: Width, total, 34in. (or this can be reduced to only 30in., so that the machine can pass through an ordinary doorway); wheel tracks, 29in.; frame, 24in. Length, total, 80½in.; centres, 58½in. A 48in., geared to 56in., scales only 61lb. Price £22 17s. 6d.; this includes balls all parts, Arab spring, Harrington's enamel, &c.

No. 40. Coventry Rotary Racer.—The "Racer" demands notice on account of the many splendid feats performed upon it. Suffice it to say, that, until lately, it held the records from one to fifty-five miles, and many still stand to its credit.

Very light tubing is employed—16-gauge, but 1¼in. in diameter—a size that gives ample strength. The long tube at the side is very gracefully curved down at the ends to the small wheels. Additional strength is afforded by light brace

FIG. 34.—THE COVENTRY ROTARY RACER.

rods, which run from just below the back and front necks (of the side wheels). These are joined by a stay coming down from the centre of the machine. The cross tube (Fig. 34), which forms the short arm of the ⊥ frame is very strong, and runs close to the large left wheel, but higher than the axle. From the centre of the cross-piece a tube descends, slanting forwards, and ending in a prong which carries the chain pinion and crank shaft, exactly similar to those of a bicycle, with ball pedals, &c. The pinion is set slightly to one side, in order to clear the supporting tube. The axle of the large wheel extends to the

centre, being joined to the cross tube by two arms and ball bearings, one near the hub, the other close to the extremity on which the upper pinion is carried. Laced spokes are adopted for the wheels, and every part is very light; tangent wheels and hollow felloes.

The saddle has the usual ⌐ rest and a low firm spring. The length of stroke of the pedals can be adjusted, or the cranks detached at will. We have often before spoken of the splendid steering qualities of this machine; indeed, this is one of the chief causes of its great success. The whole machine is a gem, and for long will hold a prominent place in racing circles.

The machine we inspected was a 48in., geared up to 65½in., with 21in. side wheels, and weighed only 52lb. The price is, with ball bearings to eight places, enamelled and part plated, £24. The weight is considerably lighter now; on 15th August we scaled a 46in., which was under 48lb.

No. 41. The Ladies' Coventry Rotary Roadster.—A speciality for 1884, and one of the most suitable ladies' cycles of the day, owing to its extreme lightness, reliable steering, and very easy running. After toiling along on some of the heavy carriages dubbed "specially light tricycles for ladies," a fair cyclist, when mounted on a Coventry Rotary for the first time, seems endowed with some new power, so easily does it glide along. The frame is somewhat different from that of the Racer, being a truer T shape. The axle of the large driving wheel works on ball bearings within the large cross tube. Flat bars support the pedal shaft—on the right it is additionally strengthened by brace rods. A tin guard is put over the chain, which is on the left side (see Fig. 35), and the handles and seat rod (Arab spring and suspension saddle, with back rest) are readily adjustable. Brake lever on left side. Although designed for ladies, it is suitable for anyone of medium size and weight. The general size of the driving wheel is 40in. or 42in., and the machine only having an extreme width of 30in., it will, in its complete state, pass through most doorways. The price, ball bearings to all three wheels, pedal shaft, and pedals, and with an Arab spring, and enamelled, £21 7s. 6d. If with ordinary spring, without balls to large wheel, axle, and pedals, and painted, £18 10s.

No. 42. The Coventry Rotary No. 2 Roadster.—In outline resembling the Ladies' with side gear, but larger, 48in. wheels, and heavier. Foot rests on both sides are provided. Flat sides are also used instead of tubes, otherwise it is like No. 1. Price, finished as that type, £22 17s. 6d. If painted, plain pedals, and elliptical spring, £21.

No. 43. The New Coventry Rotary No. 2 Roadster.—A very light combination of Nos. 1 and 2. The side chain is retained, but instead of the wheel axle working inside the cross tube, it is held below it, as in the No. 1, by two sets of ball bearings. This raises the frame somewhat, and

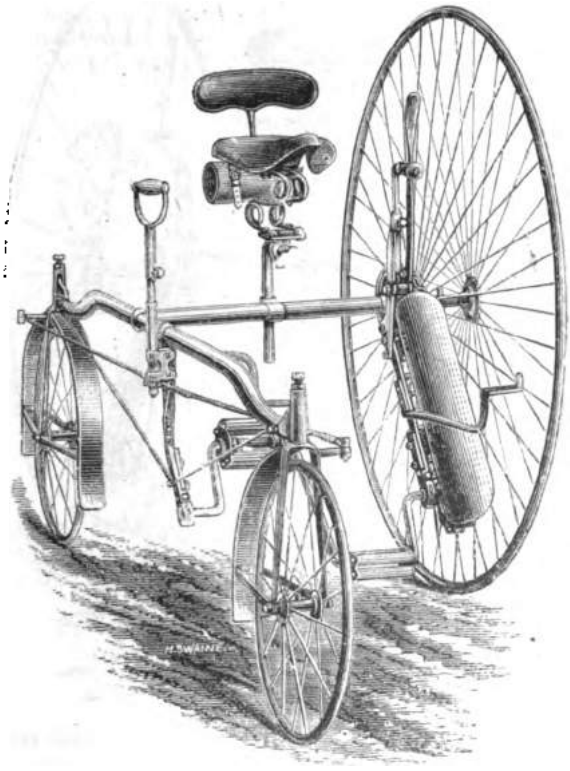


FIG. 35.—THE LADIES' COVENTRY ROTARY ROADSTER.

permits of a taller rider using the machine. Tangent wheels, with laced (15-gauge) spokes, with hollow felloes and ½in. rubbers, form the driving wheel. The foot rests, now of a comfortable pattern, also serve as lamp brackets. It makes a splendid light roadster, and may be described as the companion

machine to No. 45 (see Fig. 40), and the price is, with usual finish, £25 17s. 6d.; or if painted, ordinary spring, and plain pedals, direct spokes, and solid felloes, £22.

FIG. 36.—THE NEW COVENTRY ROTARY NO. 2 ROADSTER.

No. 44. The Coventry Convertible Sociable Roadster—As will be seen (Fig. 37), the machine has a large wheel on either side, with two small ones in the centre—back and front. The left portion consists of an ordinary Rotary Coventry. The frame (of the left side) consists of steel tubes, ⊢ shape—the

axle of the driving wheel works inside the cross tube, as in the Ladies' pattern (Fig. 35)—the small wheels are placed at each end of the longer tube, in the centre of which is a strong boss, with a rocking joint attached; to this the end of the right axle is secured by a taper pin passing through it. (See Fig. 38.)

In order to separate the two portions, all that has to be done is to withdraw the pin A, after removing the nut B, and undoing another nut which secures a brace rod on the head of the rear wheel, when the sides separate at the line C, the

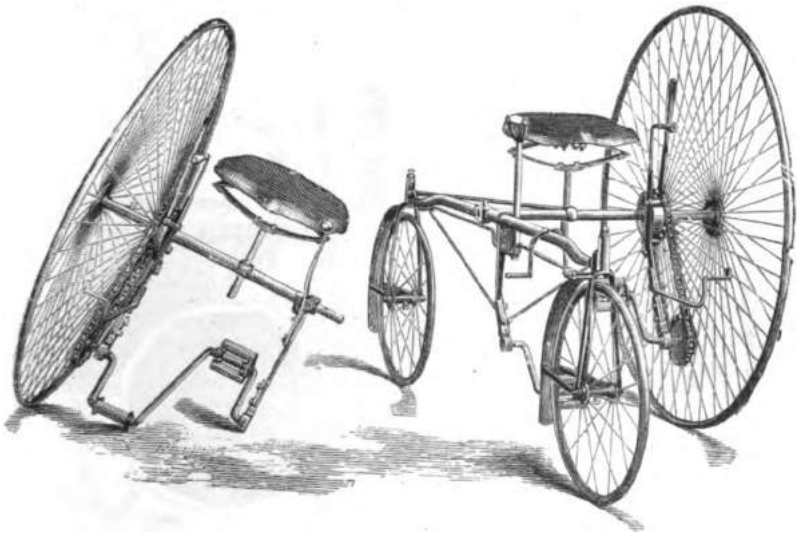


FIG. 37.—THE COVENTRY CONVERTIBLE SOCIABLE ROADSTER (Detached).

left part being a perfect machine, while the right remains with all its parts intact, as shown at Fig. 37. Were it not for the hinge joint, the machine, in its double form, would be useless, as on unequal ground the wheel axles would be strained. The hinge, however, effectually prevents this, as it allows a certain amount of play—*i.e.*, both driving wheels remain on the ground, although one may be a couple of inches higher than the other, or the central wheels higher or lower than both. This also adds considerably to the safety of the Quadricycle, as it is next to impossible to overturn it sideways.

Going into the details, we find each wheel with independent driving power chains. The ends of the pedal shafts are held in ball bearings, which are knuckle-jointed to flat steel bars coming down from the main frame. These are held together by a seeming multiplicity of nuts. The frame is strengthened by light stay rods, which run from the neck of the rear wheel to the axle near each large wheel, and from near the same point to the leg which carries the pedal shaft of the left half of the machine; it is further strengthened by a similar rod running back from the neck of the front wheel. The pedals have a 6in. throw, and slackness in the chain can, of course, be taken up.

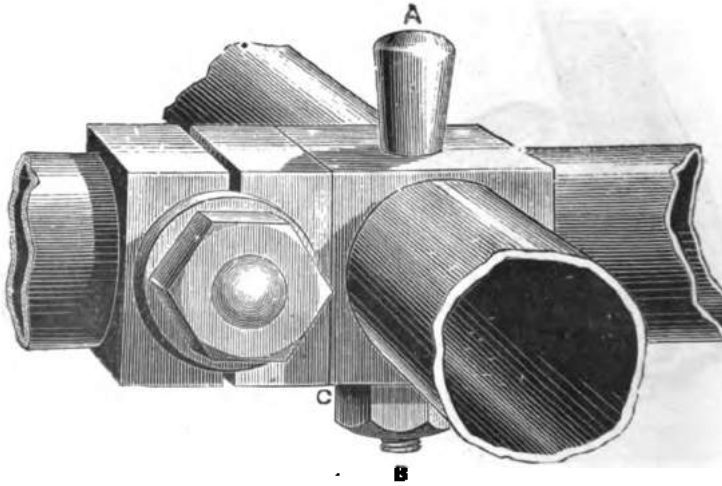


FIG. 38.—DETACHING BOLT OF COVENTRY CONVERTIBLE ROADSTER.

The steering properties of the Coventry are wonderfully good. A central position is assigned to the handle that regulates the helm, and the rider on the left has command over it; both small wheels act together, and the machine obeys their guidance readily. Most efficient mud guards are placed over the central wheels, so that the riders are protected from flying dirt. Good foot rests are also provided; they project from the central frame and side legs, affording a practicable and comfortable "rest." The difficulty of brake power is got over by having an independent band brake to each driving wheel, applied by

pushing forward a long lever: this action, in descending a hill, tends to push the rider further back on the seat, counteracting the inclination to slip forwards. The brake is very powerful in action, and with it there is little fear of a run away down any slope. The handles are adjustable.

Little remains to be noticed. The wheels bear the neat Rudge outline, and have ⅛in. moulded tyres, direct spokes, gunmetal hubs, &c.; Lamplugh and Brown's best suspension saddles are added; they are, of course, adjustable vertically and

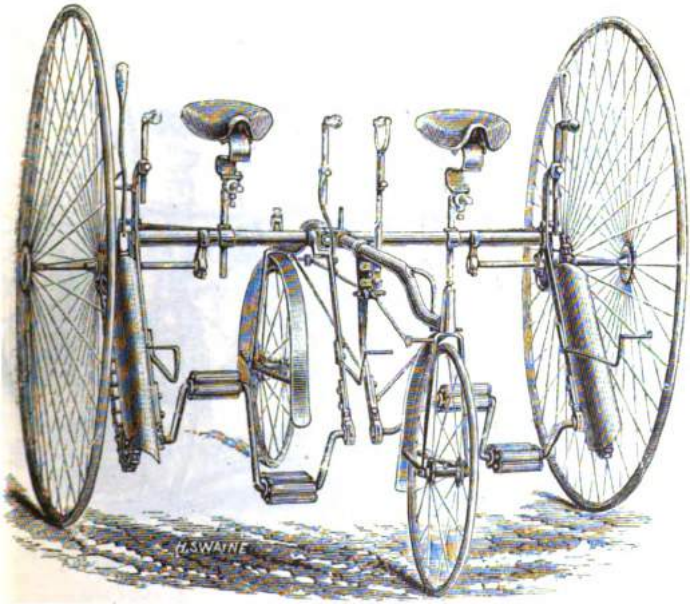


FIG. 33.—THE NEW COVENTRY CONVERTIBLE ROADSTER.

horizontally. Rudge's celebrated ball bearings are put to all the four wheels and ends of the crank shaft and pedals; the whole is finished, as in the other machines, with the bright parts nickelled, so the price must be considered very moderate, in comparison with single machines. The improvement mentioned in connection with the tandem would add materially to the attractions of the machine. General measurements, with 48in. and 22in. wheels: Length over all, 80in.; from centre

of frame to head of front wheel, 32in.; to rear, 26in.; total of frame, 58in. Width, total, 57in.; wheel tracks, 49in. Price £30; if painted, with plain pedals and elliptical spring, £26 10s. Weight, single machine, 84lb.; loose wheel, 55lb.; total, 130lb. for a very strong roadster.

No. 45. The New Coventry Convertible Roadster.—New this year, and an improvement on the old pattern just described in several ways. It is built much lighter, being constructed on the same lines as the single New Pattern (see

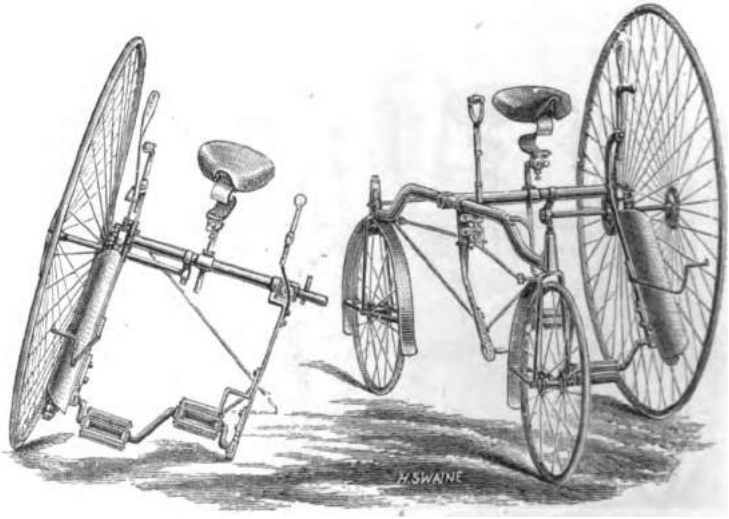


FIG. 40.—THE NEW COVENTRY CONVERTIBLE ROADSTER (Detached).

description of No. 43), and has laced spokes, tangent wheels, hollow felloes, ball bearings to every part, Arab springs, &c. The difference of construction can be seen by comparing Figs. 37 and 40. Finished in this manner, and part plated, &c., the total price is £37. The new pattern, which is illustrated at Figs. 39 and 40, has plain pedals, common S springs, direct spokes, solid rims, and is painted in lieu of enamel. The price therefore descends to £30 10s.

No. 46. The Coventry Rotary Tandem Roadster.—The ordinary rotary having proved so pre-eminently adapted

for racing, it was one of the first to be converted into a tandem,

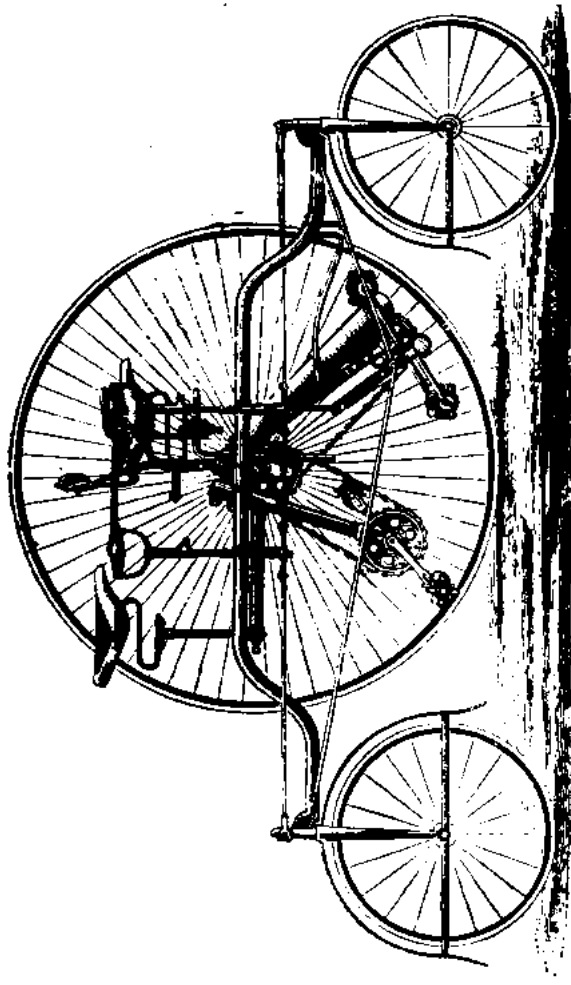


FIG. 41.—THE COVENTRY ROTARY TANDEM ROADSTER.

in which form it promises to very nearly, if not quite, rival

the bicycle in speed. In fact, when we consider that a mile has been done in but little outside three minutes (we have it on reliable authority that "three" has been beaten in a trial) by a single rider, what ought the watch to record when two racing men propel a single *two-track* light machine? Time will tell. It will be observed that the machine is virtually an ordinary rotary. By means of an ingenious joint it may be converted into a single machine. This joint (see Fig. 42),

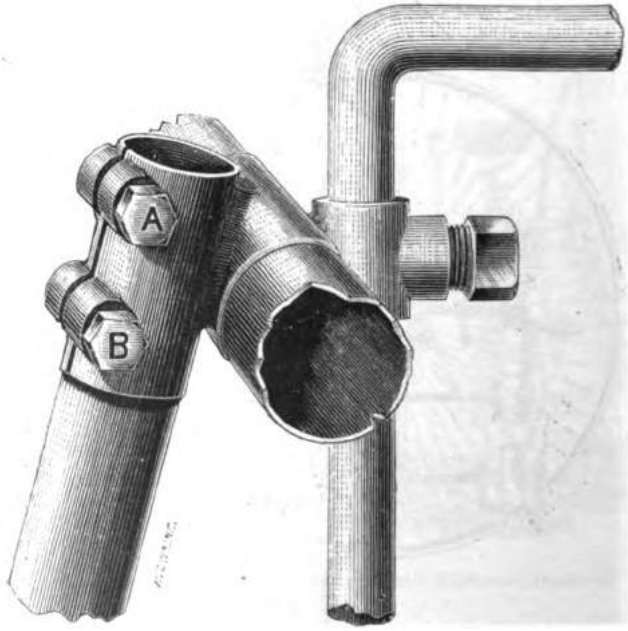


FIG. 42.—JOINT FOR CONVERTING A TANDEM INTO A SINGLE MACHINE.

consists of a very strong boss encircling the cross tube of the machine, holding in front a socket, with adjusting screw for the ⌐ pin of the leading rider, and at the back a "split" holder or ring. The latter supports the back pillar, which carries the cranks, pedals, chain pulley, &c., at the bottom, and at the top a strong tube, shaped thus ⌐, which runs out horizontally to the back to support the adjustable rod of the rear rider's saddle. A handle on the right side (allowing both riders, if

desired, to steer) and part of a horizontal rod, with handle knobs at the ends, on the left, is all the extra weight—only about a dozen pounds in addition to a single machine. The chains work separate chain pulleys, attached to the same axle. In a minute the extra parts are disconnected by slacking the nuts A and B (Fig. 42), the back pillar and saddle, with all its connections, can be removed at once, and the machine becomes a single Rotary. Rudge's ball bearings are put to all parts of the frame, both sets of crank shafts, pedals, and small wheels. Enamelled, and with Arab springs, &c., the price is £28 17s. 6d. If non-slipping tyres are included—a useful addition—the total cost is £29 5s. The No. 2 type has plain pedals, ordinary springs, and is painted. Price £25 10s. As regards weight, in its double form it is lighter than very many single tricycles.

No. 47. The Coventry Tandem Racer.—Built after the model of the racing single and the Roadster Tandem. It has hollow felloes, laced spokes (very fine wires, linked through a small hub, and carried back to the rim, inside which they are held by nuts, with a safety sleeve), ¼in. or ⅜in. rubbers. Every part is reduced as much as possible. Ordinary racing springs are sufficient, but light rat-trap ball pedals are used; and Morgan's chain—a great improvement on the ordinary—is adopted. It is both wonderfully strong and runs remarkably easy. Balls are, of course, put to every possible part, and, in short, we feel sure it will make a mark in racing, and we shall not be surprised to hear of its being driven ten miles in thirty minutes—or twenty in the hour—if riders of sufficiently good and equal merit are on it. Price, enamelled, nickel plated parts, tangent wheels, &c., about £30. Of course, the machine is geared up very highly, as the labour is so light. Already several races have been won upon it.

No. 48. The Double Tandem Convertible Four-in-Hand Roadster.—Changes can be rung upon this four-in-hand that remind one of a pantomime trick. In its simple form—as we described it at the time of its first appearance at the Stanley Show of 1884—it is a "four-wheeled carriage for four riders." Its appearance (see Fig. 43) is that of a New Coventry Convertible (see Fig. 39) with a tandem seat added to each half of the machine. Both or either of the rear seats are removable, so that it can be adapted for either two or three or four riders, or, when separated, one part forms either an ordinary single rotary, or if the rear seat is retained, a tandem. When four good riders are working in unison, the machine ought to travel at something like railroad speed, and "astonish the natives," even down the Ripley road, where they are more used to cycling sights than on any highway in the world.

Over two years ago—in 1882—we threw out a suggestion, which, if acted upon, would tend to make the quadricycle, especially in its tandem form, far more useful and popular. It was that of supplying a spare beam and small wheels (they ought not to cost more than £5 or £6). Two separate machines could then be formed, when so desired. The idea is worth acting

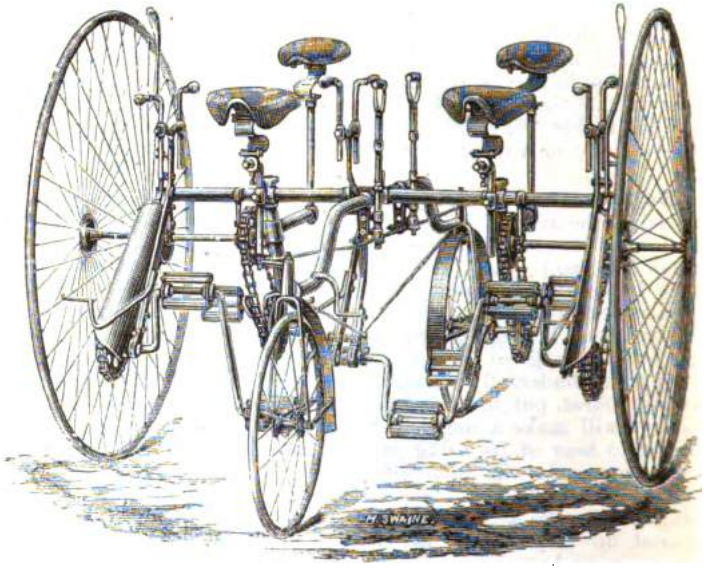


FIG. 43.—THE DOUBLE TANDEM CONVERTIBLE FOUR-IN-HAND ROADSTER.

on, especially in this quadruple form of machine, as, when disconnected, one half is lying idle, whereas the beam and wheels, with necessary small parts, would convert it into a second perfect machine. The cost of the complete machine depends on the number of extras, but runs somewhere about £46.

No. 49. The Central Gear Rudge Roadster.—One of the latest additions to the already numerous ranks of double-driving central gear machines, and has few superiors of its class. The frame is of the usual ⊢ shape, the chain pulley being placed in the centre of the axle, the chain working behind the central tube, to which is attached a prong, holding the lower pulley and crank axle in ball bearings. The tube ter-

minates just behind the front wheel, where it is joined by the backbone, instead of all being in one piece, as is usually the case (see Fig. 44). A cross tube above the axle, joined to it in two places by strong arms and ball bearings, supports the central pillar. On the latter there is a ring boss, through which the long arm of the ſ rest slides for adjustment. The

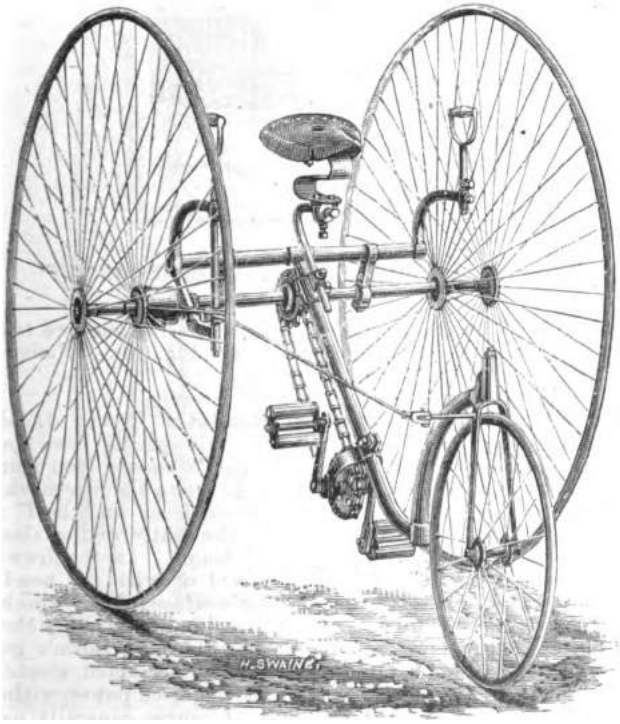


FIG. 44.—THE CENTRAL GEAR RUDGE ROADSTER.

double driving gear is placed on the right side of the axle. Handles and all parts are adjustable, with balls to crank shaft and pilot wheel in addition to the frame attachment. Price, 48in. wheels, £22; if with ball pedals, Arab spring, fluted tyres, and enamel instead of paint—not a list of extras, but the accepted finish of most machines—£24 7s. 6d.

No. 50. The Parcels Express. Coventry Rotary Roadster.—An adaptation of the tandem to meet the new and popular form of carrier machines for transporting small

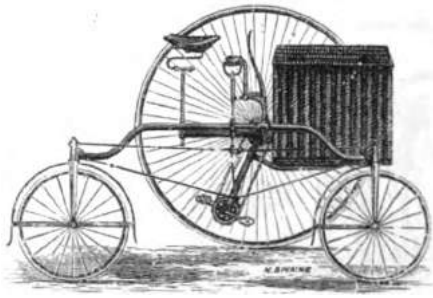


FIG 45.—THE PARCELS EXPRESS COVENTRY ROTARY ROADSTER.

parcels. The front pillar, pedals, &c., of the tandem are taken away and replaced by a large basket (see Fig. 45). It answers its purpose capitally.

No. 51. The Flying Scud Roadster (South London Machinists' Company). — Considerable alterations have been made in detail since last season. It has a square loop frame, the top ends of the side tubes joining direct to the sleeve which covers the axle, there not being any cross piece; and the Γ rod passes through a boss projecting from the centre of the sleeve, and can, of course, be adjusted at any height. In the drawing (see Fig. 46) this has somehow got mixed up with the head of the pilot wheel, giving the machine a confused look, which it does not possess in reality. A dress guard is put over the chain, on the left side, which drives either Starley's or Bown's gear. On an extra payment of 10s. beyond the price quoted, a ratchet can be added, to retain the brake at any required power, without any strain on the hand. A saddle is of course generally used. Ball bearings are fitted to all parts, including pedals, and the machine is all enamelled, with lamp, valise, &c., included. Price of a 48in., £15 12s. 6d.; if part plated, £2 dearer.

No. 52. The Flying Scud Sociable Roadster.—Plain and simple in outline. The pedal shaft is held, in ball bearings, at the end of legs at each side, and supported in the centre by the tube which connects the machine with the pilot wheel. The Γ rod on the right has ball handles affixed to it—the off being a

tube bent round at the back, where it is attached to the rod, and brought out in front on each side of the saddle. On the left side there is only the handle next the wheel; the other is supplied by

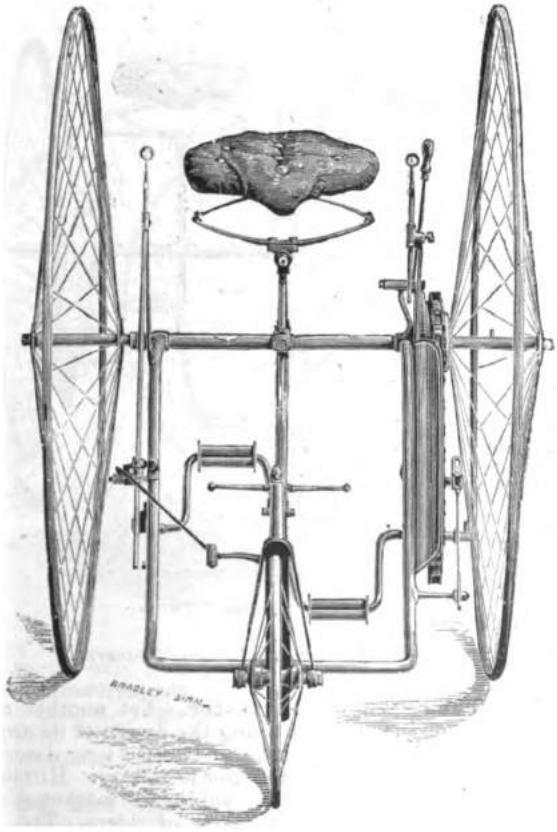


FIG. 46.—THE FLYING SCUD ROADSTER.

the steering handle (see Fig. 47). Brake power is applied by a long lever on the left side, acting on the flange of the case carrying Starley's gear. Both sides are quite open in front,

there being no frame. Full inch tyres are put to the large wheels, and materially add to the comfort on rough roads. Nett price, with all usual extras, ball bearings, two lamps, &c., £18 for a 44in.

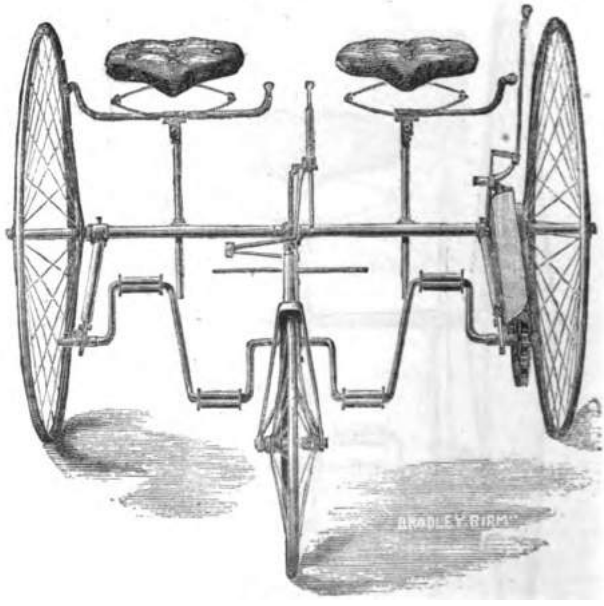


FIG. 47.—THE FLYING SCUD SOCIABLE ROADSTER.

No. 53. The Paragon Roadster.—Yet another of the "Humber" school, in form resembling the design of its antetype as closely as possible (see Figs. 27 and 48); a long description of its structural points is therefore not necessary. Hitherto all machines of this pattern have been put in the market at a very high price, prohibitive to the majority of riders. The South London Machinists' Company have, with the Paragon, endeavoured to produce one at a moderate tariff.

It is intended in the future to give a choice between Bown's new double driving gear (in which case the machine will be driven from a central pinion), or Starley's, the latter, up to the present, being generally applied. Strength of construction has been duly considered. The coming improvements will also

include an adjustable saddle and lowered centres, with the American head. The usual bicycle steering rod and brake lever are provided, and the spring has a curled tail. A good mud guard is placed over the back wheel, and, in short, the Paragon will, for those who prefer this class of machine, be found a good roadster.

It is generally painted or enamelled. Ball bearings are put

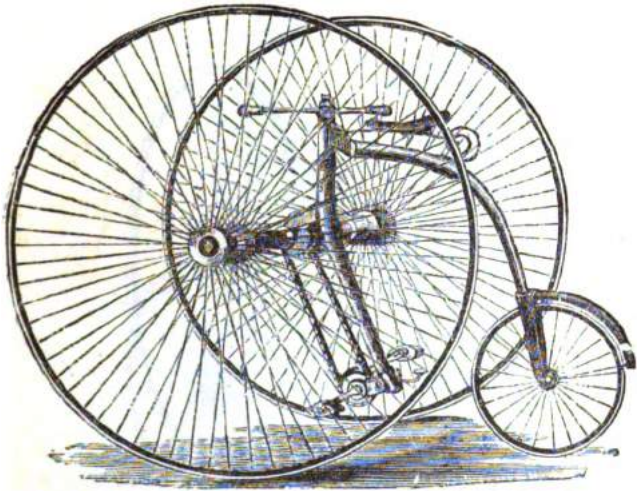


FIG. 48.—THE PARAGON ROADSTER.

to all parts—axle (two places), pedal shaft, small wheel, and pedals. Measurements of a machine with 50in. and 18in. wheels: Length, 70½in.; centres, 36½in.; width, 40in.; wheel tracks, 35in. Price (nett), £17 5s. For £2 10s. extra, all three wheels, as in the Traveller, can be made to steer.

No. 54. The Antelope Roadster.—To all appearances identical with the Rover (described and illustrated on pages 23-25) in every detail save cost, as the nett price of a 48in., enamelled, and with ball bearings to frame, pedals, crank shaft, and trailing wheel, is £19 4s. 6d. Without balls to shaft and pedals, £17 11s., or £17 2s. for a 44in.

No. 55. The Maxeppa Roadster (The Metropolitan Machinists' Company).—In order to save weight, the axle is

uncovered and joined by ball bearings to a boss with two arms, which support the frame legs and tubular cross piece above. The front legs slant forwards; the pedal shaft is held between them and works in ball bearings. A tube arches up over the front wheel, which has Stanley head, solid forks, and ball bearings. A capital double curl spring forms an easy support to the suspension saddle. Both handles are adjustable, and the brake band acts over the drum on the left side, containing the double driving gear (see Fig. 49). It steers, as usual, from

FIG. 49.—THE MAZEPPA ROADSTER

the right, and a rear safety tail runs out behind from the same side. A dirt guard and foot rest are to be found in front.

Despite the very low price charged, the extras include a pair of King of the Road hub lamps, double gong, spanner, &c. This makes the price really much lower. The measurements of a 50in., with 18in. pilot wheel, are: Total length, 64in.; wheel centres, 30in.; total width, 36in.; wheel tracks, 28½in. Price, nett, £17 2s. Weight, 91lb.

No. 56. The Gnat Roadster.—Originally introduced as "Garrard's New Action Tricycle," in Uxbridge, over four years ago, but it almost disappeared from view until early in 1883, when it was taken up by the above-named firm. It is

different from any other in the market, and has a central driving wheel, about 30in., at the back, with two small 20in. wheels in front (see Fig. 50). The rider sits rather high, and the pedals drive the back wheel by connecting chains, which gear up considerably (about double); steering is effected by both the front wheels. The machine is moderately fast, but altogether too

FIG. 50.—THE GNAT ROADSTER.

small, unless for riders of very low stature. On 26th July, 1880, the inventor, G. Garrard, on a 26in., won a ten mile race at Lillie Bridge in 44m. 46sec.—the best time then on record, but during the present year, on 24th May, 1884, F. Lees rode the same distance in 33min. 39sec., at Leicester, on a Humber. Price, with 30in. wheels, £19. Weight, 71lb.

No. 57. The Brixton Merlin Humber Roadster (The Brixton Cycle Company, Limited).—Although following the Humber in outline, a decided departure is made from that class of cycle in the system of driving. The front wheels and

backbone are as usual. The axle is divided in the centre, where Starley's gear is placed. On each side of this there is a drum holding Thresher's Patent Silent Clutch. This consists of a plate, loose on the axle, with a horizontally projecting flange, on the inner side of which a circle of slanting teeth is cut. Within this, and fixed to the axle, there is a disc provided with four falling pawls, arranged so that the upper one lies on the top (of the disc). Through a hole in the "nose" of each pawl a spiral spring is passed. This, when the box is shut, by the outer plate being put in, is slightly compressed, so that the action of the axle, when a pedal is returning or the machine running free, causes the pawl to be drawn away from the teeth, making it

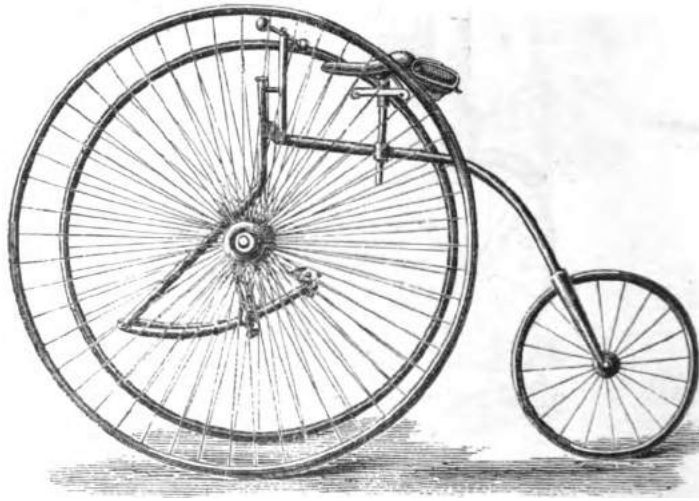


FIG. 51.—THE BRIXTON MERLIN HUMBER ROADSTER.

perfectly silent, there being none of the disagreeable clicking common to most ratchets. When pressure is applied to the pedals, the pawls fall, and firmly "bite" the teeth of the drum, and so drive the machine. The whole is dust and dirt proof.

An arched stay, or bent tube, rises over the whole of the gear, being strongly joined at each end, close to the wheels, to ball bearings on the axle. This "stay" supports the front portion of the frame, which consists of a tubular pillar slanting forwards, and holding, at the bottom, a cross piece on which the ends of the levers work. These run forward, curving slightly

upwards, and having a rocking adjustable pedal at the end (see Fig. 51). On the upper side of the pedal lever there is a slotted ridge; on this the pedal works, and its position can be controlled by the action of the toe pressing against a spring clip. By this means the gearing can be altered from about 40in. to 60in., with, say, 48in. wheels; or any intermediate stage can be had, a result not obtainable with "fixed" gears. This operation is easily performed from the saddle whilst propelling the machine, which is a very great advantage, and should not be overlooked. A clamp encircling the pedal lever holds a stout catgut cord, which is wound round the drum carrying the gear, which is acted on as already described. Between the gear boxes there are two small pulleys (as in the Omni); these are attached to a short chain, and roll up one lever as the other lever is depressed.

The pedals have not independent action, but any length stroke can be taken, or the pedals remain at rest when desired. A little above the arched stay the central pillar becomes almost perpendicular to support the Stanley head of the backbone; from just behind the neck there is a second pillar, over which the adjustable handle bar is placed. A novel form of steering is adopted. The second, or rearmost pillar, is connected with that in front by a link from a short arm to a longer arm on the front tube. This is said to improve the steering and relieve the arms of the jolting vibration and strain common to the Humber class.

The adjustability of the various parts is particularly good. The saddle "plunger" is held on the left side in a ring boss, the clamp of which encircles the backbone, which, for a considerable distance, is horizontal. By means of the ring boss (a bend in the ⌐ pin counteracts its position), the height of the saddle is regulated, while, by sliding the clamp along the backbone, the position of the rider can be adjusted to the required distance from the pillar. The spring is supplied to order—single curl or Arab, &c.

The wheels are of the ordinary description. The machine *ought* to prove a great success, but we fear the makers are hardly enterprising enough to bring it sufficiently before the public in order to give it a chance. The Merlin is both fast on the flat and a splendid hill-climber, and its many special points will doubtless prove a great attraction to riders. We almost forgot to add that a powerful band brake is included. All parts are interchangeable, and balls are put where required. The cost of the machine finished and japanned is £22 1s., or if made to collapse, reducing the width considerably, £23 2s.

No. 58. The Brixton Improved Merlin Roadster.—As will be seen on referring to Fig. 52, this is a central-framed

machine. The frame consists of a middle tube, attached to a cross piece; the latter, at the ends, holding the combined handle and lamp brackets, and the former the "plunger," of the saddle. The system of driving is the same as in the preceding machine. A tail runs out to the rear to support the cross bar for the ends of the levers, and also to act as a safety guard. The position of the driving gear is shown much more clearly in Fig. 25 than in Fig. 51. Brake power is applied by a long lever on the left

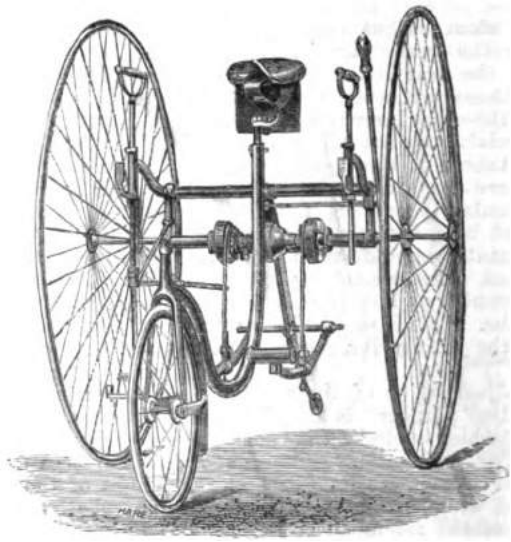


FIG. 52.—THE BRIXTON IMPROVED MERLIN ROADSTER.

acting on the central box, containing Starley's gear. In other details, including the price, it is identical with the Humber variety. A good plan is followed in taking the steering rod very low, so that the machine may be mounted from either side. The measurements of a machine with 46½in. and 18in. wheels were: Length, 65¼in.; width, 39in.; wheel tracks, 33in. Weight, 94lb. Price £22 1s.; collapsible, £23 2s.

No. 59. The Brixton Merlin Roadster.—Instead of 46in., the general size is 42in., and a rather eccentric form of frame is to be found, as all the framing is kept below the axle.

We cannot describe the innovation as an improvement either in appearance or results. One point gained is the ready adjustability of the handles, which can be done whilst riding. In other respects it is the same as the "Improved."

No. 60. The Brixton Merlin Sociable Roadster.—A double form of the "Improved" (see Fig. 53). Each rider is quite independent of the other, but both assist in double driving, as whatever power either puts into the pedals is absorbed in the propulsion of the machine. If desired, the riders can drive at different powers without affecting the running of the machine. The choice of gearing runs from, with 44in.

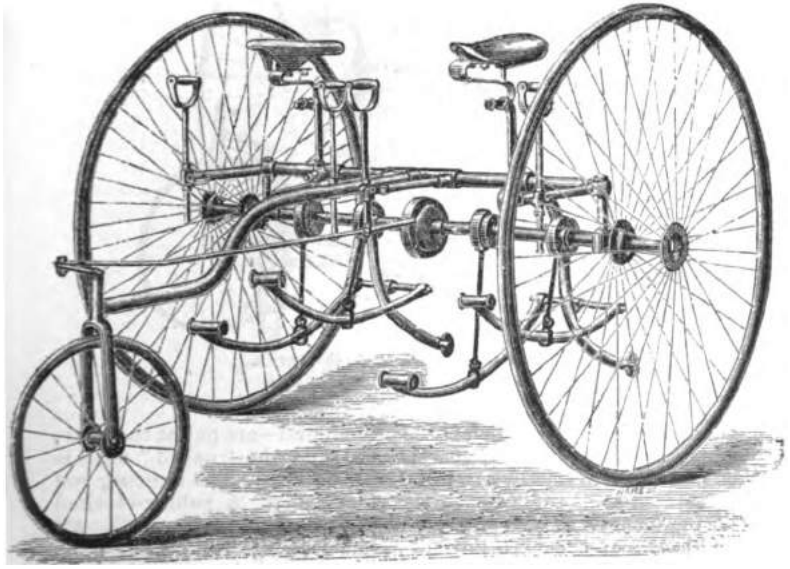


FIG. 53.—THE BRIXTON MERLIN SOCIABLE ROADSTER.

wheels, down to 38in. and up to 60in. It seems a first-class machine, and if the makers only let it become better known, it will, doubtless have a successful run. All parts, including the handles, can be adjusted vertically and laterally. A very powerful brake is fitted. Price, japanned and lined, with balls to all parts, £29 8s.

No. 61. The B. S. A. Roadster (The Birmingham Small Arms and Metal Company, Limited).—Without professing any great speciality, the "B. S. A." is a loop-framed double-driving front steerer of the highest class, as is natural when only the best materials and most skilled labour are employed. The frame is exceptionally neat, the curve of the side tubes (see Fig. 54) being very graceful. Two tails—a vast deal better

FIG. 54.—THE B. S. A. ROADSTER.

than the single one which is too often found—are put at the back, Starley's double driving gear is used, and the "naked" axle is joined to the frame by the usual ball bearings. The steering rod is lowered so as to be out of the rider's way. A rubber-clothed spring foot rest is conveniently placed over the small wheel. All parts are of the best finish. Enamel and part plating, balls everywhere, non-slipping tyres, &c., £23.

No. 62. The Gem Caroche Roadster (The Caroche Tricycle Co.).—Invented in 1884, the present machine at once claimed attention by reason of its being far in advance, in point of merit, of any previous production of the firm. It is of a particularly neat and taking outline (see Fig. 55). The double-driving gear is placed in the centre, and instead of the single tube in front, two are used. At the bottom they hold the crank shaft, and are joined by a short cross piece, from which the

backbone of the pilot wheel runs. At the top these twin tubes are attached to the usual cross tube, which is joined to the axle by two sets of ball bearings. The cross tubing is very strong, and the turned-up ends serve as handle supports and lamp brackets, as may be seen in the illustration. An excellent hand brake, acting over the central gear box, and capable of being "set" as required, is by means of a ratchet worked from the left side. Bicycle cranks and pedals, fluted non-slipping tyres, are also included in what must be classed as an A 1

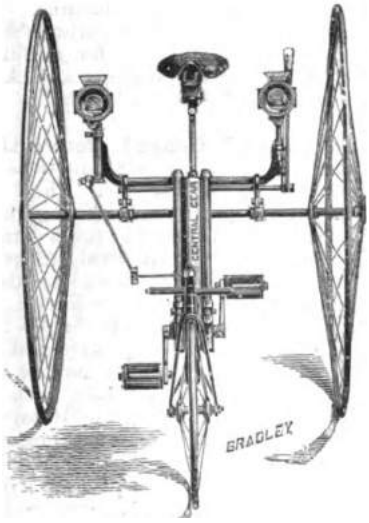


FIG 55.—THE GEM CAROCHE ROADSTER.

machine for either lady or gentleman. In addition to the special points already detailed, the machine is easily and quickly reduced from its normal width of about 39in. to some 10in. less, which permits of its passing indoors. The machine is made and finished in the best style, and, with balls to pedals, crank shaft, pilot wheel, and axle, coated with Harrington's enamel, part plated, and with cradle spring, the cost of a 46in. is £23 12s; without balls to pedals or shaft and with ordinary spring, £21.

No. 63. The Caroche Roadster.—The original double-driving Caroche improved and brought "up to date," so that

it is practically a new machine. It is of the loop-frame order, but the frame is extended more to the front than usual, which has the effect of (by putting the front wheel further out) giving increased steadiness to the steering and control of the machine. There are no angles or joints in the frame. The front portion and side tubes are all in one piece, and are attached to the axle—as usual—by Bown's ball bearings. The backbone of the front wheel is also tubular, and has a useful foot rest. A single tail runs out at the back, and the same excellent ratchet brake as in the central gear forms one of the attractions of the machine. Starley's gear is employed. All parts are, of course, adjustable, and finished like the central gear. The price is, for a 46in., £26 4s., or, minus plating, £23 14s.; if ball bearings and Arab spring are also discarded the cost is reduced to £18 18s.

No. 64. The Central-Geared Convertible Sociable Caroche Roadster.—A very late introduction—the duplicate form of the single central gear Caroche. The "naked" axle is an inch in diameter, and joins, by ball bearings and short arms, the very strong cross tube: from this tubes run down at the sides to hold the ends of the crank straight, in ball bearings. In the centre a third tube bends down to the pilot wheel. This is strengthened by a stay, which has a graceful swan-like curve, and, in addition, holds the rubber-clothed foot rest. The machine is practically open-fronted, and the gear is placed in the centre—a departure from the ordinary lines. A safety tail is to be found on each side, with a small metal wheel at the end, and brace rod, joining it to the front tube, strengthening both. The capital ratchet brake, of additional power, to withstand the strain of a "double," already described, is applied in the centre, over the gear box. With very little trouble the machine can be converted into a single, when it becomes almost a two-tracker, with the double-driving gear on the right side. The other details do not call for special notice, but the machine is of equally high merit as the single. With the accepted "standard" finish, the price is £30; minus ball pedals, £28 10s.

No. 65. The Everycycle Roadster (Messrs. Bayliss and Thomas).—A seeming attempt, and a very successful one, to combine the many points of merit in various types of different machines. This may be understood when we describe the machine as a two-track, pilot-steering, open-fronted, folding double driver. Its "shape" can be seen, both open and closed, on referring to Figs. 56 and 57. Commencing with its main features: Starley's gear is placed on the left side of the machine, and, in lieu of a chain, Messrs. Bayliss and Thomas's well-

known wheel is employed. This consists of a wheel with small revolving horizontal rollers, which give a remarkably free-running gear—very certain and direct in action. The frame, over and behind the axle (to which it is joined by ball bearings), forms a sort of square at the back, being similar to the Folding Excelsior (see "Tricycles of the Year, 1883," pp. 4-6). The corners of the frame work on pivots, as in the machine referred to. In order to fold the machine, the central part of

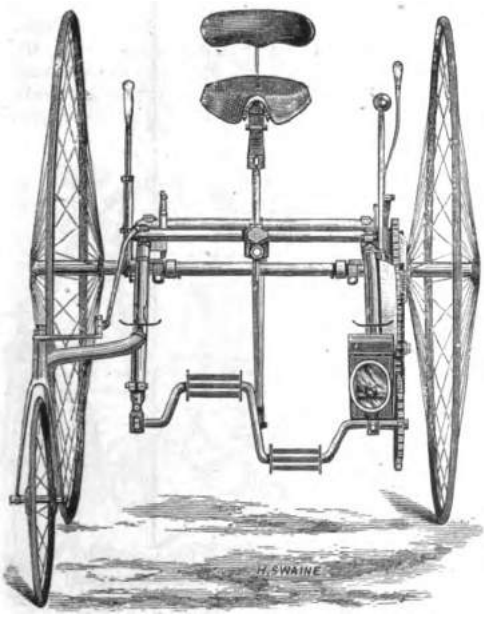


FIG. 56.—THE EVERYCYCLE ROADSTER

the axle—rather a daring innovation—is removed by freeing a spring clutch at each side. The ends dovetail into strong bosses on the remaining portions of the axle, and it appears to be very strong and not at all likely to come loose at an undesirable moment. After taking out this and withdrawing a taper key pin at the back, the machine can be compressed, as shown in Fig. 57. With the exception of the axle, no part is taken away—everything remains in its place, the crank shaft

and frame swinging round upon joints, reducing the width by one-half, from about 40in. to nearly 20in.

Returning to the frame, it will be seen that the front legs support the crank shaft by a hinge pivot joint in ball bearings, run down on each side. From the right leg a tube curves out to the front, supporting the pilot directly in front of its larger follower, thus giving an entirely open front, with the

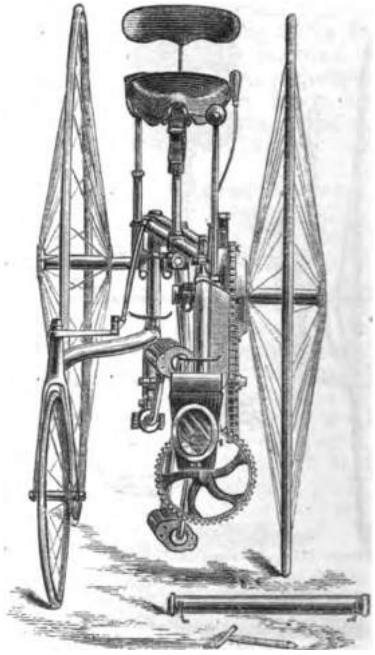


FIG. 57.—THE EVERYCYCLE ROADSTER (Folded).

additional advantage of having only two tracks. Judging from what we have seen of the behaviour of the machine on the road, it seems to steer admirably. The connecting rod runs above the tube, from the right side. A powerful band brake, acting over the driving drum, is applied by a long lever. The ⌐ pin of the saddle is adjustable by a ring boss on the front cross tube of the square frame. A very comfortable

elliptical spring is used, or the Arab can be substituted, and the whole is well and strongly made. Of course, all parts are adjustable. It is worthy of special note that, when folded, the machine really requires less width than a bicycle, and, as the wheels are parallel, it can be freely wheeled about. It is geared level, but can be speeded to order. Painted, with balls to axle, pedal shaft, and pilot wheel, price £25.

No. 66. The Duplex Excelsior Tandem Convertible Roadster.—As the first modern Tandem tricycle, the Duplex demands unusual attention (see Fig. 58). It was the pioneer machine of this type, and its success paved the way for the present increase in the number and popularity of Tandems. We described the technical details of the machine in "Tricycles of the Year, 1883," pages 1-4. Since then, many improvements

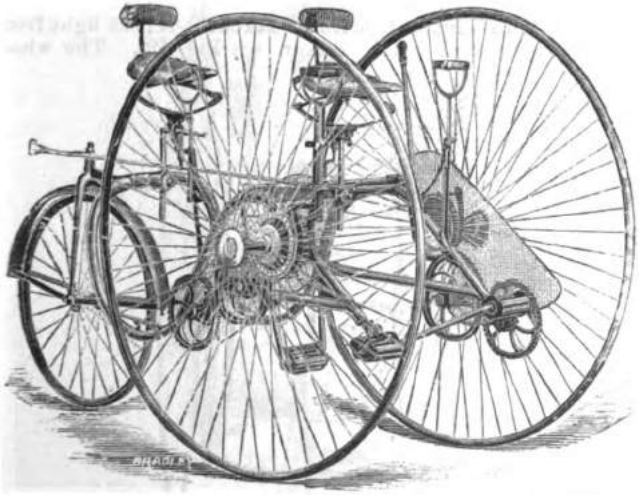


FIG. 53.—THE DUPLEX EXCELSIOR TANDEM CONVERTIBLE ROADSTER.

have been made in general detail. It is a double driver, inasmuch as both wheels are driven, as in the Coventry Convertible, but each rider only propels one wheel, by the anti-friction wheel gear. The front rider is not shut in in any way, as may be seen from the illustration. By removing the front pedals, &c., reversing the front seat and taking out the rear

one, a single driving machine with pilot steering is made. Many long rides have been performed on the machine, and its merits have been proved. The brake, with powerful "band" action, can be applied by either rider—both have also control over the steering. The machine has very strong bicycle wheels, ⅞in. rubbers, and the usual details. Finished painted, with balls to all three wheels and crank shaft, the price is £26 for a 46in.; if part plated and with ball pedals, &c., £30.

No. 67. The Duplex Tandem Racer. — Now that Tandems are in such demand for use on the path, it is imperative for every maker to supply both classes. The Duplex Racer is, of course, very much lighter than the Roadster, and has 40in. driving wheels, geared very highly, with a 22in. steering wheel. It has all the points usual to a racer, and is built very light. Price £30.

No. 68. The Victor Excelsior Racer.—A neat light front-steering loop-framed double driver (see Fig. 59). The wheels

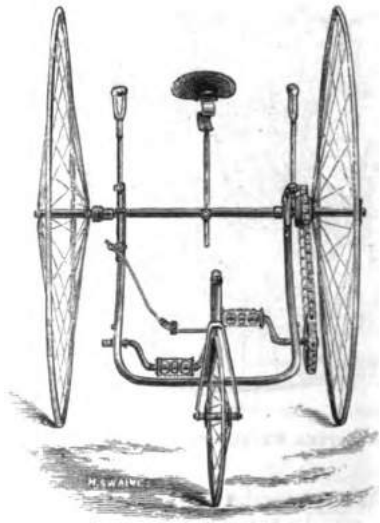


FIG. 59.—THE VICTOR EXCELSIOR RACER.

have laced spokes, Warwick's hollow rim, five-eighths tyres

Very light tubing is put to the frame, and the handles are strengthened by brackets, which have a graceful curve. The saddle Γ pin is also hollow. In fact, every care has been taken to bring down the weight as much as possible, at the same time preserving the requisite strength. The general size of the wheels is 46in., geared to 56in., while the pilot is 16in., or in the one we measured, 16½in. Balls are put everywhere—frame, crank shaft, small wheel, pedals, &c.—and the price is £23 15s.

No. 69. The Victor Pet Roadster.—Another 1884 Excelsior. It has all the characteristics of the foregoing, only stronger and heavier to bear the strain of roadwork, and extras, such as a powerful brake, &c. (see Fig. 60). Balls to all

FIG. 60.—THE VICTOR PET ROADSTER.

parts, dress guard over chain, making it suitable for ladies; it is painted or enamelled, part plated, and is generally geared level, or altered to order. 46in. and 16in. are the wheel heights, with ⅞in. rubbers. Price £23.

No. 70. The Victor Roadster.—Another increase in weight and strength, and the anti-friction wheel gear is used in connection with Starley's double-driving system, instead of chains—the only double driver propelled in this manner.

The frame is exceedingly simple, there being no cross piece, the side tubes attaching direct to the ball bearing cases, while the Γ pin is held behind the axle sleeve in an adjusting boss. The steering remains high, on the right. A safety tail is placed in all these machines at the back. The price of a 50in., part plated, balls throughout, &c., £26.

No. 71. The Pilot No. 2 Roadster (Hickling and Company).—A loop framed front-steering double driver. A very simple frame is adopted—the tubes attach to the bearing cases and bend forward at the top, in the usual manner, to form handle and lamp brackets. A ring boss at the back of the axle sleeve holds the saddle plunger, which can be, by the aid of a short lever, instantaneously raised or lowered.

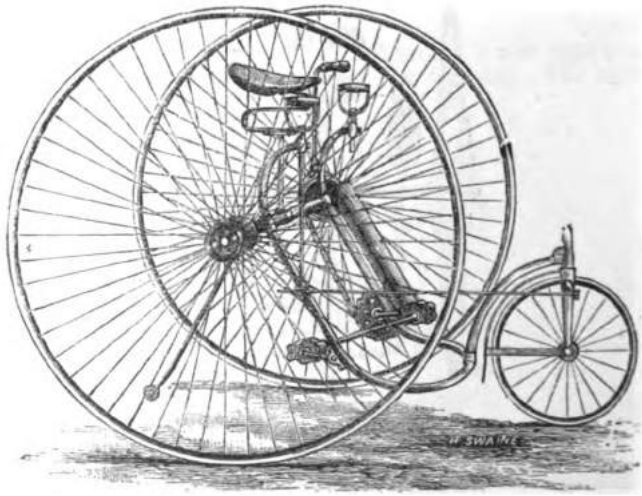


FIG. 61.—THE PILOT No. 2 ROADSTER.

The difficulty generally experienced in adjusting the crank shaft—to take up slackness of the chain—is obviated by an ingenious kind of universal joint, which not only relieves the shaft of undue strain, but permits of quick and exact adjustment. One very special point is to be found in the tyres, which are, as in the noted "Timberlake" bicycles of years ago, wired in, in addition to cement. A strong wire is passed through a specially-prepared rubber, the ends being bound together. With this arrangement such a thing as a loose rubber is

unknown, and the rubber remains firm in the felloe until absolutely worn out.

Direct enamelled spokes and bright gunmetal hubs make up an effective wheel. Morgan's patent chain (elsewhere described) communicates the power from the pulley on the crank shaft to the axle box containing Starley's driving gear. So powerful is the brake that the wheels may be skidded—it is applied by a lever. A very comfortable foot rest is over the leading wheel, and the S spring can be regulated to suit different weights. In place of balls, long rollers are put between the sleeve and axle—they answer admirably. The safety tail runs out on the right at the rear (see Fig. 61).

Another speciality is the swinging block, which controls the pinion of the steering handle, and by a spring keeps it properly adjusted. Thackery's patent washers are put under all the nuts subject to vibration, so that the disagreeable rattling common to many machines is entirely obviated. The machine is in every way to be commended highly, and takes rank in the best class. We took the following measurements with 50in. and 16in. wheels: Length, 65½in.; centres, 32½in.; width, 39½in.; wheel tracks, 32in. Price, including balls to front wheel, shaft and pedals, rollers to axle, part plated, &c., £23.

No. 72. The Pilot No. 1 Roadster.—An open-fronted double-driving rear steerer. The clutch action is resorted to, but it is of a very simple and effective description. Fixed to the ends of the crank shaft there are irregular square-shaped flanges; close to each corner there is a round hole with a narrow "mouth" cut; in these are placed "dogs"—strong pieces of metal with a side head fitting into the hole, so that the remainder of the "dog" forms a falling pawl. On the crank shaft—loose—there are drums, the inner flange of which have a series of deep teeth cut. When the shaft is turned the pawls fall, and the "dogs," or rather one of them, bites into the teeth, locking the drum to the axle, and, as the chain pulley is outside, drives the machine. The feet may remain at rest any time, as the wheels, which are on short, independent axles, can overrun the pedals. The tread is the closest—only 6½in.—we have ever met with in any cycle. This, combined with a well placed saddle, ought to give wonderful ease of travelling. "Hay-fork" is the name by which the pattern of the frame is known. It is simple, strong, and sufficient, with an almost straight backbone; the latter is rather longer than usual, which puts the trailing wheel further back, and so steadies the machine. From a lever under the left handle, spoon brakes are applied simultaneously to the tyres of both wheels. It has the same famous rubbers, plain bearings throughout, but enamelled and part plated. All parts adjustable. Price, 48in., £18.

No. 73. The Devon Swing Frame Roadster (the Exeter Cycle Company).—Although not precisely a new machine, as understood by "recent invention," it is decidedly a tricycle of 1884. Its first and most prominent feature is that of a "swing frame," the object of which is to permit

FIG. 62.—THE DEVON SWING FRAME ROADSTER.

of the rider being always perfectly upright and accommodating his position to the slope of the ground. In an ordinary machine, when on an up grade, the front wheel is raised, placing the pedals more vertical, consequently, not in so

good a position for the rider to exert his power. In order to do away with this objection there is a double frame to the machine. The outer, or ordinary frame, is of an oblong shape, square in front, where it receives the backbone of the small wheel, and after being joined by balls to the axles, square at the back, where it has a safety tail at each side—a vast improvement, as we have frequently pointed out, to the single lop-sided arrangement so common. Within this frame there is a smaller one, which is loose on the axle, so that it swings freely. At the bottom the legs hold the crank shaft in ball bearings. Above, and partly behind the axles, the inner frame forms an arch, through the crown of which passes the straight pin of the spring. The latter is of a peculiar shape (see Fig.

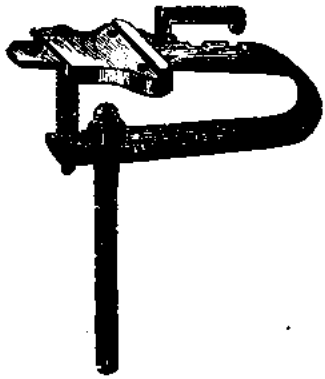


FIG. 63.—THE DEVON SLIDING SPRING.

63). It is of a plain turnover design, but the front end is supported by a curl spring. A sliding plate on the upper portion permits the rolling saddle being placed forward or backward, a spring clip holding it in the required position. Below the saddle there is a block of rubber, and the plate is so arranged that the saddle rolls to each side with the downstroke of the leg, putting more power into the pedal, saving friction, and balancing the rider better.

The swing of the inner frame is controlled by a quadrant, which holds the loose frame firmly for ordinary work; by a small lever this can be instantaneously released on coming to a hill, so that the frame swings back, or rather, balances; it can

then be fixed at the proper angle, or allowed to swing and adapt itself to the varying conditions of the incline. When first set free the feeling is, to a novice, rather alarming, as if the machine was coming to pieces. Increased power and comfort soon banish the feeling of fear, and the hill is surmounted with astonishing ease. The original position is easily regained when the hill has been surmounted. No alteration in the speed is necessary. Formerly the Devon was only made with independent wheels, which were driven by clutch action. Now there is a continuous axle, and Starley's gear is put to the left side. In addition to the brake lever on the left side, further and independent power is given by a ground brake. This consists of a strong arm, carrying a shoe at the bottom, hinged to the front of the main frame; the upper arm terminates in a foot plate, on depressing which—easily done from the saddle—the "shoe" is brought in contact with the ground, and although not so powerful as the band above, it is sufficient to check the course of the machine, should the upper one give way. By the way, the method of applying the latter is worthy of note. It is provided with a lever, which is connected with the left handle, and operated on by turning it or by pulling back the lever as usual. When not in use the ground brake is held off *terra firma* by a spring.

The Devon, although still heavy, is very much lighter than formerly. There are no other specialities in the Devon, which is a wonderfully good hill climber and is specially suited to very heavy riders. The exact price of the Devon, fitted and finished as other first-class machines, is still by no means too clear; the list quotes £23, for enamelled, with balls to front wheel, axle, and cranks. Ball pedals would add at least £1, the spring 10s. 6d., and part plating about £2 10s., bringing it up to about £27.

No. 74. The Ladies' Premier Roadster (Hillman, Herbert, and Cooper).—The same lines of construction observed in the Royal Premier—as described on pages 80 to 83, "Tricycles of the Year," Series I., for 1884—are followed, but the machine is much lighter, and has somewhat smaller wheels, about 44in. or 46in. The chain communicating with the double driving gear is protected by a guard, and the steering rod is carried below the frame. The last-named improvement is an absolute necessity in all front-steering loop framed tricycles intended for use by ladies. We can recommend the machine as one that is sure to give satisfaction in every way to the fair sex. The appearance may be seen by Fig. 64. The price, complete, with ball bearings to all parts, enamelled, part plated, &c., is £25. It is generally geared level or slightly down; but, of course, this is made to suit individual requirements.

No. 75. The Central Geared Premier Roadster. — Another proof of the growing demand for ⊢ framed machines with central driving chain. With the exception of the formation of the framing, the machine has all the characteristics which have made the original Premier famous. A stout cross tube, parallel to and a few inches above, is joined to the axle by three arms, knuckle-jointed to the adjustable ball bear-

FIG. 64.—THE LADIES' PREMIER ROADSTER.

ing cases, one at each end and the third close to the chain pulley in the centre. By this means an unusually firm support is made for the central tube, which gracefully curves down to the pilot wheel (see Fig. 65). At the back, depending from the centre, a lighter tube forms the safety tail. Double supports are provided for the adjustable handles in the form of C-shaped brackets running out from each end of the cross tube. The seat ⊢ rod carries an Arab spring, suspension saddle, and is

easily adjustable. Regular bicycle cranks and ball pedals are used. They have a very narrow tread, and are vertically placed. The double driving gear is put on the left side. In short, the

FIG. 65.—THE CENTRAL GEARED PREMIER ROADSTER.

machine is a splendid specimen of cycle architecture, fast, light and exceedingly strong. It is finished enamelled, part plated, and with balls to all parts, axle (three places), crank shaft (two places), both pedals, and pilot wheel. Price £25 10s.

No. 76. The Youth's Premier Roadster.—Happily, the introduction of tricycles of sterling merit like the one now under notice is gradually driving the wretchedly common and dangerous machines usually sold for children out of the market. The Youth's Premier (see Fig. 66) is a small reproduction of

the ordinary Premier, with an immensely strong frame, quite sufficient to bear an adult's weight without being strained. It has plain hardened parallel bearings, and all the usual parts are adjustable. The chain is on the left side, and the Premier double-driving gear is used. In future the steering rod will be

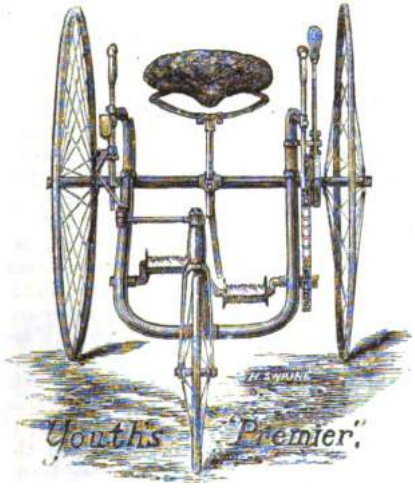


FIG. 66.—THE YOUTH'S PREMIER ROADSTER.

carried *below* the frame—a vital necessity in children's as in ladies' machines. Both in construction and finish the Youth's is equal in merit to its larger companion. 36in. is the size of the wheels, and £12 the price.

No. 77. The Premier Racer.—Records from 50 miles, 4h. 12min. 10sec., to 100 miles, 7h. 23min. 50⅖sec., were made on this machine by A. Nixon, on the Crystal Palace track, on 25th June, 1883. Since that date—on 6th August, 1884—these times have been beaten, but the merit of the first performance is not lessened thereby. It is an exceedingly light edition of the roadster, with every ounce of superfluous metal cut away, but without weakening the machine. Its outline is sufficiently suggestive of speed and lightness. Racing bicycle wheels, laced (or direct) spokes, hollow felloes, and small-size tyres are adopted. The tubing is of good diameter, but of a light gauge; the crank shaft is also tubular, and has rat-trap ball

pedals. The naked axle is joined to the frame tubes in the usual manner, by ball bearings, and the loop of the frame, in front, is higher than in most machines, the crank shaft being carried, in ball bearings, below it. Above the axle the seat tubes curve forwards, forming strong bracket supports for the handles. The whole machine is worthy of the highest praise. It is generally made with 48in. wheels, geared up to 58in. or 60in. Price, enamelled and part plated, with balls to all parts, £26.

No. 78. The Grosvenor Roadster (Hart, Son, Peard, and Co.).—At the first glance the outline of the Grosvenor (see Fig. 67) reminds one of a certain well-known machine; a closer inspection will show that it differs in several points. One of its great features is that it is a "two-tracker." Instead of the small side wheels being an equal distance "fore and aft" from the centre of the large wheel, the rearmost one is brought forward in line with the driver, while the pilot is—centre to centre—36in. in advance. Perhaps the first feature to rivet the attention of a rider is the absence of any steering gear. Apparently there is no controlling influence over the wheels; a test will, however, convince one that the opposite is the case, and that the side wheels are under perfect control. The method employed is simple. Upon the side tubular beam there is an orb into which runs the support of the steering handle; the beam terminates at both ends in similar orbs; within these are bevel cogs connected by a light rod. The steering can be geared up or down, *i.e.*, the rider has increased or lessened power over the guiding. In order to strengthen the ⌐-shaped frame, a stout bracket runs across the angle and prevents springing of the tubes.

The axle of the large wheel is held within the shorter—or cross—tube of the frame, and it works on ball bearings. Solid supports run down from each side, strengthened and made very rigid by a double system of brackets. Near the bottom these supports bend outwards, and carry, in an adjusting slot, ball-bearing cases for the ends of the crank shaft. Ball pedals form part of the machine, and they are so placed that the rider enjoys the benefit of a very close tread. The bracket strengthening the left leg also supports the hollow handle rod. Power is applied to the brake on pushing forward the lever, by strap action, acting on the gear box. The seat ⌐ pillar passes through a ring boss in the centre of the cross tube. Kelsey's spring ventilated handles are used to all machines, unless in the rare case of the ordinary ones being preferred. Foot rests are placed at either side. The spring saddle should also be noted. Five spiral springs are placed between the plate of the saddle and a similar plate on the

Γ pin, which produces a very easy and comfortable seat. In addition to having only two tracks, it is a narrow gauge, and will, being well under 30in. in width, pass through an ordinary doorway. The steering, by being entirely out of the way, cannot be damaged by accident, nor does it get choked with dirt or soil the clothing. Apart from its novel nature, the Grosvenor

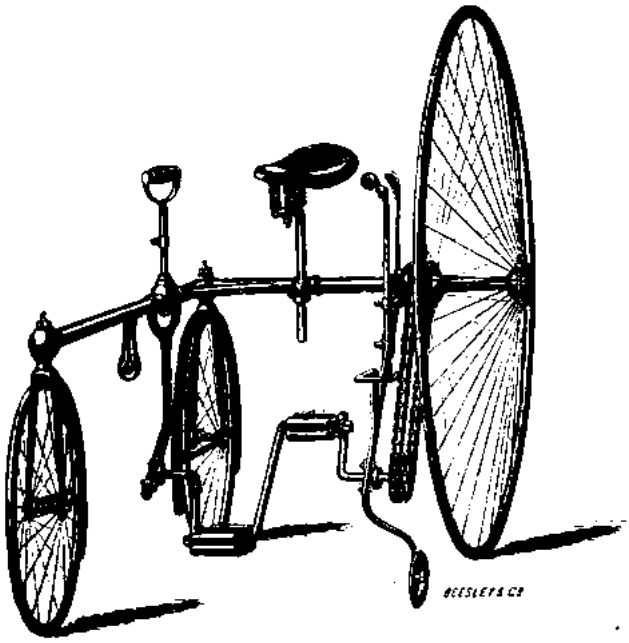


FIG. 67.—THE GROSVENOR ROADSTER.

seems a thoroughly sound machine; as a rule, a 46in. or 48in. wheel is used, geared level or to order. Very large spokes (9 gauge) are put in, which gives the wheel a rather heavy look. Price, enamelled, part plated, balls everywhere, &c., £18, at which sum it is one of the cheapest machines of the day.

No. 79. The Grosvenor Sociable Roadster.—Surely the acme of simplicity, if not reached, must be very nearly approached when a sociable can be converted into a single by unscrewing *one nut*. This is all that is required in the Gros-

venor. The loose half (see Fig. 68) has, projecting from an arm, an "eye" or ring, which fits over a continuation of the end of the main tube; a hinge clasp then folds round the beam, between the steering rod and a raised flange, which prevents it shifting; the sides are then joined by a nut and bolt, and the connection is quite firm. When joined together the machine looks like a Coventry Convertible, but, as already stated, is

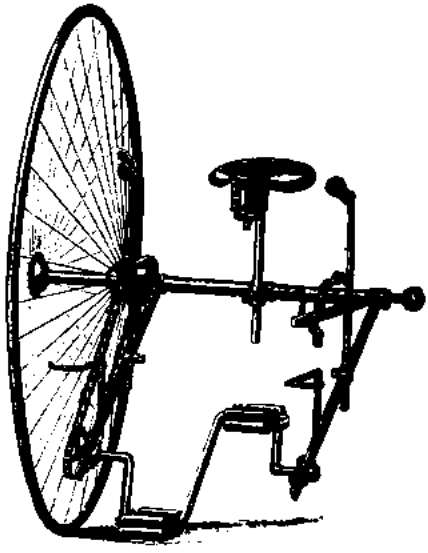


FIG. 68.—DETACHING PORTION OF THE GROSVENOR SOCIABLE ROADSTER.

different in detail, and it forms a first-class machine. Of course, the driving power is divided, each of the riders propelling his or her own wheel. We took the following measurements, at the office of the London Agent (H. Smith), of a machine with 46½in. and 20½in. wheels: Length, 69½in.; centres, 36in.; width, 56in.; wheel tracks 51in. Price, complete as a sociable, finished as in the single, £28 10s.; if the separate part be purchased with a single, the extra charge is £10 10s.

No. 80. The Orbicycle Roadster (Thomas Moore).—When first introduced, this machine had two large orbs or balls, from which its cognomen was derived; one of these was

placed on the centre of the axle and the other between the pedal cranks (see "Tricycles of the Year, 1883." pp. 19-21). This year the orbs are dispensed with and the gear disclosed to view (see Fig. 69). In place of a chain, driving power is communicated by a rod, with a bevel cog on each end; the lower is driven by a similar cog on the crank shaft; the upper end works between two bevel cogs, like the crown pinion in Starley's gear (see page 22). When being driven the ordinary way, the machine is either geared up or level; but by back

FIG. 69.—THE ORBICYCLE ROADSTER.

pedalling power is changed, and the machine—say a 50in.—becomes equal to a 36in. only, enabling a very steep hill to be easily climbed. The pedals can also be thrown out of gear altogether and used as foot rests when going down hill.

The shape of the frame is shown at Fig. 69. The axle is divided in the centre. The cross tube is joined to it by ball bearings at each side of the gearing and supports the central pillar, which slants down forwards. A backbone runs straight from the Stanley head of the pilot wheel to this pillar, making a firm and rigid attachment. Brake power of the favourite

strap action is applied simultaneously, from a lever on the left side, to drums attached to each of the wheels. Steering is carried out on the right side, high up. An ⌐ pin carries an Arab spring and long distance saddle. The machine is well and strongly made, and that it is a success is proved, as in last year's L.T.C. twenty-four hours' ride, a rider covered over 150 miles on one. With balls to all parts, enamelled, Arab spring, &c., the price is £27 1s.; if with racing wheels, £2 extra.

No. 81. The Special Orbi Semi-Roadster.—Made more in conformity with the accepted pattern of central framed machines, the usual chain replacing the revolving pillar. It passes over an orb in the centre of the axle, which incloses the double-driving gear. The whole machine is built very light, the wheels having hollow felloes, small size tyres, laced spokes, &c. It is exceedingly neat looking, and ought to prove fast. With balls to all parts, &c., the price is £25.

No. 82. The Leni Roadster (C. Leni).—This machine is so new, having only been brought out in August, that there has been no time to get a block prepared, and we are therefore unable to illustrate it. The front portion, however, is like the Rover, with the double driving gear on the left side (see pages 23, 24). It is in the rear part that the change has been made. The side tubes, which in the Rover are only sufficiently long to carry the crank shaft, run down almost perpendicularly behind the axle, to which they are joined by ball bearings, and at the bottom form a low, square, horizontal frame. At the back, in the centre, a stout tube arches up to the Stanley head of the trailing wheel, to which it forms the backbone; from this tube another bends forward to support the rather long ⌐ pin, topped by an Arab or other spring and easy saddle. The crank shaft is carried (in ball bearings) by an adjustable holder behind the side tubes; the latter, as in the Rover, are turned over at the top to form rigid supports for the handles. One good point is the position of the rod connecting the steering handle with the guiding wheel; despite the lowness of the frame, it is taken below it, where it is out of the way and sight, permitting the saddle to be reached with equal facility from either side, or even from the back, over the small wheel. It is easily ridden by ladies, and will certainly take high rank amongst rear steerers.

Below each of the bearing cases, which attach the tubes to the axle, there is an eye ring—this is to receive the ends of a tubular framework, covered with wire netting, which forms a most comfortable and convenient seat for a child. It is low down in front, so that the young occupant can readily step in or out. Instead of this, a large basket can be fitted, converting the machine into a parcels delivery cycle. Of course,

either of these is a legitimate extra. The weight in front, unless excessive, would rather tend to balance the machine. In short, the Leni may be said to possess the advantages of the Rover, without most of its disadvantages. It will, as a rule, have 46in. wheels geared level, or to order. Owing to the back wheel being so far in the rear, as will be seen from the measurements, the steering is steadier and more certain. We inspected the first made—it had 44in. front and a 22in. rear wheel. The measurements were: Length, 71½in.; wheel centres, front and rear, 38½in.; width, 39½in.; wheel tracks, 32½in. Ball bearings will be put to all parts, and it will be finished in the best style—enamelled, with plated parts, &c. Price not yet fixed.

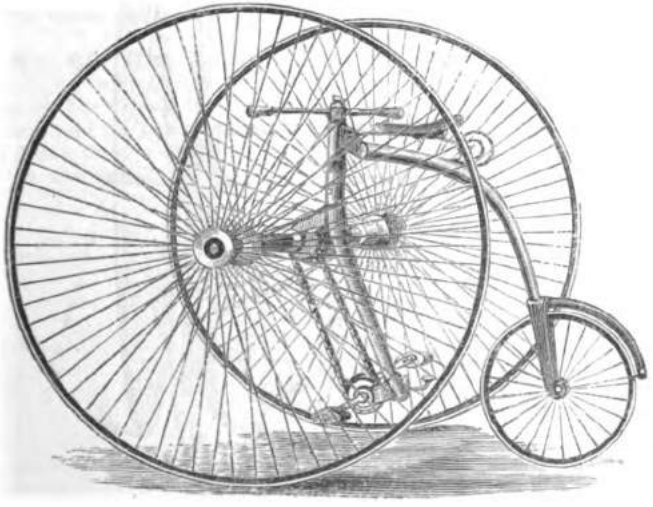


FIG. 70.—THE ALASKA ROADSTER.

No. 83. The Alaska Roadster (The "Alaska" Company).—This machine is a copy in almost every feature of the well-known Humber—witness the striking similarity between Figs. 70 and 27—and therefore a long description is not needed. Ball bearings (Rudge's) are put to all parts: the cranks are detachable; brake power is applied over the driving gear in the centre of the axle. It seems a really capital machine, and is well made. The one we inspected had 44in. and 17in. wheels,

and measured: Length, 61½in.; centres, 31in.; width, 38½in.; wheel tracks, 32½in. Weight, 76lb. Price (usual finish and accessories) £22.

No. 84. The Royal Windsor Semi-Roadster (T. Timberlake and Co.).—Loop frame in shape, light in build, fast in action, may be summed up as the salient points of this type of tricycle. The oblong frame is composed of a single ¾in. weldless steel tube, the ends of which are joined together by a strong

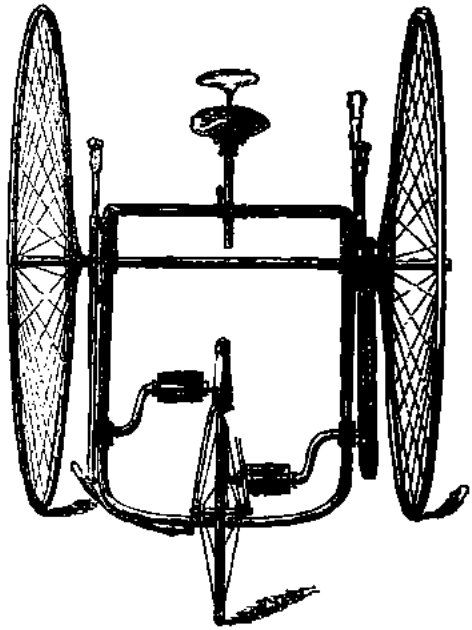


FIG. 71.—THE ROYAL WINDSOR SEMI-ROADSTER.

sleeve boss, which also holds the ⌐ pin above and behind the axle, over which it passes, being joined to the bearing cases, and curving down in front, forms a squarish loop frame. By aid of a short lever, without the trouble of any nuts or screws, the height of the saddle is instantly altered. The steering is wisely carried below the frame (see Fig. 71), so that the machine is virtually

open-fronted. Neat brackets run out from the frame to support the adjustable handles. Starley's double driving gear is used, on the left side, with a chain as power communicator. Warwick's hollow rims carry $\frac{13}{16}$in. rubbers; these are wired in, so that loose tyres are unknown with this make. Kelsey's ventilated grip handles are used; they are very cool and comfortable to hold. Brake power is put forth by pushing forward a rather short lever on the left side. Direct spokes screw into gunmetal hubs. Other details do not need notice. We had a trial run on one of these machines, and can speak very favourably of its easy running and hill-climbing capabilities. It is finished enamelled, part plated, balls everywhere, &c. Measurements, with 48in. and 18in. wheels: Length, 67½in.; centres, 34½in.; width, 39in.; wheel tracks, 31½in. Price £22 10s. Weight, a little under 85lb.

No. 85. The Royal Windsor Roadster.—Heavier and stronger, with larger tubing and rubbers; roughed plates are put on the frame for mounting. It is suited to more weighty riders and for heavier work. Extra neat lamp brackets are fixed in front, and in general details it resembles the Semi-Roadster. Price the same.

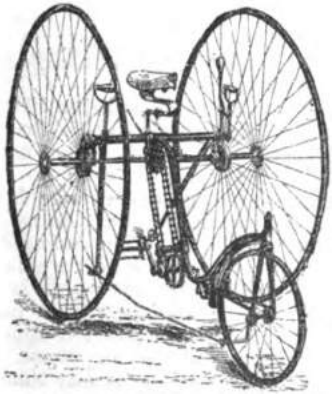


FIG. 72.—THE INFLEXIBLE ROADSTER.

No. 86. The Inflexible Roadster.—A central-geared front-steering double driver (see Fig. 72). The cross tube is attached to the axle in three places—at each end, and on one side of the chain pinion, which is fixed to the centre of the axle. Attached

to each wheel hub there is a drum, containing a silent gravity clutch. A flange on the axle has falling pawls, which bite into teeth inside the drum, and so drive the wheels. The latter are free upon the axle, and can overrun the pedal action, so that the pedals and cranks remain at rest when the machine is running forward by its own impetus or on falling ground. From the left side a bar of the lever brake passes through the cross piece, so that bands act on the drums of both wheels together; it is very prompt and certain in action. As in the loop-frame pattern, the connecting bar of the steering gear is carried very low (see Fig. 72), giving the rider room to spring out at either side, and is attached to a cranked continuation of the hollow front forks. A neat curve is given to the central tube. An S or Arab spring is used; the Inflexible has the same points as the others, wired rubbers, &c., and is finished enamelled, plating, ball bearings to all parts, &c. Measurements of one with 46½in. and 18in. wheels (geared to 56in.): Length, 64¾in.; centres, 32½in. Width, 39in.; wheel tracks, 32in. Regular bicycle cranks are employed, and the tread is only 9in.; weight, only 76lb. Price £22 10s.

No. 87. The Ladies' Timberlake Roadster.—An open-fronted rear steering double driver, *à la* Cheylesmore, with hay-fork frame, chains each side, and independent wheels driven by clutch action. Further details are not needed. Price, with balls to all wheels, and pedals, plated fittings, &c., £19 15s.

No. 88. The New Howe Roadster (The Howe Machine Company, Limited).—Prior to 1884, this firm, although well-known in the sewing machine world, did not make their mark as cycle makers; their machines showing no signs of novelty. During the present year, a decided change for the better took place, and, at the Sportsman's Show, the machine now under notice excited considerable attention amongst those who examined it. One very remarkable feature is the manner in which the brake power is applied; there is no wild groping about to find a lever—not even a handle has to be turned; *simply back-pedal*, and full brake power is applied to the *crank*, sufficient to check progress almost anywhere. Furthermore, in going up hill, a rest can be taken at any time, as the machine will not run backwards. This (under other conditions) seeming objection is removed by raising a small lever, when the Howe may be either pushed or worked rearward. On the other hand, the pedals are free for running down hill, Edge's patent clutch (see Fig. 73) being used. There is next to no back-lash, and it is quite silent and certain in action. In appearance, the machine is of the Cheylesmore type (see Fig. 74), open-fronted, rear steering, with Morgan's "roller" chains on each

side. A hayfork frame carries the wheels on short independent axles; the backbone, ⌐ pin (with elliptical spring), and other

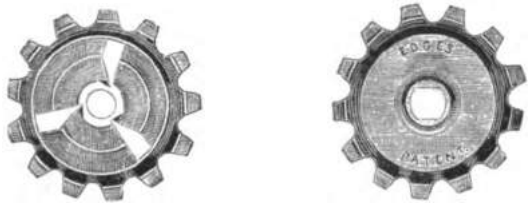


FIG. 73.—EDGE'S PATENT SILENT CLUTCH.

parts, are all well made, but without special features. The machine is evidently an excellent hill climber. It is enamelled,

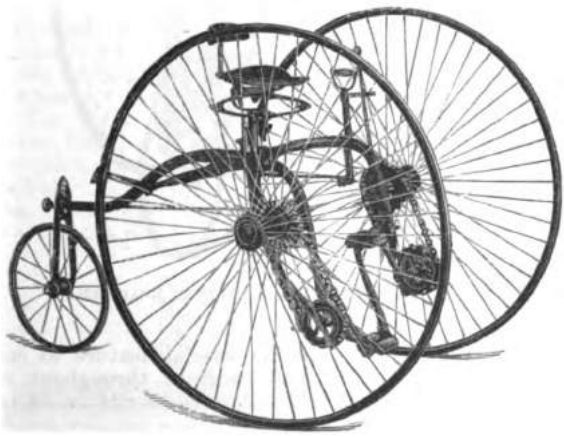


FIG. 74.—THE NEW HOWE ROADSTER.

part plated, balls all parts, and price £22 17s. 6d.; if plain or cone bearings, £20. Average size, 46in.

No. 89. The Howe Front Steerer Roadster. — A double-driving front steerer (see Fig. 75). The frame is square at the top, supporting in the centre both the safety tail at the back and the ⌐ pin. The frame runs pretty straight down, and is rounded in front; the crank shaft is placed

above, in ball bearings. The steering is carried very low, so that mounting can be accomplished from either side. Starley's double-driving gear is placed on the left side. It seems a capital

FIG. 75.—THE HOWE FRONT STEERER ROADSTER.

machine of its class, but has no special feature to call for lengthened comment. With ball bearings throughout, coated with Harrington's enamel, &c., a 50in. costs £24 2s. 6d.; without ball pedals, £23.

No. 90. The New Shakespeare Roadster (D. Carter and Co.).—Centrally placed, and joining the ends of the divided axle, the double-driving gear (Carter's Patent) equally distributes the power to the wheels. Over the axle, and joined to it in three places by ball bearings, is a stout cross tube. The central tube runs straighter than usual to the pilot wheel, which, being carried well in front, gives increased steadiness to the whole machine. The ⌐ pin slides down the central tube, and has either a bow or Arab spring. Brake power is brought to bear on the large central drum from the left side.

Ordinary bicycle cranks, pedals, &c., are put in front. The machine is well and carefully made, and ought to prove a reliable roadster. Finished, painted, with balls to all parts, the price of a 50in. is £20 15s.; with hollow felloes, £21 10s. A 46in., with plain pedals and spring, costs £18 10s.

No. 91. The Scantlebury Roadster (W. Scantlebury).—Several new points are to be found in this machine, which belongs to the Cheylesmore class. Unlike most rear steerers, it is nearly impossible to make it tip up forwards, considerable weight being on the rear wheel; the frame is also rather different in shape. A capital and very powerful "four-spoon" brake, self-adjusting to unequal pressure, is brought to bear on the wheels by a half turn, *in either direction*, of the left handle. Perfect safety is thus insured; there is no "halting between two opinions" by the novice, or letting go one handle to grasp, and perhaps miss, another by the experienced rider. A turn of the wrist, and progress is checked. On the right side, the steering handle is also self-compensating, and not easily strained. A new form of clutch, simple and silent, drives both wheels by separate chains, and allows the pedals to act as foot rests (others are also provided) when so desired. Ball bearings are applied to several parts. The crank shaft works in a kind of universal joint to prevent binding of the bearings. Comfortable handles are also provided, and altogether the Scantlebury is decidedly a remarkable "tricycle of the year"; perhaps the very low price, £14 14s., is one of its most astonishing features. The other details are of the routine order.

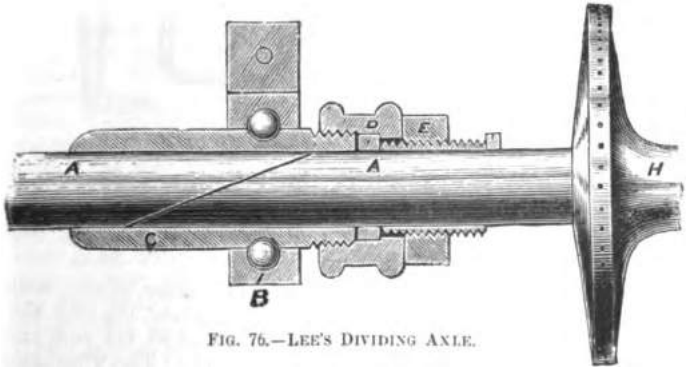


FIG. 76.—LEE'S DIVIDING AXLE.

No. 92. The Special Sutton Reducible Roadster (Sydney Lee, The Bicycle and Tricycle Sale Rooms Company).

—Originally made notable by the excellent method adopted for dividing the axle, the Sutton has now taken a recognised place amongst the best class of machines. To deal first with its chief characteristic: The axle, A, is carefully cut slantwise (see Fig. 76). On the longer portion of the axle, and secured to it, there is a strong sleeve, C; this has grooves cut for the bearings, B, and extends beyond the cut portion. On the other

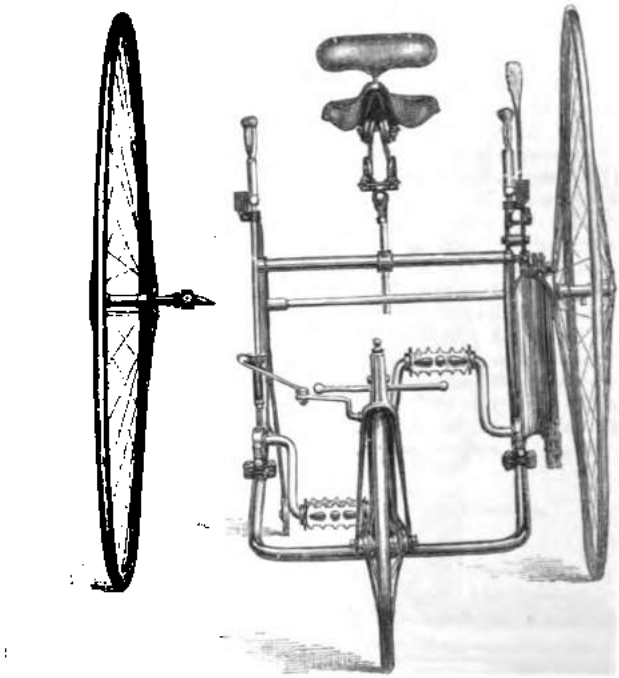


FIG. 77.—THE SPECIAL SUTTON REDUCIBLE (Divided).

part, next the wheel hub, H, there is a shorter sleeve, with a cap, D, and a lock nut, E. In order to separate, the lock nut, E, is slackened and screwed back to the guard at the end, and the cap nut, D, unscrewed till it is free from C. The wheel and shorter sleeve is then withdrawn out of C (see Fig. 77), the entire operation only occupying a few seconds. To join again, the shorter axle is slipped into the sleeve of the longer, over which

the cap nut is screwed, binding the portions firmly together, it is then retained in position by the lock nut, and the axle is quite as firm and strong as if it was not divided or weakened in any way. Nor does the action of the machine in motion have any effect upon it; in fact, the rotating axle seems to tighten rather than loosen the joint. The unpractised eye would scarcely detect any difference in the appearance, as the

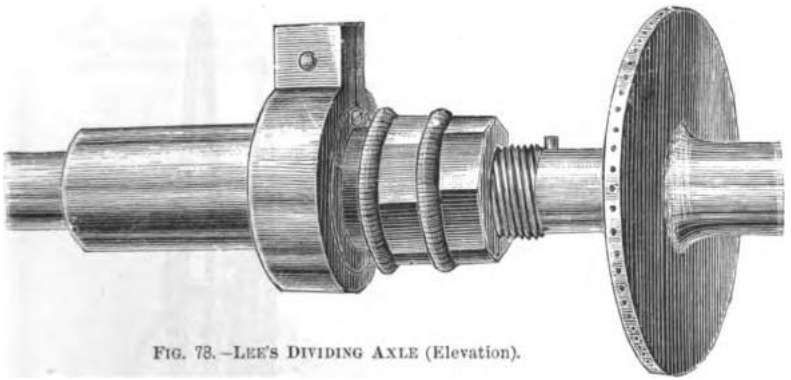


FIG. 78.—LEE'S DIVIDING AXLE (Elevation).

dividing sleeve occupies but a small space (see Fig. 78). The safety tail at the back prevents the machine from falling when the wheel is taken off. In fact, Lee's patent may be justly termed one of the simplest and most effective "folders" of the day. It can be applied to most machines at small cost.

To return to the machine itself. The frame is square in front, and the crank shaft is held in Rudge's ball bearings above the side tubes. Ball, rat-trap or rubber, pedals have a narrow tread. A good mud guard is put to the pilot wheel, which is steered, high up, on the right side. Ball bearings are employed to form the bond of union between the frame and axle. The side tubes are joined by a strong cross one, which gives support to the adjustable ⌐ pin, with its Arab spring and Long Distance saddle. A stay rod strengthens the safety tail at the rear. Laced tangent spokes, and hollow felloes, with small rubbers, make light but strong wheels. Efficient brake power, applied by a "push" lever, and steady steering are also points of merit in the Sutton. The other details include balls all over, Harrington's enamel, and cradle spring, plated parts, permanent lamp brackets, &c., all of which are included in the list price, a commendable example to those firms who dearly love to run up a well-nigh endless list of so-called extras. Cost £26 10s.

No. 93. The Sutton Roadster.—This type differs only in having solid crescent rims and direct spokes to the wheels, plain bearings to the pedals, and a rigid axle. It makes a very handsome machine (see Fig. 79), at a remarkably low price. indeed, it is doubtful if there is another tricycle of equal merit at the same figure—£18 18s.; if Lee's dividing axle is

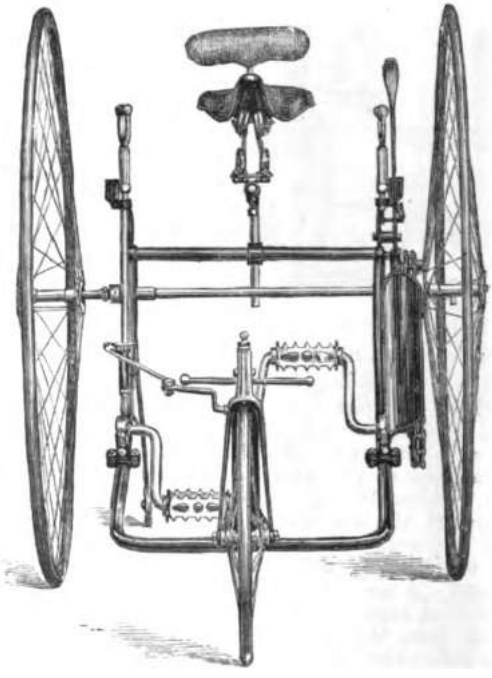


FIG. 79.—THE SUTTON ROADSTER.

included, the price becomes £21. The following are the measurements with 46½in. and 17in. wheels: Length, 63½in.; centres, 32in; width, 37½in.; wheel tracks, 32in. Thus the points of contact with the ground form a trihedron, giving a splendid balance to the rider.

No. 94. The Quadrant No. 7 Roadster (Lloyd Brothers). —These remarkable machines are attracting deserved attention:

the daring innovations displayed in their construction is now proved beyond question to be not only in accordance with the scientific mechanical construction of tricycles, but a genuine success. The inventors of the Quadrant are *thorough* in everything, they spare neither expense or trouble to make each and every machine they turn out sound and perfect in every respect. The No. 7 is in general details like the No. 4 (see Fig. 80) described on pages 40 to 43, First Series "Tricycles of the Year, 1884." The same rigid axle (Lloyd's patent), which is made practically unbendable by surrounding it with a sort of cage of spoke wires, which, running from a large flange in the centre

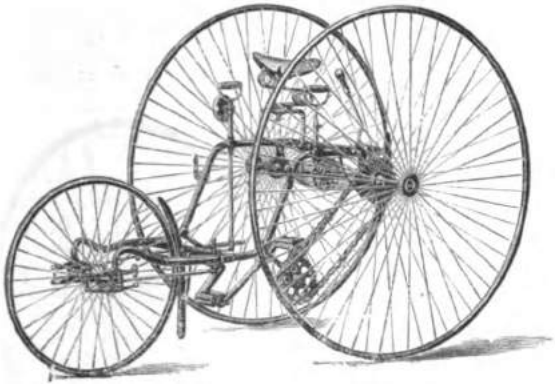


FIG. 80.—THE QUADRANT No. 7 ROADSTER.

of the axle to the bearing cases, near the hubs, receive all the strain instead of the axle. The chief difference to the No. 4 is that the chain and driving gear are placed at the left side, instead of the centre. We have before spoken of the Quadrant as unexcelled for steadiness, absence of vibration (where no springs or buffers are employed), and exactness of steering; the last named is effected in a special manner—different from that employed by any other maker. The No. 7 usually has 48in. driving and 26in. steering wheels, geared up to order, and is much lighter than one would be led to suppose from the appearance. Inclusive of balls all parts, plating, &c., the price is £23.

No. 95. The Quadrant No. 8 Racer.—Introduced so recently that it was only by the makers sending a machine from Birmingham by a special messenger on 20th August, that we

were enabled to inspect it in time for the present work. Unlike the majority of machines, which seem to "follow one another," the Quadrant starts out boldly into a line purely its own. One of the first points of ordinary construction the inventors of the Quadrant took exception to was the size of the front wheel; with a small "pilot" there must be more resistance, especially when high driving wheels are used, than with a large one. The more vertical is the line of applied force the greater the resistance. With the Quadrant the large leading wheel, in this case 26in. to 40in. drivers, runs much smoother, easier, and is generally steadier than if 6in. or 8in. less. The axle of the pilot is about 12in. long, and on it the wheel hub runs by ball bearings (previously—in the roadsters—the wheel was fixed and the ends of the axle worked in balls). Each end of the axle has a grooved roller, which works between quadrant-shaped slides, held by the front frame. This front frame is of a

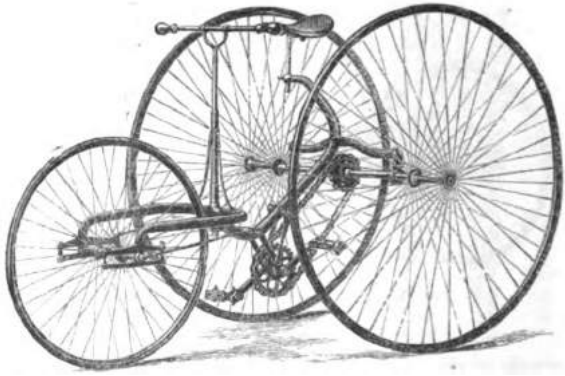


FIG. 81.—THE QUADRANT NO. 8 ROADSTER.

peculiar shape (see Fig. 81), being that of a horseshoe with a square end; it is horizontal, and (in the roadster forms a splendid foot rest) the fore ends are turned down to hold the quadrant steering, from which the name of the machine is derived. From the centre of the rear portion of the "horseshoe" an upright pillar rises, supported by stays at the bottom, and carrying a bicycle handle bar at the top. The latter is connected with a rod which passes through the pillar, and, at the bottom, below the frame, it is joined to a light cross rod which has side rods running to each end of the front wheel axle. It can be easily understood how very exact and sensitive

the guiding must be; at first it feels rather curious, but a few minutes' practice makes that all right. From the back of the horseshoe a very strong tube bends down slightly, then runs up to above the axle, where it is supported by a powerful arched stay, which, by knuckle-jointed ball bearings, joins the axle. Above this stay the tube tapers, and bending over to the front, holds the Γ pin of the saddle and turns down to the top of the steering pillar, where it joins it, adding greatly to the strength and rigidity of both (the last named improvement has been made since the block shown at Fig. 81 was cut). The chain is of a particularly good pattern—the invention of a Dutchman—and is known as Hans Reynolds' Patent Bush Chain. A new axle is adopted for the first time; it has special points which need not here be gone into, as they are covered by letters patent; it is divided in the centre, Starley's gear being employed, the chain pulley carrying the central or "crown" pinion (see Fig. 18, page 22). It works beautifully and both wheels are, of course, equally driven. Another patent is to be found in the brackets supporting the lower chain pulley, pedals, cranks, &c. In place of the usual very heavy casting, weighing several pounds, very light brackets of spring steel are substituted (see Fig. 81); these, altogether, scale only about a pound, or, if anything, less. They are quite strong enough, however, and hold the crank shaft in ball bearings. By simply slacking the nut of the bolt, which passes through the central tube and holds the top one, in case the chain should become slack, the pulley and cranks, &c., drop sufficiently to adjust the chain to its required degree of tightness. Novices must be cautioned against a tight chain; it should always be fairly loose, at the same time not have undue sag, or the difficulty of driving will be increased enormously. The ball rat-trap pedals have a 9in. tread. Hollow rims, ⅜in. rubbers, fine spokes and good broad hubs are put to all wheels.

The Quadrant is sure to make its name on the path; it feels a regular "flier," and with ordinary bicycle action and position, it ought to be to the front in many a contest. *On dit* a well-known London rider will, at an early date, attempt to beat Webb's 100 mile record (6h. 43min. 32½sec.) on it. The following are the measurements of the machine we inspected, wheels 40in. and 26in.: Length, 66in.; centres, 33in.; width, 38in.; wheel tracks, 31½in. Price, including balls everywhere, plating, enamelling, &c., £25. Weight 47½lb.

For 1885, a roadster is being brought out, about 10lb. heavier, and also one made suitable for ladies.

No. 96. The Antelope No. 1 Roadster (Thomas Smith and Sons).—The advent of this machine makes "Two Rich-

monds in the field," or, rather, two Antelopes in the market. Strange to say, *this* Antelope, which is one of the very latest introductions, also follows the Rover lines very closely. It will be seen that a strong sleeve covers the axle. From a stout boss in the centre of this a backbone runs out to the rear wheel, down to which it curves. At each end of the sleeve are very strong > tubes. The upper arms hold the handles and short lamp brackets; the lower legs support the crank shaft, in ball bearings. This has chains and clutch action (something after the Cheylesmore plan). The wheels are, therefore, loose upon a continuous axle. Of course, the pedals can be used as foot rests if wished, though roughed plates are put on the sleeve for the feet. The ⌐ pin passes through the backbone, and is easily adjusted. A novel form of Z spring is used; it seems pliable, but does not look safe in case of accident. The lever brake acts on the left side only. It is a strong built machine, and ought to answer. The finish, including balls to all wheels, cranks, and pedals, enamelled and part plated, £23 2s.

No. 97. The Antelope No. 2 Roadster.—The same in general features, with the exception that only one chain and double driving gear is employed instead of the clutch action and two chains. No other alteration.

No. 98. The Two Track Empress Front Steerer Roadster. — One of what may be called the new style of tricycles—a double driver with the pilot wheel brought before the right driving wheel. The frame is particularly simple. A sleeve encases the axle, and, from the right side of it, a tube extends to the right front for the leading wheel. Under, and almost parallel to this, the steering rod is carried. A safety tail runs out from the right-back. The wheels have direct spokes; gunmetal hubs, ⅜in. and ¾in. respectively. It seems a nice light machine. Price (enamelled, part plated, balls to all parts, &c.) £23 2s.

No. 99. The Two Track Empress Rear Steerer Roadster.—With the exception that the small wheel is placed behind the right large wheel, instead of before it, the machine is precisely the same, including finish, price, &c.

No. 100. The Empress Roadster.—A machine of the Cheylesmore type—an open-fronted rear steerer, with the large wheels working on independent axles, each being driven by a chain (see Fig. 82). Free pedals are gained by using a clutch action to the crank shaft. The frame is of the "hay-fork" pattern, and brake power is applied by spoons acting against the wheel tyres, on pulling back a pivoted lever on the left side. The

other details do not call for comment. All parts are adjustable, ball bearings are put to all wheels, crank shaft, and pedals, and the machine is finished enamelled and part plated. Price £24 10s.

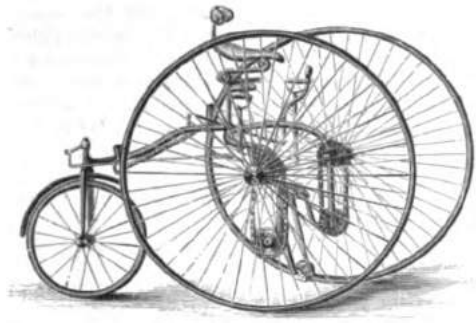


FIG. 82.—THE EMPRESS ROADSTER

No. 101. The Empress Sociable Roadster.—This machine is about "as simple as simple can be." There is no superfluous framework whatsoever. The axle is covered by a sleeve which supports the front legs at the ends, the central tube of the pilot-steering wheel in the middle, and the adjusting bosses of the Γ rods in the usual position. The crank shaft is continuous with the chain, and double driving gear on the left side. The outline is very neat. Short side toe rests are fixed to the legs, in addition to the cross foot rest on the central tube in front. The rider on the left controls both the hand brake and steering. The Z springs, as before described, support Long Distance saddles, and the machine is only supplied in one size—46in.—at one standard of finish, enamelled, part plated, with balls to frame, crank shaft (three places), pedals, and leading wheel. Price £31 10s.

No. 102. The Empress Front Steerer Roadster.—A pilot steering loop-framed double driver. The crank shaft is carried below the frame and the steering is very high. The other details are of the ordinary description. Fitted with Starley's double-driving gear, ball bearings, enamelled and plated parts, &c. It seems a good strong machine, is only made one size, 48in., and at one price, £24 3s.

No. 103. The Hand-Lever Meteor Roadster (Starley and Sutton).—A very superior description of hand cycle, the outline of which can be seen at Fig. 83. It has the famous Starley's

double-driving gear (see Fig. 18). As in the Meteor No. 2, the wheels are joined by a continuous axle, covered with a sleeve, from which runs the backbone to the rear guiding wheel. Long levers work a cranked shaft low down behind the footboard; this, by a chain, acts on the gear in the ordinary way, so that both wheels are equally driven. The seat "rides" easily on comfortable springs. Steering is accomplished in a capital way. The top of the right lever is provided with a spade handle, placed horizontally to it; this has a small drum, round which is wound a cord, that passes round a pulley at the bottom and another

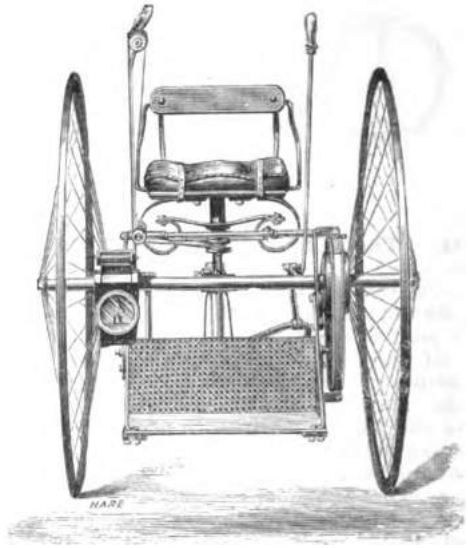


FIG. 83.—THE HAND-LEVER METEOR ROADSTER.

on the backbone, whence it controls the guiding wheel. The "spade" handle is always gripped, so that, whatever is the position of the lever, the machine is easily steered. Of course, the levers are worked "turn about." Sufficient brake power can be usually created by counteracting the action of the levers, or extra power can be added. The machine is built throughout in the best possible manner, enamelled, part plated, &c., with balls to the rear wheel. Price £21 14s. The usual size is 42in. A small safety wheel is put below the footboard, to prevent the machine tipping.

No. 104. The Garfield Hand-Power Roadster (H. Whitehouse).—A new pattern of open-fronted, rear-steering, invalid carriage, with hand cranks. The framing is like that of a Meteor pattern, with the front legs turned up instead of down. From the cross-tube double bracket supports run down to hold a flat wooden footboard, as it is presumed that those who drive the Garfield have not the use of their lower limbs. At the top of the side tubes there are adjusting slots, which hold, in ball bearings, the ends of the crank shaft; this has loose grips, taking the place of pedals, which are worked by the arms. The crank shaft is hinged at one end, and on drawing out a spring clip at the other, it can be folded back to permit the propeller—we cannot call him the rider—to reach the seat; it is then replaced, shutting him in—a rather dangerous proceeding. On the outer ends of the crank shaft there are large pulleys; round these, and the smaller ones attached to the wheel hubs, the chains pass, gearing down the machine considerably. Placed on a comfortable spring above the backbone of the rear wheel, is a seat, so very low and so far back that an upset is made extremely difficult. Steering is carried out either by an adjustable rest at the back, by the movement of the body, or from a lever at the left side. A brake lever is also provided. If the chain pulleys had clutch action, it would be an immense improvement. The size of the wheels ranges from 38in. to 46in. The gearing, or other details, are altered to suit individual requirements. It is finished painted, and makes a good strong machine for its special purpose. With balls to all wheels and shaft, the price is £17 17s.; with single driving and plain bearings, the cost is £15 15s., making the former decidedly cheaper.

No. 105. The Oarsman Roadster (Taylor and Weatherhead).—With a "flourish of trumpets" this extraordinary machine was heralded by some sections of the cycling press, early in 1884, as a marvellous production. Perhaps it is; but it needs very material alteration and improvement before it can be successful. Several pages would be needed to give a full technical description. At present, it seems designed to tire the propeller as rapidly as possible by calling into play every available muscle; therefore, as a developer or exerciser, it would be a much greater success than as a locomotive vehicle. The front wheel is about four feet in advance of the drivers; between these, upon an inclined plane, there is a sliding cradle seat with a rocking back. The feet have a strong purchase in front, and steer by a plate against the toes. There is a cross-bar in front of the rider; this communicates by cords at each end, which pass over raised pulleys in front and back, with large drums on the wheels, which they drive by clutch or ratchet action. When this bar is pulled, the propeller slides

down the incline, and on the return stroke pushes with his back against a rest, which also drives the machine. Altogether it is, indeed, a curious cycle, but, as we have already said, open to re-construction. The action, both of arm and leg, is more nearly akin to rowing than that of any machine yet brought out. Price and other details have not been arranged.

No. 106. The Adjunct (G. Singer and Co.).—We close the descriptions of machines in our present series with an account of a remarkable demi-tandem. Taken by itself, the Adjunct is a monocycle or unicycle, and quite useless as a vehicle. The case is altered, however, when taken in conjunction with a tricycle, as it has the power of converting nearly any front-steering single machine into a tandem.

It consists of a 24in. wheel, with light framing, which supports in front cranks and pedals, and is held in position by a long tube which attaches it to the frame of the machine in front. At present, a chain runs back from the pulley between the pedals, gearing up the back wheel about equal to the main machine. At the time of going to press, however, we are informed by the maker that further changes are being made in its construction for next season, so that technical details would not be accurate; but the main fact is not altered—that the Adjunct (in which old riders will doubtless recognise the original Krao) is capable of transforming a front steerer into a tandem. The present price will doubtless also be subject to revision, as it is now £15—very high, when we consider that half of a Coventry Convertible, consisting of large wheel, pedals, chain, frame, &c., all complete, costs but £6 to £8. When put in the market at a fair price, in these days of tandem popularity, there is sure to be a great demand for the Adjunct.

ACCESSORIES.

Introduction.

SINCE the issue of our "First Series," the increase in accessories has by no means kept pace with the development of the tricycles themselves, and we have, therefore, very few novelties or improvements to record. Such an immense improvement was effected during the winter, in saddles, lamps, &c., that not much further advance has been made in them during the past few months, and the following pages are therefore devoted, for the most part, to notices of articles of dress, &c., particularly suitable to tricyclists.

Bags, Valises, &c.

No. 1. Phillips's Luggage Carriers (R. E. Phillips).—These are of two kinds; the one generally used for bicycles comes in useful in the Humber type, or where there is a cross steering rod. It consists of a leather plate, 9in. by 3in., with straps, which at the bottom secure it to the bar, and at the top hold the required parcel. The price is only 2s. Another type, also suitable to Humbers, goes behind the saddle, on the backbone; it is rather larger, and costs 2s. 6d.

No. 2. The Tricycle Bag (Goy).—A great improvement on the old type of hard red canvas; the material is soft and pliable, being a sort of waterproof tweed, leather-bound at the edges and corners. It has an outside measurement of 13in. by 12in., and within the main part is divided into two; the large folding

over flap has also a pocket. Outside there is a small pocket to hold readily accessible articles. The bag is provided with straps to accommodate it to nearly any machine, and it may be carried by the leather handle at the top. Price 16s.

Costumes, Leggings, Shoes, &c.

No. 3. The Ladies' Rota Habit (Harris, Jones, and Co.).—Decidedly the neatest "habit" we have yet seen. The material is fine West of England Respiratory Waterproof Tweed, light but durable. It forms a very attractive costume (see Fig. 1), and is equally suitable for walking. The excessive

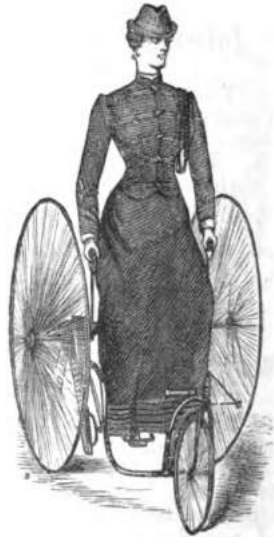


FIG. 1.—THE LADIES' ROTA HABIT.

fulness in the skirt has been reduced, but, at the same time, it permits of free movement of the limbs. It is, of course, "tailor-made," and the price (£3 5s., or, with gaiters to match, £3 12s. 6d.) is moderate. The same firm turn out exceptionally neat uniforms for gentlemen.

No. 4. The Rational Jacket (W. J. Pile).—Under the able management of Mr. Stephen Withers—who is well known to metropolitan riders—this firm is rapidly taking a leading place amongst outfitting houses. The present speciality promises to make it even better known. The original scheme of this costume is due to Lacy Hillier, ex-amateur champion; but it has been worked out under Mr. Withers' supervision. It will be seen, on referring to Fig. 2, that the customary rule is de-

FIG. 2.—THE RATIONAL JACKET.

parted from, and, instead of the jacket buttoning down the centre, it is buttoned from the neck to near the right shoulder and down the extreme right side. This effectually protects the chest from cold winds, and an all-round "stand-up" collar does the same for the throat. For winter and night riding it is simply invaluable. A plentiful array of pockets is provided, and it will prove a most comfortable jacket. It can be had in the C.T.C. tweed or serge. Price 25s. to £1 15s.; or, if lined with flannel, 2s. 6d. extra.

No. 5. The Elastic Frame Knitted Uniform.—Although not so attractive in appearance as tweed, this is most useful for those who perspire freely, as it is porous and absorbent. The jacket merely requires a light jersey to be worn underneath, and while cool in hot weather it is warm in cold. It is made in various colours, and the price, complete, is £1 10s.

No. 6. The Gossamer Waterproofs (Swan and Edgar).—These extremely useful garments, which are manufactured by a noted American firm, are procurable from either the chief agents, Messrs. Swan and Edgar, or any cycling outfitter or "wheel" agent. They are very different from what is usually

FIG. 3.—GOSSAMER WATERPROOF COAT.

FIG. 4.—GOSSAMER WATERPROOF CAPE.

understood by "waterproofs." The material of which they are made deserves the name bestowed upon it, being of "gossamer" like nature, so thin and light that the whole suit only weighs a few ounces; furthermore, being "sun-cured," it does not stick together, as is so often the case with common rubbers.

FIG. 5.—GOSSAMER WATERPROOF LEGGING.

FIG. 6.—GOSSAMER WATERPROOF LEGGING AND GAITER COMBINED.

The chief article is the Cycle Coat (see Fig. 3), which varies in price from 15s. to 25s.; it is about 36in. long, and has sleeves, turn-up collar, &c. The cape is some 3in. shorter, and is without sleeves (see Fig. 4). It is much cheaper—10s. 6d. The lower limbs are well provided for

with coverings, which are either like Fig. 5, and made to go over the stockings only, or over the knickerbockers as well; for the former purpose they cost 4s. 3d., and are 25in.; for the latter they are 33in., and cost 5s. Those who prefer a more "dressy" appearance can have the tight-fitting legging and gaiter combined (see Fig. 6). For head gear there is either the

FIG. 7.—GOSSAMER WATERPROOF HAT.

soft hat (see Fig. 7), which is made in all reasonable sizes, price 4s. 3d. to 5s. 3d., or a waterproof covering, with side flaps, for the "Polo." With the full suit on, a rider can safely defy the rain. The whole suit can be carried in the Multum, and is easily put on or taken off. We heartily commend it to our readers.

No. 7. The Cyclist Shoe (Waterman and Co.).—The subject of our present notice is one of the very few cycling requisites to be found in the Health Exhibition. It forms part of a capital exhibit by Waterman and Co. The annexed illustration shows the special features (see Fig. 8). Under the sole is placed a

FIG. 8.—THE CYCLIST SHOE.

pad of corrugated leather or rubber (the latter to be preferred). This acts both as a buffer to deaden vibration, and also prevents the feet slipping off the pedal, giving a better grip than is procurable with a flat sole, enabling the rider to give more ankle play, and push the pedal rather further round than usual. The upper part of the shoe follows the generally-adopted model—that of a walking (racing) shoe—only it has a better heel, which comes in useful when the rider has to tramp for any distance.

No. 8. The Perfecta Racing Shoe (W. J. Pile).—The best yet introduced. It is of a peculiar shape (see Fig. 9). It is wonderfully light, the pair weighing only 14oz. The

part at the ankle bone is cut away, but it has a rather stiff back, which supports a strap and buckle, to encircle the ankle, thereby giving a great increase in the firmness and "purchase" of the foot. A steel spring is placed between the soles to increase the elasticity, and the sole carried further back. The

FIG. 9.—THE PERFECTA RACING SHOE

heel is low and flat, but "practicable." Well shod with a shoe like this, instead of ordinary boots or shoes, a man ought to be yards faster in a mile, and, in these days of scientific handicapping, it is the "little bit extra" that decides the contest. The price is moderate, 14s. 6d., or, if to order, and of better quality, 18s. 6d.

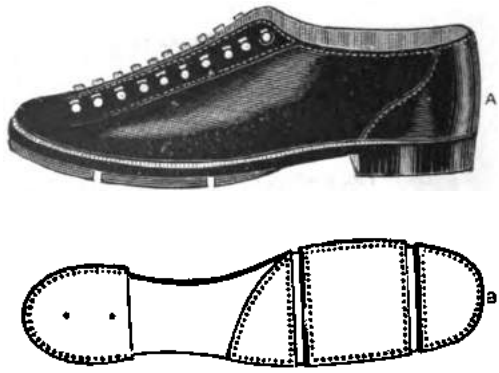


FIG. 10.—THE TOURING AND RACING SHOE

No. 9. The Touring and Racing Shoe.—A very light-built and low-cut shoe, similar to that used in walking races (see A, Fig. 10), lacing close down to the toe, in

order to bind it well on the foot, which it fits like a glove without pinching or impeding the circulation. The bottom of the shoe (see B, Fig. 10) has a double sole, the outer having two deep grooves to exactly fit the rat-trap pedal. It is of great service for either purpose.

No. 10. The Racing Shoe (Goy).—In outward aspect like a walking (racing) shoe. The uppers are made of fine soft leather, and lace well down to the toe. It is in the sole that the special features are manifest. Next to its inner sole there is a second one, consisting of a layer of cork ¼in. thick, and outside this is a final covering of buffalo hide. This allows the teeth of the rat-trap pedals to sink into the bed of cork, and so give a splendidly firm grip without tearing the outer sole. The whole shoe is well made, and the waist is extra stout to give increased support to the instep; the heel is circular. A lighter shoe could scarcely be had. Price 18s. 6d.

No. 11. Wilson's Patent "Insertus" Shoe Clip (Fisher and Co.).—One of the many devices to prevent the common and dangerous occurrence of slipping the pedal. Extreme simplicity is not the least merit of the Insertus. A gunmetal plate is screwed on the sole of the shoe—this has knobs at each end

FIG. 11.—WILSON'S PATENT "INSERTUS" SHOE CLIP.

which fit into notches cut in the pedal end (see Fig. 11). Although holding the foot when riding, it is freed in case of a fall. It seems to answer, but is too new for any public verdict to be passed on it. Price 2s. 6d. per pair.

No. 12. The Rota Leggings (Harris, Jones, and Co.).—Formed from the same material as the Rota costumes, they,

while being quite as efficient, have not as striking an appearance as black waterproof; in fact, when of the same shade as the uniform, they merely look like tight trousers. Price about 10s.

No. 13. The Skeleton Legging (Lamplugh and Brown).—Originally intended for bicyclists. The Skeleton will prove very valuable to those who bestride either the Humber or central-gear type of machines. Words are scarcely needed to describe it, as it is shown exactly in the illustration (see Fig. 12). It

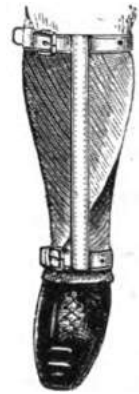


FIG. 12.—THE SKELETON LEGGING.

consists of merely a top and bottom strap, connected by a vertical one, to hold the trousers in position and prevent them flapping in the disagreeable manner known to all. They only weigh a few ounces, and are not heating like ordinary leggings. Price 1s. 6d. or 2s. Their value is doubled if used with the Cyclist's hooks.

No. 14. The Cyclist's Hooks.—Remarkably handy little double hooks, about 2in. long, with sharp points turned toward each other. When the trousers are folded back these are most useful to retain them. Going into a very small case, they can be carried in the waistcoat pocket, and although they can be used alone they will be found doubly effective if used in conjunction with the Skeleton leggings just described. Price per pair, in a case, 6d.

No. 15. Stocking Suspenders (Goy).—One of the most unpleasant accidents that can happen to a cyclist is that of his

stockings coming down with a run. To guard against this, and also to do away with garters or tightly-buttoned knee breeches, a strap or belt passes round the waist; from this depend two elastic bands, with hooks, to fasten to the stockings, and so secure them. Price 2s. 6d. Another description—short elastic straps, which button on the trousers—are only 1s. 6d. per pair.

No. 16. The Cavalry Gauntlet.—The rider who acts up to the *rôle* of "Knight of the Steel Wheel" will be suited with this. It is made of mouse-coloured doeskin, and there is decidedly more gauntlet than glove, as it goes well up the arm; the palm is leather-lined and well ventilated. Price 3s. 9d. A cheaper and smaller description is made at 2s. 6d.

No. 17. The Goy Glove.—One of the best yet introduced. An attempt has been made to please all tastes in the matter of ventilation, by making air holes at the quick of the fingers, perforating the calfskin lining of the face, and by an ornamental open-work shield on the back. The glove is buttonless, and is made of white doeskin, light to wear and neat in appearance. It is about the most popular glove of the year. Price 3s.

No. 18. The New Polo Cap.—This simple but necessary article of head gear generally receives very rough treatment, and, consequently, soon loses its shape and looks anything but elegant. Goy has come to the rescue, and by inserting thin sheets of pliable cork to form the "walls," makes the sides always retain their shape, and the top keep flat, although the cap is capable of being folded to go in the pocket or bag. Price, by post, 2s. 9d.

No. 19. The Hill-climbing Belt.—A stout strap, with broad leather shield to fit the back, passes round the waist, and a stout double hook in front slips under the handle-bar, on machines of the Humber type, in order that the rider can gain additional "purchase" for up-hill work. The strap is 1¼in. broad, and gives great additional power, but should only be used in climbing ascents, as a fall with it would be most dangerous. Price 3s.

No. 20. The Tricycle Belt.—A brace-like set of straps go over the shoulders, and hooks attach to each of the side handles. The extra power gained is enormous. Price 5s.

Distance Recorders.

No. 21. The Ordnance Odometer (Dunn's Patent).—With the Ordnance Odometer an entirely new method of scoring is adopted, and one that will commend itself to every rider. It can be attached to either bicycle or tricycle, to the hub or head;

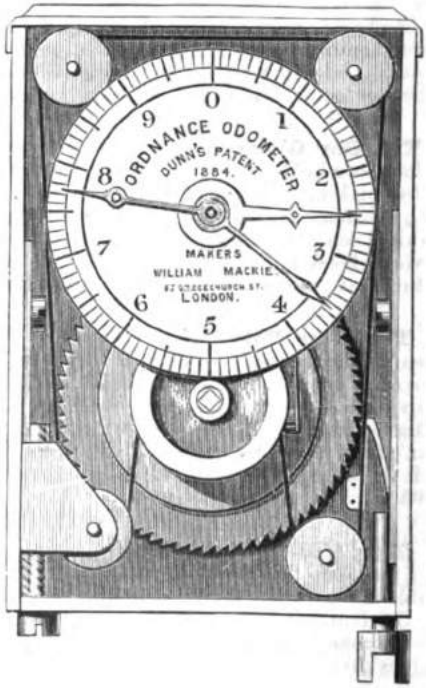


FIG. 13.—THE ORDNANCE ODOMETER.

it is in the latter position, fixed in front of the handle bar, that it is particularly valuable. When in this position, the travelling band, which runs round the pulleys (see Fig. 13), is visible through the glass top, and very easily read, as the band is marked off by furlongs into one mile; each of the former being 1¼in. long, the distance, to within a yard or so, can be seen at a

glance by the aid of a fine pointer. With one of Iverson's Cyclists' Watches placed over the head of the machine the rider can "clock" each mile, and race against time to his heart's content.

The instrument has three hands, possessing an advantage never attempted in any other instrument of the kind. The short hand marks the miles up to 10; the second, the tens up to 100. These can be reset, by a watch key, to zero at any time. The third hand is secured to the mechanism, and registers the hundreds up to 1000 miles, quite independently of the adjustable hands. The advantage is manifest. Before starting for a run, the adjustable hands are put at 0; say the ride has been 43¼ miles, it is clearly shown. The adjustable hands are reset, but the fixed one continues to keep a progressive tally of the total distance traversed, so that, without referring to any book, or calculating the various runs, they are mechanically and correctly added up. The rider thus knows, at any moment, his total riding of the season, or since he commenced to use the Odometer.

The internal working parts are more simple than might be supposed. The large wheel with slanting teeth actuates the clockwork, and is in turn acted on by a pawl attached to the plunger which passes through the lower part of the case. The plunger is connected with a light rod passing down on the inner side of the fork. The end is acted on by an eccentric on the hub, which, with each revolution of the wheel, pushes up the slide rod, and consequently the pawl moves on the ratchet wheel one notch. The action is certain and exact; fast or slow, every revolution is sure to be recorded. There is no necessity to go into the technical details. The left-hand bottom pulley is adjustable, to permit of any possible slackness in the band being taken up.

One very important feature must not be overlooked, especially as it is a new departure in distance recorders. Hitherto measuring machines have been made for a given height of wheel, generally in even numbers, such as 50in., 52in., or 54in.: but wheels are seldom *exactly* the estimated size. Thus, a wheel supposed to be 54in. will often be found to be only 53¾in., or perhaps 54¼in. Then, again, the weight of the rider makes a difference, according to the thickness of the tyre. All these difficulties are surmounted by Dunn's Patent, as it is adjustable for about 2in.; thus, one normally for 54in. can be made to answer for a 53in. or a 55in. The bicycle should be *ridden*, not pushed, over a measured mile, and adjusted until it records exactly. This is important, as an error in calculation of about a quarter of an inch in the diameter of a wheel becomes nearly an inch in the revolution, equal to over eleven yards per mile, for a 50in. wheel. We tested one of these instruments round Stamford Bridge Ground, the head-quarters of the London Athletic Club,

where there is a cinder path four laps to the mile, and found it correct. It has been adopted by the Southern Counties Cross Country Association as a standard for measuring the steeplechase courses of the various clubs affiliated to that body. It is well and strongly made, and can be easily attached to a machine. The price is £1 12s. 6d., or if fitted to hub (a lamp can be used as well), £1 10s.

No. 22. The Disto-meter (A. H. Hernu).—Designed to be used in conjunction with a hub lamp, which bars most forms of meters. A clamp, having on its outer face a very deep pitch endless screw, is fixed round the axle. The meter is attached to the lamp, behind the barrel, and is connected by a short pillar, having a cog at each end, with the endless screw, which actuates the mechanism very correctly and regularly. The dial, which records up to fifty miles, can be set at zero at any time. The one we inspected was one of the first made, and we have not yet had an opportunity of testing it. The method employed to record revolutions compels their registration, and renders a "misfire" virtually impossible. Furthermore, it can be seen from the saddle by glancing down, and its weight helps to balance the lamp. It can, of course, be used without the lamp.

No. 23. Underwood's New Odometer.—Having earned a good name for the former, and smaller size, which recorded to 300 miles, the same inventor has placed a new "measurer," which carries up the score to 1000 miles, incomparably superior to those which require to have the revolution marked down several times in the course of a day's run. Price £1 1s.

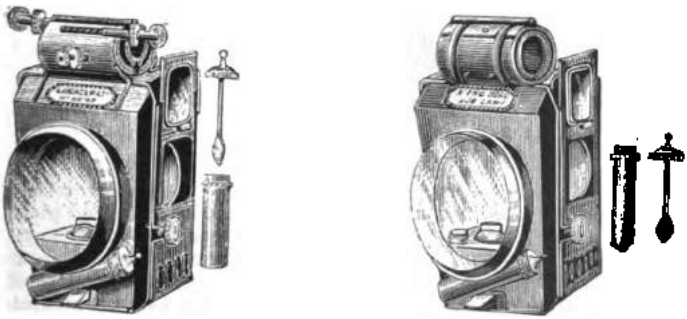
No. 24. Johnson's Patent Indicator.—One of the most simple forms of recorders. It is watch-like in form, the large face having three small dials, showing (1) 1 mile, in demi-furlongs; (2) 10 miles, in miles; (3), 100 miles, in 10 mile periods. The works are actuated by a rolling ball. It is of course only made for a fixed size wheel, and is very easily attached by a strap round the axle and another round two or three spokes, so that, in fact, the *near* side, if turned the other way, will be useless. Nearly any cycle agent can supply it. Price £1 9s.

No. 25. Thompson's Patent Cyclometer.—Very similar in design to the foregoing, with the same kind of triple dial and registering the same distance—100 miles. It is hermetically closed to inspection, and has to run on, not being, like Stanton's, capable of being reset at zero. The price is £1 11s. 6d.

No. 26. Kittoe's Patent Cyclometer (C. Leni).—Only introduced early this season, but promises to make its mark. Outwardly it presents much the same appearance as Thompson's or Johnson's, and the dial, which revolves, is only marked up to 16 miles, the distance being taken from a small needle affixed to the rim of the case. When required to reset to zero this can be turned round by the fingers. There are two circles of measurements marked on the face, the inner being quarters and miles, the outer representing 16 chains ($\frac{1}{5}$th of a mile) between each division. The works are beautifully made, and consist mainly of an eccentric pendulum, which, hanging while the case revolves, actuates the mechanism. If good workmanship goes for anything, the Kittoe ought to be a success; but until it is made to record much higher—at least 100 miles—it cannot command much popularity. The price is £1 10s.

Lamps.

No. 27. The King of the Road Hub (T. Lucas).—For several years the King of the Road has been in the very front rank as a light giver. Five years ago the maker brought it under our notice, and we subjected it to several experiments.



A B

FIG. 14.—THE KING OF THE ROAD HUB.

Since then there has been a continuous improvement, and the lamp is entirely altered in design. During the past year many new beneficial reforms have been introduced. Not the least is the new Lightning Lighter—to overcome the difficulty in igniting

stubborn wicks. Outside the door there is a small tube (see Fig. 14) holding a reservoir which contains paraffin. Attached to the screw top there is a stem, terminating in a sponge or cotton pad. This is applied to the wick, which, being anointed with paraffin, is easily lighted. It need scarcely be said that the King adopts the now almost universal improvement of lighting and turning up from the outside, without opening the door. The former is accomplished by sliding up the glass window on the near side, when a match can be introduced. Just inside the door there is a curved striker, or roughed plate, on which the match is rubbed. The wind-up burner also projects on the left side, so that the wick is under easy control.

Inside there is a large brilliantly bright reflector at the back, with small hole in the centre for red danger glass; it is of German silver, and screws out for polishing. The oil reservoir is of extra large size, and flanges projecting from the bottom slide in grooves in the frame, efficiently preventing rattle. The feeder closes and opens by a slide—no loose screws to be lost.

FIG. 15.—THE KING OF THE ROAD HEAD.

At the top there is a strong barrel, which, as in the old plan, hinges in the centre, to permit the lamp to open wide out, so as to pass into the wheel easily. Within the barrel there is a stout German silver spring, leather lined, which forms the bearing of the axle; this is regulated by a set screw and lock nut, which passes through a projecting shoulder at the back of the drum. A slide holder for matches is given with each lamp. At the top of the drum there are adjustable guard rods (see A). A late alteration does away with these and improves the appearance of the lamp (see B). A split sleeve is put over the axle and firmly secured to it; on this are two raised flanges or rings, which work on bearings inside the drum, and the spring fitting between them, the lamp is kept in the centre of the wheel.

All parts of the lamp are made of the best material, they are riveted and lapped together so that they cannot possibly come apart, however great the heat they are subject to. The whole inside of the lamp virtually forms a reflector, and a splendid light is, by the bright internal cone, thrown upon the thick bevelled 4½in. glass. The price is, japanned, 14s.; plated, 19s.

No. 28. The King of the Road Head.—It will be seen by glancing at Fig. 15 that with this lamp the top barrel is done away with, its place being taken by a double dome, and there is a strong clamp, with rubber buffer at the back, to attach to the head clip. The prices are: No. 1 (3⅝in. glass), 11s.; No. 2 (4½in. glass), 13s. 6d.

FIG. 16.—THE ACME HUB.

No. 29. The Acme Hub (Henry Matthews).—A large fine light giver, which attracted very favourable notice at the last Sportsman's Exhibition in London. The wedge shape is adopted (see Fig. 16). It has all the "modern improvements." The barrel hinges in the centre, and has an adjusting screw to regulate the pressure on the axle. At the bottom of the lamp there is a powerful spring clip to secure the door. Both the German silver at the back (which is removable for cleaning) and the cone leading the rays to the bevel glass greatly increase the power of the light. The side lights slip up, for lighting, a roughed plate inside facilitating the striking of the match. The wick is, of course, turned up from the outside. The whole lamp is well and strongly made, and it is extraordinarily cheap at 10s.

No. 30. The Acme Head.—Same in details, but with the usual alterations to adapt it to its purpose. In both, an extra large wick, which is secured against slipping down, is adopted, and they give a splendid light, besides being most reliable; indeed, the steadiness with which they burn, even over rough roads, is a special feature. The "head" is very cheap indeed—only 8s. 6d.

No. 31. The Captain Hub.—A small-sized but capital lamp, very well suited for boys' bicycles. The barrel is held by an automatic spring; it turns up, but does not light from the

FIG. 17.—THE CAPTAIN HUB.

outside, and the barrel has guide rods (see Fig. 17). It has a 2¾in. glass, and is of the same quality in every other way as the King. Price 7s. 6d. japanned, or 11s. nickel plated.

No. 32. The Monarch Head (Henry Mathews).—Of wedge shape, the Monarch is 6¾in., with a large oval bevelled glass, 4in. by 2¼in., which has a deep conical reflector inside. The reservoir is of a good size, and is held in the bottom by a firm clip to prevent rattle. An outside "turn-up" burner regulates the size of the wick, and on one side the red "window" slides up to permit of lighting without opening the door. A roughed plate is also provided for striking the match. Special attention is directed to the new holder at the back—the weakest part of a head lamp; two thicknesses of tin are put where the clamp is secured by six copper rivets. The clamp is a brass holder, with thick rubber lining to deaden vibration, and is exceedingly strong. The whole lamp is well made, and worth the price, 10s., or 7s. 6d. for a smaller size.

Maps and Road Guides.

No. 33. Phillips' Cyclists' County Maps (George Phillip and Son).—Hitherto so-called "Cyclists' Maps" have had very little special information for riders, being merely county maps, giving as much information to the railway traveller as to those who use the highway on the "silent steel steed." A noted firm of map publishers, G. Phillip and Son, have, however, taken up the matter in a most praiseworthy manner, and are now issuing a new series of county maps which are, from a cycling point of view, far and away superior to anything of the kind yet introduced for the wheelman's benefit. In their compilation the needs of cyclists have been assiduously studied. The maps are on the uniform scale of four miles to the inch; that of Kent measures 16in. by 13in., and all the main and chief cross roads (those given in Letts' Road Book are followed as a rule) are very clearly marked in brown, the minor roads being shown in outline. It is in the new points, however, that the maps excel. "Forewarned—forearmed" ought to be the motto of riders following up any route by these maps. Oftentimes the tour of a nervous rider is robbed of half its pleasure by a constant fear of dangerous hills. In Phillips' maps all such descents are indicated by red arrows, the nature of the hill being denoted by the number of feathers; thus ⟩——→ means "hill to be ridden with caution;" ⟩⟩——→ "brake on;" while if shown ⟩⟩⟩——→ it signifies "dangerous—dismount." Three other items of great interest are also given. In case of a breakdown *en route*, there is considerable consolation in knowing the nearest place where repairs can be executed. Towns containing a maker or repairer are marked X. Wherever there is a C.T.C. hotel—or one recommended by riders—the mark, H, appears; whilst the head-quarters of a consul of the C.T.C. is shown by C. On a sheet on the back of the map the names of the hotels in the towns denominated are given. The names and addresses of the repairers and consuls are doubtless left out for the sufficient reason that, owing to constant changes, they would be rather misleading than otherwise. Finally, we may say that the maps, which are of a handy and convenient size, ought (for his district or town) to be in the "Multum" or valise of every rider. In cover, on paper, the price is 1s.; on cloth, 2s. The counties already prepared are Kent, Essex, Surrey, and Sussex.

No. 34. The Country Round London.—Uniform with the above, but confined to the district its title specifies, which is an extensive tract of country, bordered on the N.W. by Amersham,

Chesham, Hawridge, Berkhampstead, Hemel Hempstead, and St. Albans; N. by Broxbourne, and close to Ware, Harlow; N.E. by Chelmsford; E. by Wickfield, Pitsea, and Thames Haven; S.E. by Chatham, Maidstone, Loose, East Peckham; S. by Westerham, Redhill, Dorking; S.W. by Guildford and Broadwood; and W. by Windsor and Beaconsfield. In the present issue neither the special features of the county maps nor the miles from town are marked; it is, however, a useful guide, especially to a stranger, as on the back of the folded map there is an enlarged plan of the approaches to and main roads through London. The price is, plain, 1s.; mounted on cloth, 2s. 6d.

No. 35. Roads of England and Wales (Letts, Son, and Co., Limited).—Decidedly the best road book of modern times. It is to the cyclist of 1884 what "Patterson's Roads" was in the days of coaching, in 1824, to those who either drove on their own account or patronised the vehicles which were then being eclipsed by the railway. Indeed, Patterson's and Carey's Road Books have been accepted as the best authorities in road distances; and it was in a great measure upon them that the present excellent guide was based. In addition to distances of every village, much useful and interesting information is supplied regarding historical memoirs, places of interest, &c. Both main and cross roads are treated at length. The whole was compiled and edited by A. Howard, whose name was well known in the early days of cycling literature, and the manner in which he treats his subject is vastly different from, and immensely superior to, that generally adopted by route books. Not only is the distance between villages given in addition to that from the starting point, but the nature of the road itself is distinctly specified: the hills are noted, and general condition of the surface described. C.T.C. hotels are also given. By aid of a copious index, of some 8000 names, the distance of nearly every place from London can be found at once. Some very interesting and able articles explain the various methods of road construction and give other useful information. The whole work, which is neatly bound in red cloth, contains 423 pages, with map, and costs 5s.

Speed and Power Gear.

No. 36. Morgan's Roller Chain (Frank Simons).—A glance at Figs. 18 and 19 will show that this chain is quite different from the ordinary descriptions. It was brought out at the close of 1883, and has been taken up by several large firms, prominent amongst whom are Rudge and Co. On referring to Fig. 18

it will be seen that the links consist of oblong pieces of steel, made to a standard gauge, so that they are all exactly the same size, and mechanically correct in every detail. These are joined by rollers, formed of flat steel wire wound round a steel tube or bush, like—to compare it to familiar objects—a split key ring and compressed coil spring. The result is an immensely strong

FIG. 18.—MORGAN'S CHAIN—ON GEARED-UP PULLEYS.

FIG. 19.—MORGAN'S ROLLER CHAIN.

chain. When working (see Fig. 19), the wheels roll off and on the pulleys, instead of "dead," as is the case with many ordinary chains. All frictional parts are case hardened, making them still easier in action and less likely to wear, and, in

addition, are very much lighter. In adjusting the chain, it ought not to be too slack, or it may twist; at the same time, it must be loose enough to run very freely. Its use is spreading considerably, and it has proved a decided success. It is specially manufactured for the inventor (William Morgan) by Perry and Co., Limited.

Tools and Materials for Repairing and Cleaning.

No. 37. Lee's Patent Portable Tyre Cementer (Sydney Lee, the Bicycle and Tricycle Sale Rooms Co.).—Loose tyres are one of the most annoying ills that cyclists suffer from, and any ready means of re-attaching them is a decided boon to riders. Novices fly at once to cement, and often quite choke up the hollow crescent of their rim with improperly heated cement, generally applied to a cold rim, which really makes the case worse than before. There is generally sufficient stuff in the felloe, if it were but properly melted. It was with the view to

FIG. 20.—LEE'S PATENT PORTABLE TYRE CEMENTER.

readily accomplish this that the present handy little instrument was designed. Its appearance is shown in Fig. 20. At the foot there is a round reservoir, measuring $2\frac{1}{16}$in. by $\frac{5}{16}$in. From this a flat wick holder, tapering from $2\frac{3}{4}$in. to $3\frac{3}{16}$in., by barely $\frac{1}{16}$in. thick; this contains a wick of corresponding size. The extreme height is exactly 3in.; it only weighs a few ounces, and is nickel plated. To make use of it, the cap on the barrel is screwed off, methylated spirit poured in, the cap replaced, and when the wick has become thoroughly saturated it is lighted and held against the rim, the shape giving equal heat to the segment of the circle to which it is applied. In a few moments the effect of the heat is perceptible on the cement, and when it is thoroughly melted,

the tyre should be firmly pressed into position and tightly tied. Of course, if more cement is needed, it should be run into the rim from the flame when the felloe is heated. The flame does not injure the enamel. The price is only 2s. 6d., post free.

No. 38. Perfect Tyre Heater (Snell and Brown).—Heating cycle rims is only one of this machine's "missions to fulfil," it is also used by painters to remove old paint. The handle can be filled with methylated spirit, by unscrewing the cap at the end, and a very hot flame is generated on lighting the wick when it is pressed against the portion of the rim requiring treatment. The cap next the wick holder can be unscrewed, permitting the handle to be taken off for packing into a small compass. It is made in two sizes, 4in. and 6in. long; when japanned the price is 2s. 9d. and 3s. 6d.; if with brass handles, 4s. 9d. and 5s. 6d.

No. 39. Hawkins's Sure Fastener (J. Hawkins).—More on the old lines, being a soldering iron with long wooden and wire handle, and heavy "shoe;" the latter is placed in the fire, and when hot pressed against the felloe, heating it to receive the melted cement. On the score of cost it will not ruin anyone, 6d. being the price.

No. 40. Rudge's Tyre Fasteners (Rudge and Co.).—Small flat steel springs bent round into nearly a ring. When a tyre becomes loose they are sprung over it, and clipping the rim, hold both securely until a permanent repair is effected. They are made in different sizes, ⅜in., ½in., and ⅝in., in boxes to hold one dozen. Price 1s.

No. 41. Ardill's Liquid Enamel (John Ardill and Co.).—One of the best and simplest applied enamels. It is supplied in shilling bottles (sufficient for a machine), with brushes included. Those who have knocked-about machines have now the ready means at hand to restore their pristine beauty. The enamel has merely to be laid on smoothly, when it dries quickly, leaving a smooth black surface.

No. 42. Gutta Percha Tyre Cement (W. S. London).—Well known to the trade, and highly spoken of by many of the leading firms, including Singer, Humber, Bayliss and Thomas, &c. It is also supplied in handy sixpenny sticks for riders' use.

No. 43. Elastica Paste (Gordon, Stanley, and Co.).—A recently introduced preparation for mending cuts in tyres (not cementing), or even repairing waterproofs and nearly any kind of rubber goods. It is simple and easy to use, and is certified as being very efficacious by those who have put its merits to the test. It is put up in ninepenny bottles.

No. 44. Crump's Tricycle Jack (H. S. Crump).—Almost indispensable to the tricyclist when cleaning, or, in the case of folders, dividing the machine. It consists of: At the bottom a cross-piece, supported by two arched feet; from the centre of this a tubular pillar rises (see Fig. 21); inside this a rod slides, its height being controlled by a peg, secured by a chain, which passes through both. Near the top of the second piece there is

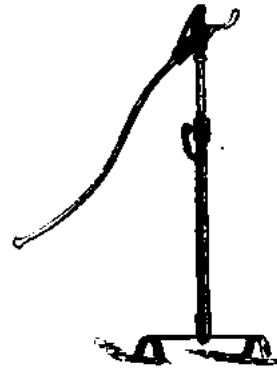


FIG. 21.—CRUMP'S TRICYCLE JACK.

a long lever, having on the short end a rubber pad. This, when the height has been adjusted, is placed under the axle, or other portion which has to be supported; the lever is pressed down and the machine raised. A pawl at the top, acting on a ratchet on the lever, retains it in the desired position. It folds into a small space. Price 5s. 6d. at any agent's, or, direct from the maker by parcels post, 6s. 3d.

No. 45. Oilless Carbonate Lubricating Powder (Entwhistle, Petrie, and Shaw).—It is not everyone who knows that blacklead is one of the best of lubricants. It was this fact that led to the invention of the present lubricant. It is used *quite dry*, and is a fine black glossy powder, when it seems to give a highly polished smooth surface to all fractional parts. The danger of novices applying it to bearings is that they are inclined to put too much, and then swill it with oil, which chokes the working parts. Applied to the chain there is no such danger, and it is unequalled for adding to the ease of running of a chain, which should, however, be first freed from all old oil and grease. It can be had in 1s. or 2s. packets, which will last the greater part of the season, being much cheaper

than oil; or the most convenient form is in a "puffer," like that in which some insect powders are supplied.

No. 46. Anti-Elbow Grease (Adamson and Co.).—For polishing plated parts which are dimmed; it quickly brings about a change in the appearance. Being a liquid, it is sold in bottles. Price 1s.

No. 47. Cyclenm (Messrs. Whittles).—A preparation for rubbing on bright and nickel parts of machines, to protect them from the injurious effects of damp. Although, of course, it does not make a machine invulnerable, it protects and preserves the parts liable to tarnish and rust, so that, with a little care, the machine may be kept in splendid order.

Various.

No. 48. The Cyclist Watch (L. T. Iverson).—The luxury of this age is making itself felt in cycling, and this is one of the latest developments. A rider need no longer be at the trouble of pulling out his watch to see how long it has taken him to compass the last "distance," but merely to glance at the top of the Stanley head, where, thanks to Mr. Iverson's ingenious plan, there is a watch, easily read while riding. The watch itself has a good clear dial and second hand, and is carefully made for the special nature of the office it is designed to fill. The case is different from that of the usual pocket timepiece, and fits into a holder, which screws over the lamp bracket or top of head, and is held by a spring clip, but it is easily slipped out and put in the pocket. It is wound and set from the back, and is very cheap at £2 2s. If placed beside an Ordnance mile measurer, the rider can "clock" every mile, and study his speed rate to his heart's content.

No. 49. The Unmatched Tricycle House (J. W. Watts and Co.).—"Where to stow my tricycle" is a perplexing query to many riders, or would-be riders if they only had accommodation. The subject of our notice is designed to meet their wants, by affording cover for machines out of doors. It is really a small and easily portable shed, with a lean-to roof for affixing against a wall; it has a door, with lock, &c., and the price is extraordinarily low, only £2.

No. 50. The Metropolitan Whistle (Goy). — Somewhat similar in tone to those now supplied to the London con-

stabularly, producing a loud resonant note when blown. It is provided with a short chain and attachment for the buttonhole, and makes a capital whistle for carrying in the pocket. Price 2s. 6d.

FIG. 22.—LANCASTER'S CYCLING CAMERA.

No. 51. Cycling Cameras (J. Lancaster and Son).—Last, but not least, in the specialities we desire to bring before our readers. Of late the beautiful study of photography has made great headway amongst riders. The pleasure of a trip to some delightful resort is rendered a hundredfold more enjoyable by permanently retaining a graphic representation of the spot. This is now easily accomplished, thanks to the noted firm of Lancaster and Son, who have laid themselves out to produce

portable cameras specially designed to meet the requirements of riders. One has but to visit any meet or assembly of wheelmen to see dozens of eager amateur photographers ready to snatch a group, race, or procession, and transfer the result, by aid of their cameras, to a permanent pictorial record of the proceedings. Cameras and their accessories can be had in every shape and form, but three are especially suited to cyclists. These are termed the "Merveilleux," "Meritoire," and "Instantograph;" the weight respectively 9oz. (double dark slide, 3oz.), 10oz. (slide 2½oz.) and 16oz. They collapse into a wonderfully small space, without removing any part. They are made in the best possible manner, and are genuine and thoroughly reliable instruments, adapted for a variety of purposes. In order that tricyclists may always have a stand at hand, a special clip is fitted to grasp the wheel (see Fig. 22), which, of course, should be blocked to prevent movement. The prices range considerably, according to size. Thus the smallest, with ¼ plate, giving a carte 4¼in. by 3¼in., costs, "Merveilleux," £1 1s.; "Meritoire," £1 11s. 6d.; and "Instantograph," for taking instantaneous photos, £2 2s. Every possible requirement in connection with the art is supplied by Messrs. Lancaster, whose goods are justly celebrated far and wide. We can, therefore, strongly recommend any one of the cameras mentioned as the most delightful and pleasure-giving adjunct that could be added to Tricycles of this—or any other—Year.

[*For Index see front of book.*]

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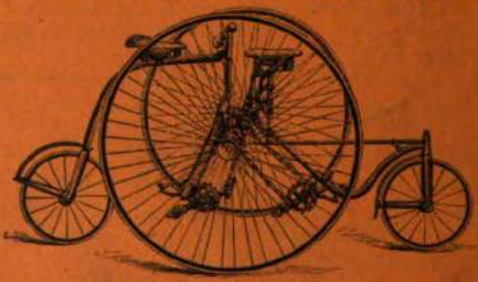

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TO CONVERT INTO A TANDEM it is merely necessary to fix three bolts.

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1ST. The front rider steers, and thus has an uninterrupted view of the road.
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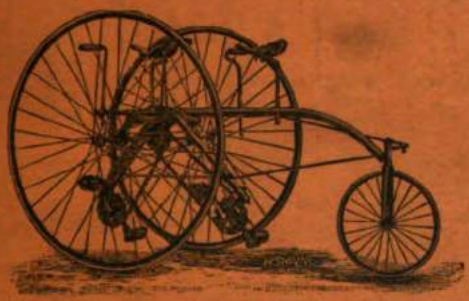
Tricycles of the Year, 1885:

BEING

A CHRONICLE OF THE NEW INVENTIONS AND IMPROVEMENTS INTRODUCED EACH SEASON, AND A PERMANENT RECORD OF THE PROGRESS IN THE MANUFACTURE OF TRICYCLES;

DESIGNED ALSO TO ASSIST INTENDING PURCHASERS IN THE CHOICE OF A MACHINE.



WRITTEN FROM PERSONAL EXAMINATION

By HARRY HEWITT GRIFFIN

(London Athletic Club, N.C.U., C.T.C., &c.).

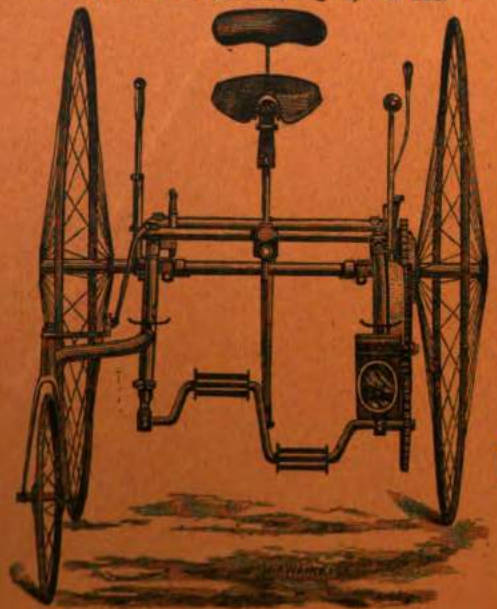
SIXTH YEAR OF PUBLICATION.

LONDON: L. UPCOTT GILL, 170, STRAND, W.C.

PRICE ONE SHILLING.

BAYLISS, ❋ THOMAS, ❋ & ❋ CO.,

Width, Closed, 20in.; Open, 3ft. 4in.



Everycycle Double-Driver Two-Track Folder.

MANUFACTURERS OF

THE WORLD-RENOWNED

Bicycles †

AND

Tricycles.

EXCELSIOR WORKS, COVENTRY.

Illustrated Price Lists on application.

Height, 46in. Weight, 70lb.

THE VICTOR PET.

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PREFACE.

ALTHOUGH there has not been quite such a rush for tricycles in 1885, the demand is still enormous, and we are glad to notice the rapidly increasing number of ladies who are taking to cycling. They could not enjoy a more delightful pursuit. Lawn-tennis and similar pastimes are all very well as recreative pursuits, but they are games of location, which must be played in a fixed spot. Not so with cycling. While participating in the most health-giving and beneficial of all pastimes, its lucky votaries are enjoying a constant change of scene, and are enabled to visit distant spots, and participate in rambles through pretty scenery which would be otherwise denied them.

It being impossible to include descriptions of all machines in one volume, unless it was of unwieldy proportions, we have only noticed new and prominent patterns. Those now omitted were fully dealt with last year, and by referring to the indices of the two books then issued, and the present, a list of nearly 300 machines will be found. Almost every known make will be found fully described in one or other volumes. If any machine that a reader may have heard of be not included, it is because we have not had an opportunity of *personally inspecting it*. We have altogether omitted the old-fashioned and dangerous types of open-fronted single driving rear steerers, as they do not call for notice, unless to caution novices against purchasing them. It is amongst this class of riders that they find a ready sale, the low price at

which they can be produced being generally a sufficient bait; the consequence is, that one sees more of this type about than of any other.

Public opinion has pronounced pretty definitely in favour of front steerers, though, at the same time, there is a growing demand for open-fronted tricycles. This has brought about the removal of that most awkward, and, indeed dangerous, obstacle, the high steering rod, which is now being put in its proper place, below the frame, where it acts quite as efficiently, and is not only less likely to be damaged, but is much safer.

Popular as tandems are, they would be far more so if the objectionable proximity of the riders was obviated. Some firms have been successful in this way, and if more would follow in the same direction, it would add immensely to the popularity of this branch of sport. It does not matter how two men are placed for racing; but for two ladies, or a lady and gentleman touring, the case is different.

Another apparently minor, but really most important, point, that makers would do well to study, is the method of applying brake power. The old-fashioned lever ought to be no longer used. It did well enough with the type of machine we have just condemned, but is altogether out of place on a machine supposed to have "all modern improvements." A brake to be really useful (in addition to being efficient *when* applied), should *always* be under the control and within the reach of the rider. Even to the most uninitiated, it seems, as it is, a point of great weakness for a rider to have to release one handle and seize another before brake power can be applied. Many makers are loth to make a change, but increased public favour would soon be the result. Some manufacturers have, with great success, applied the brake by simply turning the left handle — the most natural method. Surely others can follow their example.

We must again point out the importance of being accurately "fitted" by a tricycle. The saddle should be so adjusted that it is above the rear pedal when horizontal, and the height should be such that the middle of the foot

—immediately before the heel—can comfortably reach the pedal when furthest away. This measurement, when riding with the toe, gives a comfortable amount of allowance, the limbs being neither cramped nor unduly stretched. The handles ought to be fixed as fancy dictates—the most natural and easy position. With these points attended to, and with a good saddle (seats are only fit for invalid machines) and an easy spring, cycling may be really enjoyed. It is non-attention to these points that causes many would-be riders to be disappointed with cycling.

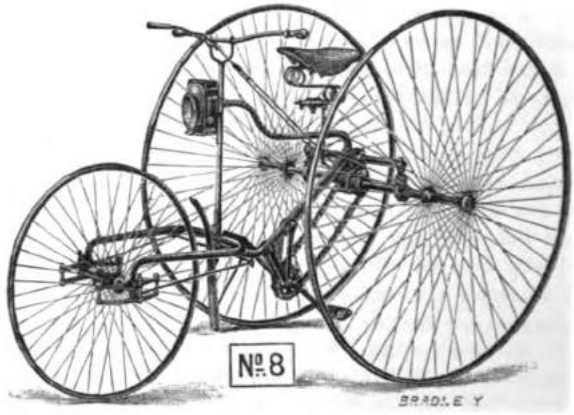
In conclusion, we again state that we have not the slightest interest in any maker, dealer, machine, or anything connected therewith. Our opinion is, therefore, unbiassed, and is the result of many years' careful study of the cycle and its surroundings. From the first we have always maintained one line of action—only to describe those machines which we have *personally examined*; therefore, every weight, measurement, or similar detail, has been verified before being quoted. In this respect "Tricycles of the Year" differs from any other works, with a presumably similar mission to fill, as their compilers are, in the great majority of instances, content to rely either upon *vivâ voce* remarks, or printed forms that have been filled up by makers, for details; and as every man thinks his goose a swan, each maker thinks his own form of cycle the "lightest, best, fastest, cheapest," &c., the descriptions usually given in these books will be found to differ in many essential points from ours.

Should any reader desire further information on any point, we shall at all times be most happy to render help; and any queries sent to this office will be readily answered, free of charge, through the correspondence columns of *The Bazaar, Exchange and Mart* newspaper.

HARRY HEWITT GRIFFIN.

170, STRAND, LONDON.

THE NEW "QUADRANT."



No. 8, Bicycle Steering. No. 9, Side Steering.

ON THE TRACK.

The Mile Handicap, 1st Prize, £10 10s., at Aston, May 16th won by a Youth of 18 years, "with ridiculous ease."

—*See Newspapers.*

ON THE ROAD.

The "QUADRANT" beat the Bicycle by upwards of a mile. Time, for 22 miles of rough and hilly road, 1h. 37m.

—*Post card from* "FARD," *May 20th*, 1885.

Makers: LLOYD BROS.,

SHEEPCOTE STREET, BIRMINGHAM.

Tricycles of the Year,

1885.

No. 1. The Quadrant No. 9 Roadster (Lloyd Brothers). Discarding the generally accepted form of very small pilot wheels, and the awkward and dangerous connecting rod of the steering arrangement, the builders of the Quadrant have adopted a very large guiding wheel, with high frame and

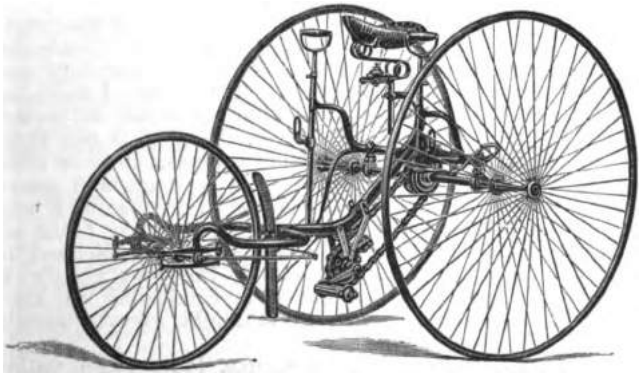


FIG. 1.—THE QUADRANT NO. 9.

low steering. It is a central geared front steering double driver; a glance at Fig. 1 will show some of its characteristics. The standard sizes are: 40in., 42in., 44in. drivers, with a 26in. front or pilot wheel. The driving wheels are

fixed on a hollow axle, which is divided in the centre, and is greatly strengthened by a solid inner axle, which is brazed to the tube on one side, and passes a considerable distance into the other portion. This prevents binding or twisting of the axle. On this firm support Starley's double driving gear is placed; this gearing, which has been adopted by the majority of firms in the trade, is illustrated in another portion of the present work. On each side of the chain pulley or wheel, which is driven by the endless chain, a deep groove is cut in the flange to prevent the superfluous oil from running into the drum of the brake, and thereby spoiling the "bite" of the contracting band, and rendering the brake weak and untrustworthy. Several novel and original points are to be found in the frame. A glance at Fig. 1 will show that it differs from any other in the market. Instead of the usual small backbone and Stanley head to the front wheel, the central tube has a large square-shaped horseshoe; the front ends of this bend down and support a double quadrant-shaped frame. It is from these that the name of the machine was originally derived.

The axle of the front wheel is about 12in. long, and on each end are small and deeply grooved rollers. These work between the coned edges of the adjustable quadrant. To each end of the axle is attached a light rod, which, being below the horseshoe frame, is quite out of the way. They are joined by a cross rod, which is pivoted in the centre, and connected with the rack and pinion worked by the right handle. This is one of the great merits of the Quadrant; the machine obeys the helm perfectly, with certainty and steadiness, and without the jerkiness and shakiness of machines with a very small pilot—as the steering wheel is termed when it is placed in front. Moreover, the pilot is not liable to be thrown out of position by hitting against a stone or other obstruction. Behind the wheel there is a large mud guard. This can be made useful in another way: in case of a runaway, or the improbable occurrence of the ordinary brake not acting with sufficient force, this shield can be jammed on to the tyre by the rider. Of course, this would only be adopted as a *dernier ressort*, but it is comforting to know that such a safeguard exists, as it might avert a serious accident.

The brackets which carry the cranks, lower chain pulley, and pedals, are the subject of a patent. They are less than a quarter the weight of the usual heavy affair, and are made of spring steel; moreover, they permit of very simple adjustment of the chain. A slot in the upper and longer arm of the bracket is held by a screw to the central tube. By slacking this the crank shaft can be dropped, and consequently, the

chain tightened. Passing to the upper part of the frame, the central tube is joined to an extra strong cross tube, and above it bends round to the front to support a ring boss through which the plunger, or stem of the ⌐ pin, passes. At each end the cross tube bends up, and on the right a support branches downwards. These hold the respective handles very firmly.

Brake-power is applied by the left handle without the troublesome and useless complication of having an extra brake lever, and power is communicated by link rods, so that by simply turning the handle, a leather lined metal strap is tightly compressed round a drum on the upper chain wheel; this at once checks speed, and brings the machine to a dead stop almost immediately, even on the steepest declivity. Ball bearings connect, by knuckle joints, the cross tube to the axle, and are placed at each end, and at one side of the driving gear in the centre. All machines have two small bosses, with eye hole, on the cross tube, to receive the connecting link of the Tandem attachment—of which more anon. The very large pilot wheel, and the manner in which it is attached to the frame, combine to make the Quadrant the steadiest running machine in the market. Of course all necessary parts are adjustable. Crescent rims, direct spokes, and moulded rubbers, are put to the wheels. Taken as a whole, the machine is one to be strongly recommended; it breaks away from the usual patterns, and is built in the best style, and on thoroughly mechanical lines. It is finished, enamelled and part plated, *i.e.*, fittings, &c., with ball bearings to the crank shaft, wheels, and pedals. An Arab spring and best Long-Distance saddle are included with the machine, which generally has 44in. to 46in. driving, with a 26in. front wheel. The price of machine as described is £24.

No. 2. The Quadrant Tandem Quadricycle Roadster.—Another strikingly original design, but of apparently alarming proportions. Its length, although considerable (104 inches), is not excessive, as one might be led to suppose from the annexed drawing (see Fig. 2). We may briefly dismiss the front part of the machine, which is identical with the one we have just described; it is only the rear or detaching part, therefore, which calls for description—but before going into details, we may note a few generalisms. First and foremost, if it had no other good points, the position of, or rather the distance between, the saddles would be a very strong recommendation. One of the greatest, in fact *the* objection, to Tandem cycles is the juxtaposition of the riders, who are nearly always placed so close together that their action is cramped, and their appearance is anything but attractive. In the Quad-

rant the average distance, from centre to centre, of the saddles, is 29½in.—or this can be increased to nearly 36in. As a rule, it is only about 20in. The extra space gives far more room and comfort; moreover, the machine may be used by two ladies,

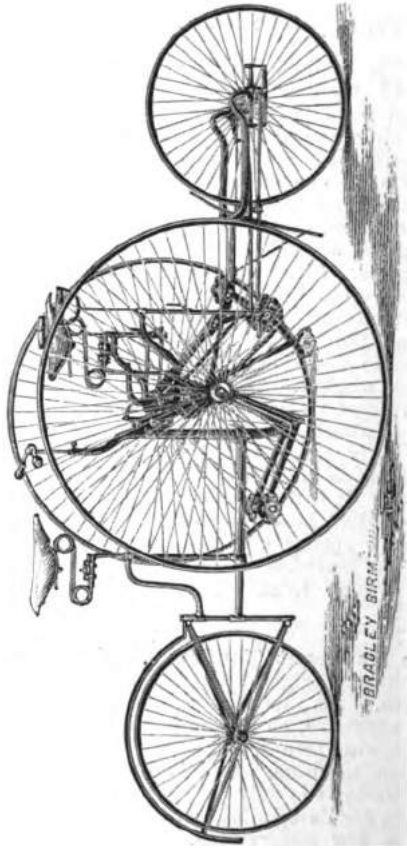


FIG. 2.—THE QUADRANT TANDEM QUADRICYCLE ROADSTER.

or by a lady and gentleman—the former being able to occupy either seat, a privilege denied on the majority of Tandems. Of course it is also suitable for two gentlemen, and with two good riders "aboard," it ought to be exceedingly fast on the road, and its merits would be especially conspicuous on a rough

and hilly highway, as, owing to the size of the central wheels and general steadiness, the vibration and bumping incidental to such travelling are not felt nearly so much.

Coming to the details of construction: Joined by knuckle-joints to the bosses, spoken of in the description of the previous machine, on the cross tube there is a second or back tube supporting an upright fork which holds the pillar; the latter forms, at the top, a tube to receive the stem of the bicycle shaped handle bar, the ends of which bend back towards the rider (see Fig. 2); it does not exert any influence over the steering. At the bottom the pillar holds a ⊥ piece, the ends of which form the fulcrum of the long crank levers. These are of a very peculiar pattern, and altogether different from any other machine before the public. There are three joints to the pedal lever ⋀, something in the form of a ⋁, minus the last stroke. The first arms run to the fulcrum, where there is a joint, the second arms running upwards, a second joint and the third arms, which are much longer, run to the front pedals, to which they are attached by a simple link hook going over the bearing case. The rider at the back, therefore, communicates the power to the front pedals during the period that the front rider cannot apply power. There is thus no loss of progressive action, and the pedals are doubly driven all the way round the revolution of the crank, and consequently the rate of propulsion greatly increased.

The improvements recently made have given a very easy and pleasant motion to the back pedals. To deal with the remainder of the frame: From the lower part of the frame a stout tube runs horizontally to the rear; from it a second pillar rises to hold the adjustable ⅂ pin and spring of the rear rider; this pillar is strengthened by a bent tube running back to the perpendicular ⊢ piece at the end of the tube. To the top and bottom of this is pivoted a double ≻, which, with the upright, forms a triangle on each side of the wheel. This makes the wheel a true trailer; it unfailingly follows every movement of the machine. It is thus perfectly steered by a simple automatic movement; even if the wheel is swung round sideways and placed against one of the driving wheels (as it would be when stored away) it regains its original position before it travels its own length, and its influence is not felt at all when riding. Those who will overcome their sentimental objections to the appearance will find the Q.T. all they can desire. It is altered to a single or formed into a Tandem in a minute, or the big wheels readily removed, for it to pass indoors. Both trailer and leader are 26in., the drivers 40in., or larger. With the sizes quoted we found the measurements to be, length 104in., centre of front to centre of back

wheel 78in., width 39in., wheel tracks 33in.—length with rear wheel folded 77in., weight about 100lbs. Finished, enamelled and part plated, with ball bearings all parts, except pedals. Net cash price £29 10s.

No. 3. The Quadrant No. 8 Roadster.—A few alterations have been made in this remarkable machine (see Fig. 3) since it was introduced, at the end of August, 1884, and immediately afterwards described in "Tricyles of the Year," 1884, pages 101–3, Second Series. In its roadster form the central tube is, above the cross bar which supports the axle, bent forwards and joined to the upright pillar of the steering handle; a strong support is thus gained for the

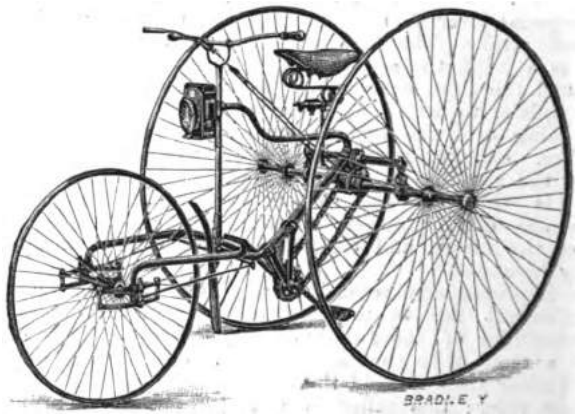


FIG. 3.—THE QUADRANT NO. 8 ROADSTER.

pin, saddle, &c. A regular bicycle brake is provided, applied by a grasp lever in front of the handles, and by means of a light connecting rod, made double in order to pass on each side of the supporting tube, power is applied to the central drum of the axle. Immense force is easily applied, but it has, in addition, the same "emergency" brake as the No. 9 and Tandem. Despite the rather heavy appearance the Quadrant No. 8 is built very light; a racer with 40in. and 20in. wheels we found to scale 47¼lbs., and a strong roadster need not draw the beam at more than 70lbs. The whole machine is much steadier than the generality of this now popular type, and the pilot wheel is not liable to the eccentric movements of smaller "pilots," which are secured from one side only. Of course the machine is mounted and

dismounted from the back, and has all the same points as No. 9, differing only in steering, &c. Both handles and spring are adjustable. The general size is 40in. to 44in. driving wheels (increased to suit tall riders) and geared up as ordered. With ball bearings to all parts, adjustable handle, &c., enamelled and part plated, the list price is £24 10s., but the net cost, allowing for discount, is about £21.

No. 4. The Excelsior Convertible Reversible Tandem Roadster (Messrs. Bayliss, Thomas, and Co.).—As the first firm to produce a modern tandem tricycle, the machine designed by Messrs. Bayliss and Thomas for 1885 is worthy of more than usual attention. It is "up to date" in every

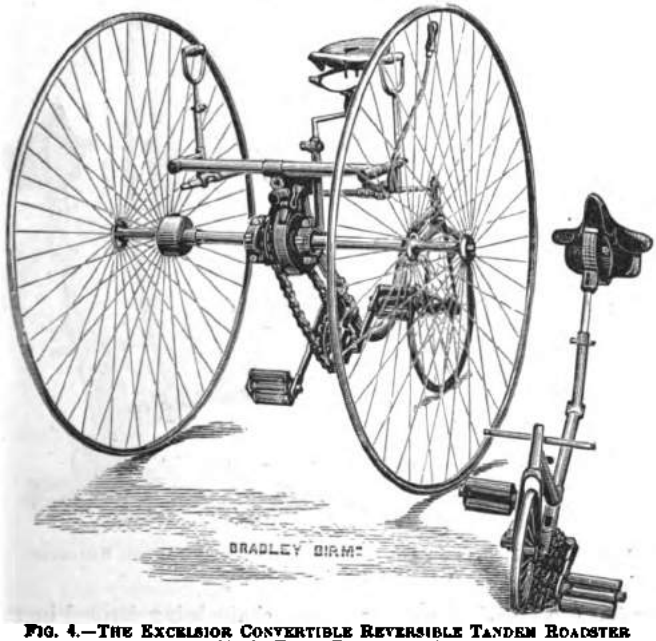


FIG. 4.—THE EXCELSIOR CONVERTIBLE REVERSIBLE TANDEM ROADSTER (Single Form, Rear Steerer).

way, and has many special points of merit. The general scheme is shown at Fig. 6. One good point is the open front enjoyed by the rider who occupies the more forward saddle, whose position is very like that on a Humber Tandem. It will be seen that a central tube in front carries, at the bottom, the

usual pedals, chain pulley, &c., and supports a short horizontal tube running forwards, which forms a step for mounting; and has a cross foot rest in front, besides supporting an 8in. "tip" wheel, with castor shaped forks. This wheel only comes into use when the machine is overbalanced in front.

The method of converting the tandem into a single machine is simple in the extreme. Front and rear tubes run into each other above the axle. By removing one bolt the front

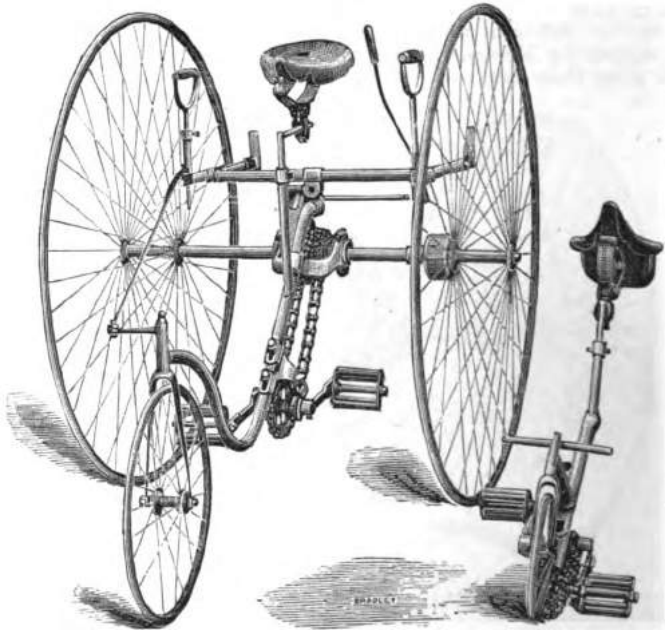


FIG. 5.—THE EXCELSIOR CONVERTIBLE REVERSIBLE TANDEM ROADSTER (Single Form, Front Steerer).

portion can be lifted away, and, the chain being divided in the usual manner, the saddle and its supports, &c., come away with the tube, a single machine of the Rover type remains (see Fig. 4). Above the axle, which has Starley's gear in at the side, there is a parallel tube with cross tubes at the end; the latter support the back and front handles; the front end of these side tubes form lamp brackets. The machine possesses one feature foreign to any other make. In addition to being

easily changed to a single, it is in either form reversible. By simply turning round the saddles with the ⌐ pins and adjusting them, the machine becomes either a front or rear steerer.

If a front steerer be desired, the saddle, saddle pin, &c., as in the Tandem form, are turned, and the steering rod changed, so that it remains on the right side; provision is made for this. The brake can also be brought round, and the machine then assumes the very popular shape shown at Fig. 5. We must not omit mention of a very simple method of tightening the chain. The central tube is pierced by two slots, through which pass the bolts supporting the "carriage" or bracket holding the crank shaft, lower chain pulley. The nuts on these bolts (see Fig. 5) have only to be

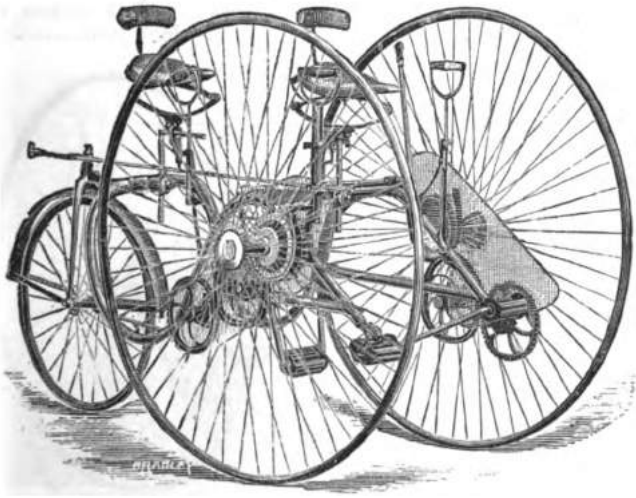


FIG. 6.—THE ORIGINAL DUPLEX EXCELSIOR TANDEM ROADSTER.

slacked, and the carriage "dropped" until the requisite tension of the chain is obtained. There are several other points about the machine, but we have noted its chief characteristics. The wheels are generally 46in. or 48in., and are geared up to order. It is made by one of the oldest firms in the trade, and may, therefore, be relied on in every respect; it is made in the best style, and enamelled, part plated, and with ball bearings to wheels, frame, crank shafts and pedals. The price is £32, or if a single machine only, balls all over, £23.

No. 5. The Original Duplex Excelsior Tandem Roadster.—This machine has been very considerably improved this year. It is now a double driver; and alterations have been also carried out in the frame, and in every way the machine is an advance on last year's pattern. It still has the mid-wheels with roller teeth in lieu of chain, and steers by either rider—generally the one at the back (see Fig. 6)—from the rear wheel. With ball bearings throughout, the price is £26; part plated, ball pedals, &c., £30.

No. 6. The Excelsior Two-Track Roadster.—Very rapidly is this pattern rising into popularity, and it now has a place in the *répertoire* of nearly every maker. Messrs. Bayliss and Thomas produced one for the first time in 1885. The frame is exceedingly simple. A safety tail is to be found at the rear terminating in a small metal wheel. This arches up to the right side of the axle sleeve, from which point another

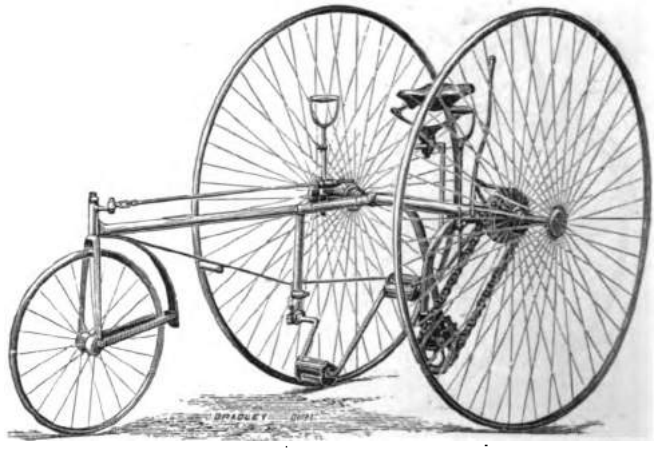


FIG. 7.—THE EXCELSIOR TWO-TRACK ROADSTER.

tube runs horizontally to the front, but bent slightly to the right, so as to bring the pilot wheel directly in front of its larger follower. From the front end of the tube a brace rod slants down to the vertical pillar supporting the crank (held on the other side by a tube which curves down from the axle sleeve) and up again to the safety tail; this serves to hold up the whole machine. A powerful brake lever on the left side. The Γ pin is held in a ring-boss behind the

axle sleeve. Very steady steering is worked, as usual, on the right side. Of course, all needful parts are adjustable. Starley's double-driving gear is employed in a box at the left of the axle. Other details are as usual (see Fig. 7); but it is a first-class tricycle in every way, and is likely to prove the most popular machine made by the firm. The price, with 46in. driving gear and 20in. pilot, enamelled, plated, balls "all," including pedals, £22 15s.

No. 7. The Mazeppa Trader Roadster (Metropolitan Machinists' Company, Limited).—A handy form of Carrier (see Fig. 8). The machine, though only a single driver, offers special facilities for the class of work for which it is designed. Not the least of these is the perfectly free and open back to the rear; the rider can slip on and off his "perch" without the slightest trouble. The pilot wheel is a long way in front, and between

FIG. 8.—THE MAZEPPA TRADER ROADSTER.

it and the rear ones there is a large oblong frame. Within this is placed a basket, the internal dimensions of which may be roughly taken at 21in. long, 18in. deep, by 17in. broad; but, of course, these are made to order. One good point—instead of sticking high up and obstructing the rider's view—the basket is low down, quite out of the way, but within easy reach. The frame has cross tubes front and rear; from

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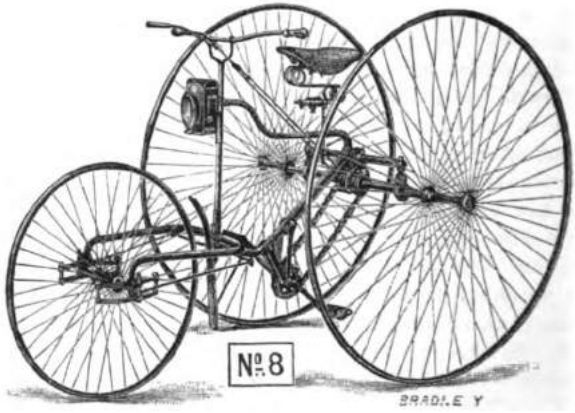
170, STRAND, LONDON.

THE NEW "QUADRANT."



No. 8, Bicycle Steering. No. 9, Side Steering.

ON THE TRACK.

The Mile Handicap, 1st Prize, £10 10s., at Aston, May 16th won by a Youth of 18 years, "with ridiculous ease."

—See Newspapers.

ON THE ROAD.

The "QUADRANT" beat the Bicycle by upwards of a mile. Time, for 22 miles of rough and hilly road, 1h. 37m.

—Post card from "FAED," May 20th, 1885.

Makers: LLOYD BROS.,

SHEEPCOTE STREET, BIRMINGHAM.

Tricycles of the Year,

1885.

No. 1. The Quadrant No. 9 Roadster (Lloyd Brothers). Discarding the generally accepted form of very small pilot wheels, and the awkward and dangerous connecting rod of the steering arrangement, the builders of the Quadrant have adopted a very large guiding wheel, with high frame and

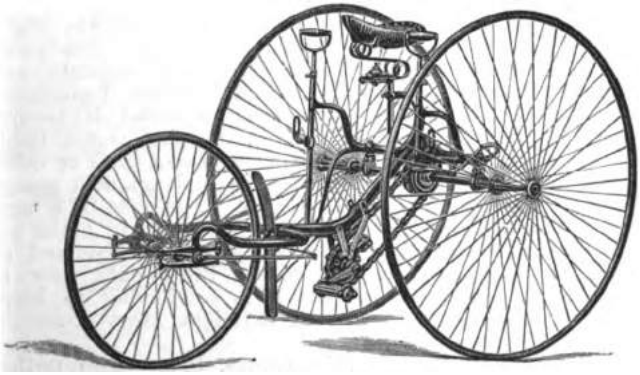


FIG. 1.—THE QUADRANT NO. 9.

low steering. It is a central geared front steering double driver; a glance at Fig. 1 will show some of its characteristics. The standard sizes are: 40in., 42in., 44in. drivers, with a 26in. front or pilot wheel. The driving wheels are

fixed on a hollow axle, which is divided in the centre, and is greatly strengthened by a solid inner axle, which is brazed to the tube on one side, and passes a considerable distance into the other portion. This prevents binding or twisting of the axle. On this firm support Starley's double driving gear is placed; this gearing, which has been adopted by the majority of firms in the trade, is illustrated in another portion of the present work. On each side of the chain pulley or wheel, which is driven by the endless chain, a deep groove is cut in the flange to prevent the superfluous oil from running into the drum of the brake, and thereby spoiling the "bite" of the contracting band, and rendering the brake weak and untrustworthy. Several novel and original points are to be found in the frame. A glance at Fig. 1 will show that it differs from any other in the market. Instead of the usual small backbone and Stanley head to the front wheel, the central tube has a large square-shaped horseshoe; the front ends of this bend down and support a double quadrant-shaped frame. It is from these that the name of the machine was originally derived.

The axle of the front wheel is about 12in. long, and on each end are small and deeply grooved rollers. These work between the coned edges of the adjustable quadrant. To each end of the axle is attached a light rod, which, being below the horseshoe frame, is quite out of the way. They are joined by a cross rod, which is pivoted in the centre, and connected with the rack and pinion worked by the right handle. This is one of the great merits of the Quadrant: the machine obeys the helm perfectly, with certainty and steadiness, and without the jerkiness and shakiness of machines with a very small pilot—as the steering wheel is termed when it is placed in front. Moreover, the pilot is not liable to be thrown out of position by hitting against a stone or other obstruction. Behind the wheel there is a large mud guard. This can be made useful in another way: in case of a runaway, or the improbable occurrence of the ordinary brake not acting with sufficient force, this shield can be jammed on to the tyre by the rider. Of course, this would only be adopted as a *dernier ressort*, but it is comforting to know that such a safeguard exists, as it might avert a serious accident.

The brackets which carry the cranks, lower chain pulley, and pedals, are the subject of a patent. They are less than a quarter the weight of the usual heavy affair, and are made of spring steel; moreover, they permit of very simple adjustment of the chain. A slot in the upper and longer arm of the bracket is held by a screw to the central tube. By slacking this the crank shaft can be dropped, and consequently, the

chain tightened. Passing to the upper part of the frame, the central tube is joined to an extra strong cross tube, and above it bends round to the front to support a ring boss through which the plunger, or stem of the ⌐ pin, passes. At each end the cross tube bends up, and on the right a support branches downwards. These hold the respective handles very firmly.

Brake-power is applied by the left handle without the troublesome and useless complication of having an extra brake lever, and power is communicated by link rods, so that by simply turning the handle, a leather lined metal strap is tightly compressed round a drum on the upper chain wheel; this at once checks speed, and brings the machine to a dead stop almost immediately, even on the steepest declivity. Ball bearings connect, by knuckle joints, the cross tube to the axle, and are placed at each end, and at one side of the driving gear in the centre. All machines have two small bosses, with eye hole, on the cross tube, to receive the connecting link of the Tandem attachment—of which more anon. The very large pilot wheel, and the manner in which it is attached to the frame, combine to make the Quadrant the steadiest running machine in the market. Of course all necessary parts are adjustable. Crescent rims, direct spokes, and moulded rubbers, are put to the wheels. Taken as a whole, the machine is one to be strongly recommended; it breaks away from the usual patterns, and is built in the best style, and on thoroughly mechanical lines. It is finished, enamelled and part plated, *i.e.*, fittings, &c., with ball bearings to the crank shaft, wheels, and pedals. An Arab spring and best Long-Distance saddle are included with the machine, which generally has 44in. to 46in. driving, with a 26in. front wheel. The price of machine as described is £24.

No. 2. The Quadrant Tandem Quadricycle Roadster.—Another strikingly original design, but of apparently alarming proportions. Its length, although considerable (104 inches), is not excessive, as one might be led to suppose from the annexed drawing (see Fig. 2). We may briefly dismiss the front part of the machine, which is identical with the one we have just described; it is only the rear or detaching part, therefore, which calls for description—but before going into details, we may note a few generalisms. First and foremost, if it had no other good points, the position of, or rather the distance between, the saddles would be a very strong recommendation. One of the greatest, in fact *the* objection, to Tandem cycles is the juxtaposition of the riders, who are nearly always placed so close together that their action is cramped, and their appearance is anything but attractive. In the Quad-

rant the average distance, from centre to centre, of the saddles, is 29½in.—or this can be increased to nearly 36in. As a rule, it is only about 20in. The extra space gives far more room and comfort; moreover, the machine may be used by two ladies,

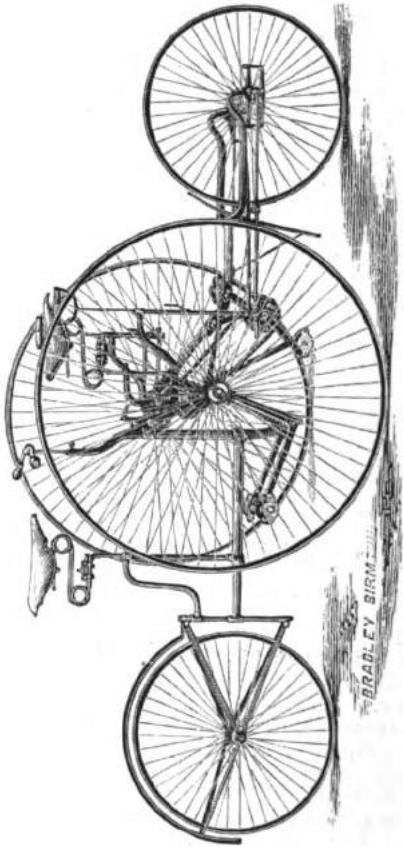


FIG. 2.—THE QUADRANT TANDEM QUADRICYCLE ROADSTER.

or by a lady and gentleman—the former being able to occupy either seat, a privilege denied on the majority of Tandems. Of course it is also suitable for two gentlemen, and with two good riders "aboard," it ought to be exceedingly fast on the road, and its merits would be especially conspicuous on a rough

and hilly highway, as, owing to the size of the central wheels and general steadiness, the vibration and bumping incidental to such travelling are not felt nearly so much.

Coming to the details of construction: Joined by knuckle-joints to the bosses, spoken of in the description of the previous machine, on the cross tube there is a second or back tube supporting an upright fork which holds the pillar; the latter forms, at the top, a tube to receive the stem of the bicycle shaped handle bar, the ends of which bend back towards the rider (see Fig. 2); it does not exert any influence over the steering. At the bottom the pillar holds a ⊥ piece, the ends of which form the fulcrum of the long crank levers. These are of a very peculiar pattern, and altogether different from any other machine before the public. There are three joints to the pedal lever ⋀, something in the form of a ⋀, minus the last stroke. The first arms run to the fulcrum, where there is a joint, the second arms running upwards, a second joint and the third arms, which are much longer, run to the front pedals, to which they are attached by a simple link hook going over the bearing case. The rider at the back, therefore, communicates the power to the front pedals during the period that the front rider cannot apply power. There is thus no loss of progressive action, and the pedals are doubly driven all the way round the revolution of the crank, and consequently the rate of propulsion greatly increased.

The improvements recently made have given a very easy and pleasant motion to the back pedals. To deal with the remainder of the frame: From the lower part of the frame a stout tube runs horizontally to the rear; from it a second pillar rises to hold the adjustable ⅂ pin and spring of the rear rider; this pillar is strengthened by a bent tube running back to the perpendicular ⊢ piece at the end of the tube. To the top and bottom of this is pivoted a double >, which, with the upright, forms a triangle on each side of the wheel. This makes the wheel a true trailer; it unfailingly follows every movement of the machine. It is thus perfectly steered by a simple automatic movement; even if the wheel is swung round sideways and placed against one of the driving wheels (as it would be when stored away) it regains its original position before it travels its own length, and its influence is not felt at all when riding. Those who will overcome their sentimental objections to the appearance will find the Q.T. all they can desire. It is altered to a single or formed into a Tandem in a minute, or the big wheels readily removed, for it to pass indoors. Both trailer and leader are 26in., the drivers 40in., or larger. With the sizes quoted we found the measurements to be, length 104in., centre of front to centre of back

wheel 78in., width 39in., wheel tracks 33in.—length with rear wheel folded 77in., weight about 100lbs. Finished, enamelled and part plated, with ball bearings all parts, except pedals. Net cash price £29 10s.

No. 3. The Quadrant No. 8 Roadster.—A few alterations have been made in this remarkable machine (see Fig. 3) since it was introduced, at the end of August, 1884, and immediately afterwards described in "Tricyles of the Year," 1884, pages 101–3, Second Series. In its roadster form the central tube is, above the cross bar which supports the axle, bent forwards and joined to the upright pillar of the steering handle; a strong support is thus gained for the

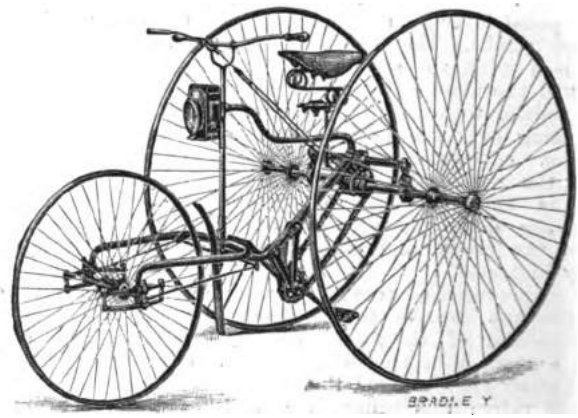


FIG. 3.—THE QUADRANT NO. 8 ROADSTER.

pin, saddle, &c. A regular bicycle brake is provided, applied by a grasp lever in front of the handles, and by means of a light connecting rod, made double in order to pass on each side of the supporting tube, power is applied to the central drum of the axle. Immense force is easily applied, but it has, in addition, the same "emergency" brake as the No. 9 and Tandem. Despite the rather heavy appearance the Quadrant No. 8 is built very light; a racer with 40in. and 20in. wheels we found to scale 47¼lbs., and a strong roadster need not draw the beam at more than 70lbs. The whole machine is much steadier than the generality of this now popular type, and the pilot wheel is not liable to the eccentric movements of smaller "pilots," which are secured from one side only. Of course the machine is mounted and

dismounted from the back, and has all the same points as No. 9, differing only in steering, &c. Both handles and spring are adjustable. The general size is 40in. to 44in. driving wheels (increased to suit tall riders) and geared up as ordered. With ball bearings to all parts, adjustable handle, &c., enamelled and part plated, the list price is £24 10s., but the net cost, allowing for discount, is about £21.

No. 4. The Excelsior Convertible Reversible Tandem Roadster (Messrs. Bayliss, Thomas, and Co.).—As the first firm to produce a modern tandem tricycle, the machine designed by Messrs. Bayliss and Thomas for 1885 is worthy of more than usual attention. It is "up to date" in every

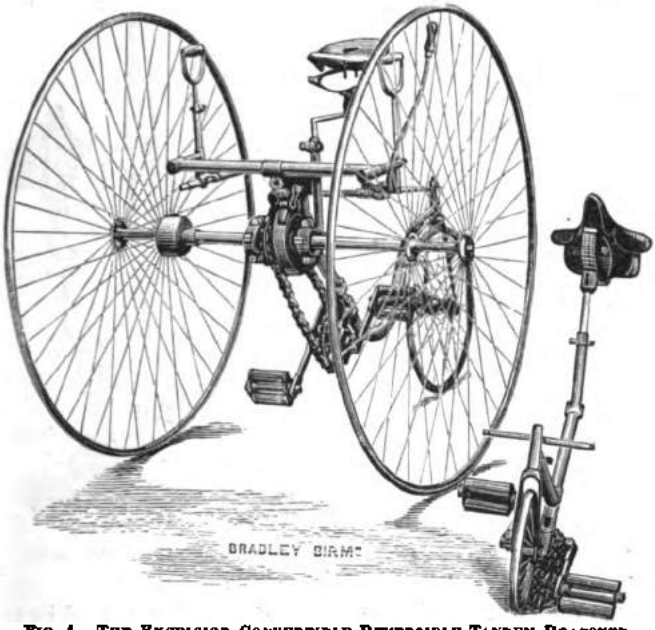


FIG. 4.—THE EXCELSIOR CONVERTIBLE REVERSIBLE TANDEM ROADSTER (Single Form, Rear Steerer).

way, and has many special points of merit. The general scheme is shown at Fig. 6. One good point is the open front enjoyed by the rider who occupies the more forward saddle, whose position is very like that on a Humber Tandem. It will be seen that a central tube in front carries, at the bottom, the

usual pedals, chain pulley, &c., and supports a short horizontal tube running forwards, which forms a step for mounting; and has a cross foot rest in front, besides supporting an 8in. "tip" wheel, with castor shaped forks. This wheel only comes into use when the machine is overbalanced in front.

The method of converting the tandem into a single machine is simple in the extreme. Front and rear tubes run into each other above the axle. By removing one bolt the front

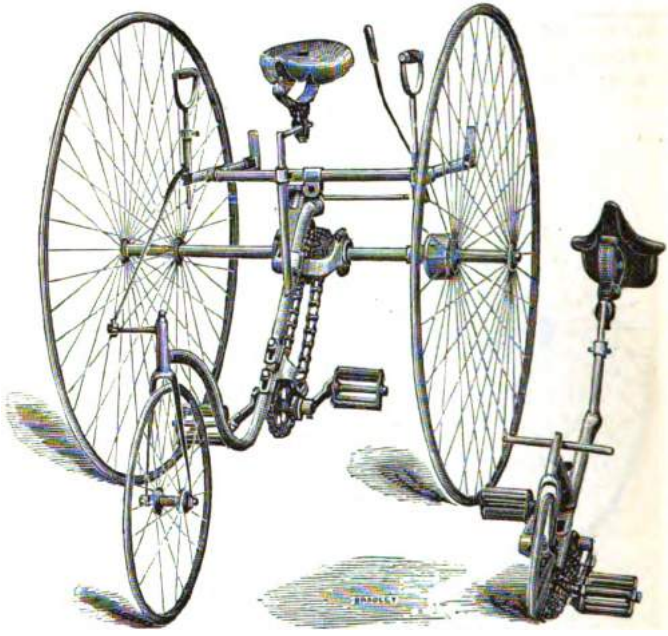


FIG. 5.—THE EXCELSIOR CONVERTIBLE REVERSIBLE TANDEM ROADSTER (Single Form, Front Steerer).

portion can be lifted away, and, the chain being divided in the usual manner, the saddle and its supports, &c., come away with the tube, a single machine of the Rover type remains (see Fig. 4). Above the axle, which has Starley's gear in at the side, there is a parallel tube with cross tubes at the end; the latter support the back and front handles; the front end of these side tubes form lamp brackets. The machine possesses one feature foreign to any other make. In addition to being

easily changed to a single, it is in either form reversible. By simply turning round the saddles with the ⌐ pins and adjusting them, the machine becomes either a front or rear steerer.

If a front steerer be desired, the saddle, saddle pin, &c., as in the Tandem form, are turned, and the steering rod changed, so that it remains on the right side; provision is made for this. The brake can also be brought round, and the machine then assumes the very popular shape shown at Fig. 5. We must not omit mention of a very simple method of tightening the chain. The central tube is pierced by two slots, through which pass the bolts supporting the "carriage" or bracket holding the crank shaft, lower chain pulley. The nuts on these bolts (see Fig. 5) have only to be

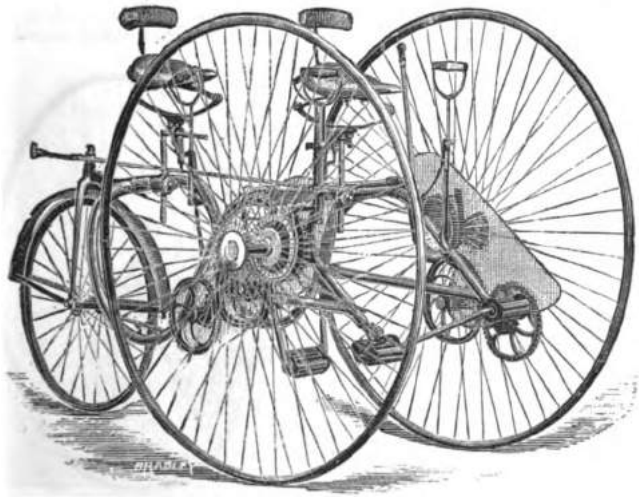


FIG. 6.—THE ORIGINAL DUPLEX EXCELSIOR TANDEM ROADSTER.

slacked, and the carriage "dropped" until the requisite tension of the chain is obtained. There are several other points about the machine, but we have noted its chief characteristics. The wheels are generally 46in. or 48in., and are geared up to order. It is made by one of the oldest firms in the trade, and may, therefore, be relied on in every respect; it is made in the best style, and enamelled, part plated, and with ball bearings to wheels, frame, crank shafts and pedals. The price is £32, or if a single machine only, balls all over, £23.

No. 5. The Original Duplex Excelsior Tandem Roadster.—This machine has been very considerably improved this year. It is now a double driver; and alterations have been also carried out in the frame, and in every way the machine is an advance on last year's pattern. It still has the mid-wheels with roller teeth in lieu of chain, and steers by either rider—generally the one at the back (see Fig. 6)—from the rear wheel. With ball bearings throughout, the price is £26; part plated, ball pedals, &c., £30.

No. 6. The Excelsior Two-Track Roadster.—Very rapidly is this pattern rising into popularity, and it now has a place in the *répertoire* of nearly every maker. Messrs. Bayliss and Thomas produced one for the first time in 1885. The frame is exceedingly simple. A safety tail is to be found at the rear terminating in a small metal wheel. This arches up to the right side of the axle sleeve, from which point another

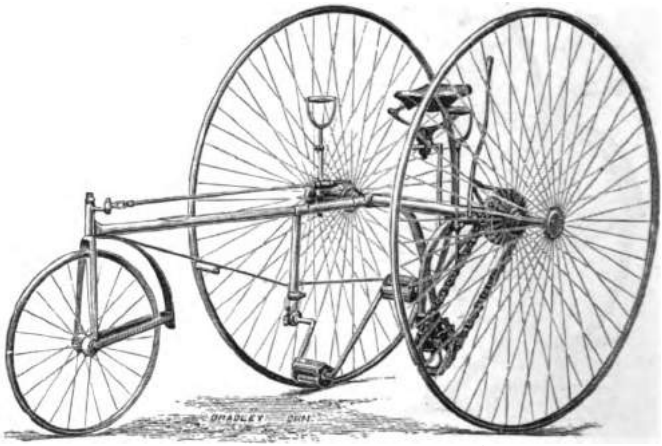


FIG. 7.—THE EXCELSIOR TWO-TRACK ROADSTER.

tube runs horizontally to the front, but bent slightly to the right, so as to bring the pilot wheel directly in front of its larger follower. From the front end of the tube a brace rod slants down to the vertical pillar supporting the crank (held on the other side by a tube which curves down from the axle sleeve) and up again to the safety tail; this serves to hold up the whole machine. A powerful brake lever on the left side. The ⌜ pin is held in a ring-boss behind the

axle sleeve. Very steady steering is worked, as usual, on the right side. Of course, all needful parts are adjustable. Starley's double-driving gear is employed in a box at the left of the axle. Other details are as usual (see Fig. 7); but it is a first-class tricycle in every way, and is likely to prove the most popular machine made by the firm. The price, with 46in. driving gear and 20in. pilot, enamelled, plated, balls "all," including pedals, £22 15s.

No. 7. The Mazeppa Trader Roadster (Metropolitan Machinists' Company, Limited).—A handy form of Carrier (see Fig. 8). The machine, though only a single driver, offers special facilities for the class of work for which it is designed. Not the least of these is the perfectly free and open back to the rear; the rider can slip on and off his "perch" without the slightest trouble. The pilot wheel is a long way in front, and between

FIG. 8.—THE MAZEPPA TRADER ROADSTER.

it and the rear ones there is a large oblong frame. Within this is placed a basket, the internal dimensions of which may be roughly taken at 21in. long, 18in. deep, by 17in. broad; but, of course, these are made to order. One good point—instead of sticking high up and obstructing the rider's view—the basket is low down, quite out of the way, but within easy reach. The frame has cross tubes front and rear; from

the centre of the latter a hollow arm runs backwards to support the spring and seat for the rider. Steering as usual from the right side—a long bar runs beside the side tube, and operates upon the pilot. Brake power is applied simultaneously to drums on both wheels. Other details are as per usual. The full width is 39in. to 40in.; but, by removing a wheel, it is reducible to 32in., which will enable it to pass through most doors. Fitted all complete, the machine ought to be valuable to tradesmen. Nett price, £16 4s. only.

No. 8. The Don Humber Roadster (Don Brazier Cycle Company).—Yet another addition to the very numerous but still increasing representatives of the Humber school. Cheapness and good value for the money is perhaps the chief characteristic. It has all the ordinary features, and, in fact, copies its prototype as much as possible; lightness is also a feature. Hollow rear forks are fitted, and Morgan's chain is used for the central gear. Neither seat nor steering rod (the latter is made bent or straight to order) is adjustable. The machine is enamelled and part plated, and the price for any size (gearing up as desired) is only £18, with balls to all parts.

No. 9. The Empress Two-Track Roadster (T. Smith and Sons).—First to attract attention and demand praise is the very excellent system of steering. In place of the clumsy old plan, still common in most machines, the shaky rack and pinion, which is both uncertain and unreliable in action, a silent certain screw action has been brought into use. It will be seen that the socket of the right handle is supported at the top by the frame, and at the lower end by the tubular leg. Attached to the bottom there is a circular plate, with bevel teeth on the lower face; below this, on the end of the light rod, there is a bevel cog. The other end has a deep pitch screw, working in a block, hinged to a short arm projecting from the fork of the pilot wheel.

In work it is direct, and has a most important advantage; the pilot is always firm, and cannot be thrown out of position by striking a stone or obstacle in the road, as is a frequent source of trouble and danger with the ordinary plan. Another unwonted luxury are the adjustable foot-rests; the right one is L-shaped. The long arm passes through a socket boss on the frame, where its height is regulated by a set screw; the short arm is rubber clothed, and offers a comfortable rest for the foot. The rest on the left is held by the frame leg, and is also adjustable. Brake power is supplied from a lever on the left; and it can be set at any required strength by a spring ratchet, so that it does not need continual attention, or require any straining of the fingers

to keep it applied. Now, if the makers would only devise a plan of applying the brake in the same way by screw action, they would add considerably to the attractions and value of an already capital machine. The Empress may be described as a two-track double-driver; the frame is of a very neat and plain ¬ pattern, as simple as possible. The pilot wheel is brought before the right, and two tubular legs slant down forwards from the axle sleeve, and terminate with a solid slotted piece, in which are held the ball bearings for the crank shaft; slackness of the chain is therefore easily taken up. The left handle, then, is held by a short arm projecting from the boss where the left leg joins the axle sleeve. A safety tail runs out from the right leg.

A novelty is to be found in the spring; it is composed of three pieces of steel joined together in the form of a Z: it forms an easy "purchase" for the Long Distance saddle, and is held by an ¬ pin. The latter is instantaneously regulated to any height, as there is a long lever to the locking screw at the back, so that no spanner is required. Starley's double-driving gear is placed on the left side. The upright on the long frame tube is a lamp bracket, and the pilot wheel has a Stanley head and mud-guard. After stating that the wheels have direct spokes, crescent rims, and red moulded tyres, no other particulars need be given. Taken all in all, the Empress is a most creditable production, and a first class machine in every way, and is worthy of a prominent place amongst tricycles of 1885. It is finished enamelled, part plated, and has ball bearings to all parts, axle, pilot, crank shaft and pedals. The general size is 48in., geared to rider. List price, £23 2s.

No. 10. The Alert Roadster (Jas. Beach). — This machine is of the well-known Humber form, but it has Starley's gear in the centre of the axle, instead of at the side, and is driven by Morgan's roller chain. There is no difference in the upright pillar which carries the pedals, crank shaft, &c., in ball bearings at the bottom. It is, like the original Humber, non-adjustable, so far as the height of the saddle is concerned, but of course the chain is readily altered to remove slackness; either a bent or straight bar can be had, and ⅞in. moulded tyres are put to the wheels. It has, however, one remarkable feature, exceeding cheapness, as, despite the fact that ball bearings are put to all parts, and painted or japanned, with the bright parts plated, the price is only £15. It is also very light, as we practically tested by putting a machine with 44in. driving and 16in. rear wheel, all complete, on our scales, when it only registered 70½lb.

No. 11. The Two-Track Advance Roadster.—General details. The 20in. pilot is put in front of the right driver. A cross tube over the axle carries the ⌜ pin of the seat, and the double driving gear is put on the left side. The leg at this side bends gradually to the front, bringing it parallel with the pillar which comes down from the right tube; between these the crank shaft is held in ball bearings. There is a good lever brake, and the steering is carried out by the usual rack and pinion. Painted, and part plated, with ball bearings (Bown's) to all parts, except pedals, £15.

No. 12. The F. S. Advance Roadster. — A choice is given between Starley's or Bown's double driving gear. The loop frame is somewhat square in front, and has the pilot wheel rather farther out than is generally the case: result—increased steadiness. A single safety tail is to be found at the rear, and, for sake of novelty, the spokes are sometimes painted light blue. We need not recount each separate feature, as there are no specialities—same as in the others. The price, any size, balls all over except pedals, £15.

No. 13. The Triumph Roadster (Warman and Co.).—A good-looking double driving front steerer, with loop frame. By taking the connecting rod of the steering below the frame, the appearance is not only improved, but the machine is made much safer by having a practically open front, so that mounting or dismounting is equally easy of accomplishment from either side. There is also a ratchet brake for retaining power without further attention. Every care is taken to make the machine sound in every way. It usually has 46in. wheels geared to 50in., and the price, balls all over, £21, or plain bearings, £18 18s.

No. 14. The Juvenile Triumph Roadster.—Although only a single driver, it is built more on the lines of a large machine, with a loop frame, safety tail at the back, adjustable seat and handles, and, a machine with 30in. and 12in. wheels, costs £5.

No. 15. The Boy's Triumph Roadster.—Rover type in shape, this capital little machine drives a pulley on the centre of the axle, and the crank shaft is held by a pillar coming down from the backbone, of which the rider sits astride. Instead of the rack and pinion steering, an eccentric is used at the bottom of the right handle stem; it keeps the rear wheel very steady, and there is no loss of power or time in guiding. Only one wheel is driven, but a brake is fitted;

and it is a capital machine for youngsters (see Fig. 9). Price £5 10s.

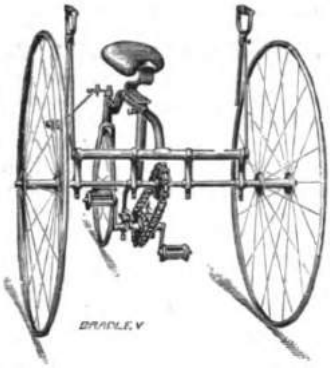


FIG. 9.—THE BOY'S TRIUMPH ROADSTER.

No. 16. The Coventry Imperial Tandem No. 23 Roadster (The Coventry Cycle Company, Limited).—A combination of the Rover and Loop Frame patterns. The front portion is of the latter description, and the side tubes are bolted to projecting arms, which jut out from the cross tube below the axle sleeve. From this they—the side tubes—bend low down and have the usual pilot wheel and backbone in the centre. The pedal shaft works, in ball bearings, below the frame, and the chain is on the left side. The system we have so often advocated in the construction of the steering is adopted, and, by being put under the frame, it is quite out of the way. The rear part is the same as will be found described as the Alberta Roadster.

An arrangement is now being perfected which will permit of either half being removed, so that the owner can vary his mounts, but, as already stated, the general plan is to take away the front portion. Both central wheels—*i.e.*, pilot and rear—steer automatically together by a single action of the right handle by the rear rider, or it can be made for either to control the "helm." A lever brake, kept by a ratchet at any power, is also within reach of both riders. The machine makes a really capital tandem, and is exceedingly cheap. It is finished, enamelled, part plated, and has ball bearings to all parts of both halves, including the four pedals (if plain pedals £2 less). We took the following measurements from a machine with 46in. and 18in. wheels: Length, from axle to centre of pilot wheel, 38in.; to ditto of rear wheel, 36in.; total length, 74in. Total width, 38½in.;

wheel tracks, 31½in. The ordinary distance between the saddle centres is 21in., but this may be slightly increased. Price £26, or, with plain pedals, £24.

No. 17. The Coventry Imperial Tandem No. 22 Roadster.—Quite a different "union" of two other patterns of this maker's output. The machines allied are known, when separated, as the Limited Mail No. 10 (Humber type), and a central geared front steerer—the latter virtually a Fairy (No. 11). The general shape is shown in Fig. 10. There is a solid continuous axle, and the wheels are driven by the sleeves or hollow casing which covers the axle. This is divided in the centre, and between the ends Starley's gear is placed; the central chain pulley carrying the bevel pinion is free on the axle, and the pinion drives the side cogs, which are attached to the sleeve ends, so that both wheels are equally driven.

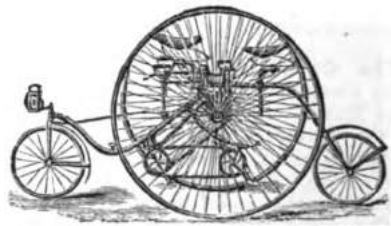


FIG. 10. THE COVENTRY IMPERIAL TANDEM NO. 22 ROADSTER.

Steering is carried out entirely by the front part, and the Stanley head of the rear part has a huge joint, and works behind the top of the central tube, so that it follows its leader automatically. At the upper extremity of the tube there is a cross-piece—with short pieces at right angles at each end—this shape, ⊦——⊦; the shorter cross-pieces serve to support the four handles. The saddle springs are supported by ordinary ⌜ pins, and the ordinary distance between them is 23in. Brake power is applied by the front rider from a long lever on the left side. Either or both can steer by the pilot wheel, which, to gain extra steadiness, is carried a good way out in front. In Fig. 10 the rear chain is shown as passing round the pulley of the front rider, but the usual plan is now adopted, and it—the rear chain—goes round a second pulley on the driving gear in the centre of the axle.

It will be seen from Fig. 10 that a somewhat peculiar plan is adopted for supporting the crank shaft. From the central frame a curved tube extends backwards, having at the end

the step for mounting, and an adjustable clamp, which holds the crank shaft, chain pulley, &c. A step is also provided in front. The whole machine is well worth inspection and trial, and will prove a very cheap investment. We took the following measurements from a machine with 46in. and 18in. wheels: Length, 110½in.; from axle to centre of pilot wheel, 39in.; to centre of rear wheel, 32½in.; between centres of small wheels, 71½in.; total width, 38½in.; wheel tracks, 30½in. Price, enamelled, balls all parts, &c., £24 net.

No. 18. The Coventry Imperial Fairy Roadster.—This is virtually the front half of the Tandem just described, and is a central framed and geared double driver. The middle tube, which forms the backbone of the pilot wheel, curves up and

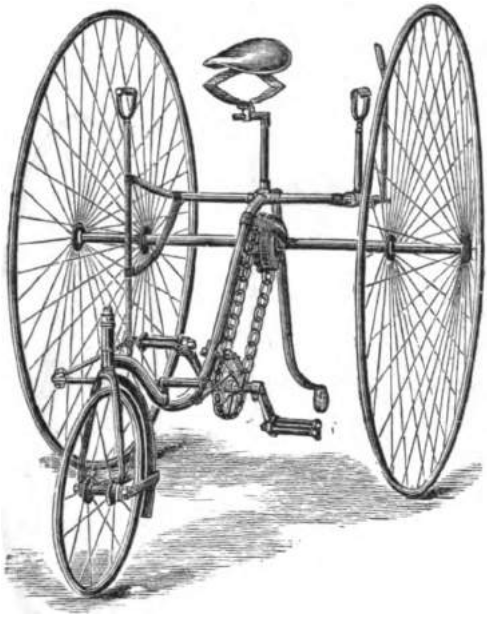


FIG. 11.—THE COVENTRY IMPERIAL FAIRY ROADSTER.

joins the axle sleeves by a double armed bracket, and the top forms a socket holder for the Γ pin of the saddle, the height of which is regulated, in the usual manner, by a set screw. Driving gear, wheels, &c., are the same as in the

Tandem. The lower chain pulley is held under the central tube (see Fig. 11), which is longer than usual; consequently the steering is steadier. Regular adjustable bicycle cranks are used, with ball bearing pedals, and a narrow tread is enjoyed. Provision is made for carrying the lamp over the pilot wheel. A central tip-tail is fixed at the rear; this is, of course, removed when converted into a Tandem. The machine is one of the cheapest purchasable of this type, as, with all the features we have named, enamelled, with ball bearings to all parts, the net price is only £13 10s. With 46in. and 18in. wheels the length is 66in.; wheel centres now 39in., formerly 37in.; width, 37in.; wheel tracks, 31in.

No. 19. The Coventry Imperial Limited Mail No. 10 Roadster.—Another Humber, and like the rear part of Tandem No. 22, save that it has the usual high head and bicycle steering of its class; but both steering rod and saddle

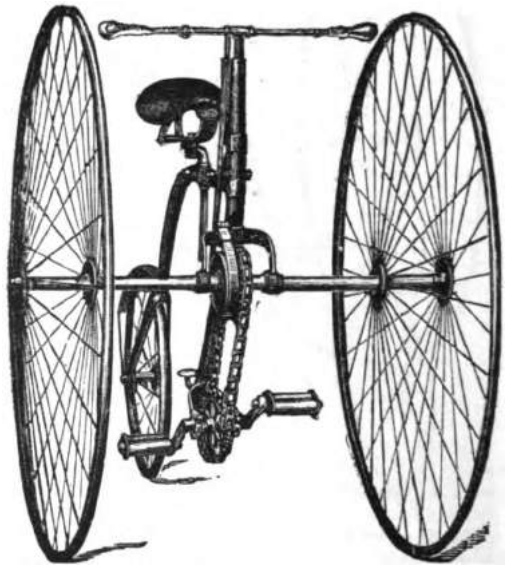


FIG. 12.—THE COVENTRY IMPERIAL LIMITED MAIL NO. 10 ROADSTER.

are adjustable, the latter by an T pin passing through the backbone (see Fig. 12). The neck and centres of the latter are

lower than usual. The axle is a weldless steel tube, and Bown's double driving gear is employed, in the centre of the axle; the same maker's noted ball bearings are used throughout. A good hand lever brake supplies the "check action;" and an Arab spring affords a comfortable support to the saddle. Enamelled, lined, and part plated, with balls all over, £17 10s. net is the price; and we found a strong roadster, 46in. and 18in. wheels, to scale exactly 80lb.

No. 20. The Alberta Roadster.—A variety of the Rover type, and rear portion of Tandem No. 23; it may be shortly described as a semi open fronted double driving rear steerer (Fig. 13). Either Bown's or Starley's double driving gear is put on the left side, and a straight backbone runs from the centre of the axle sleeve to the Stanley head of the small wheel, which is steered from the right side. As in the Rover, the sleeve of the axle makes a capital foot rest, and roughed plates are placed upon it for that purpose. Of course, when in this position, the rider has a perfectly clear front, and can easily leap out if he so desires. On each side, close to the wheels,

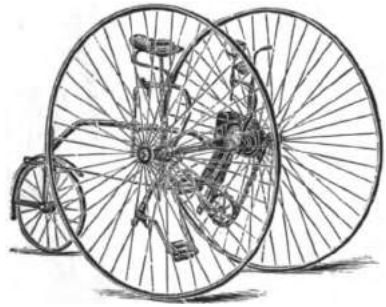


FIG. 13.—THE ALBERTA ROADSTER.

there are upright side tubes, held by a boss on the sleeve; below the axle these serve to support the crank shaft, with the gear on the left side, and, above, form supports for the handles. By adding a second socket for the Γ pin on the backbone, and altering the position of it, and turning the saddle, the machine can be converted into a front steerer, and driven small wheel forwards. The machine, especially in its normal mode of progression, is a very good one. It is finished in the same style as the remainder of the group, enamelled, and balls to all parts. The price is £18. Length of a machine, with 46in. and 20in. wheels, 71in.; centres, 38in.; width, 39in.; wheel tracks, 33½in.

No. 21. The Electric No. 5 Roadster.—This machine (Fig. 14) is of the loop-framed front steering type, with Starley's double driving gear, but without any special features peculiar to itself except the band brake, which acts all round the drum by the ends being drawn together instead of only one

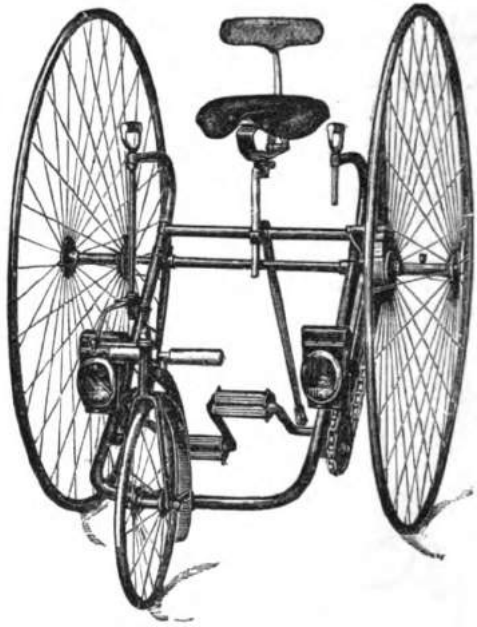


FIG. 14.—THE ELECTRIC NO. 5 ROADSTER.

end being pulled tight. It is exceedingly powerful in action, and is applied by the usual lever. With the same details of finish as other machines of the group, the net price is £17. We found a 46½in., with 18in. pilot, to be—length, 70¾in.; wheel centres, 38½in.; width, 38¼in.; wheel tracks, 31¼in.; weight, 92½lb.

No. 22. The Coventry Enchanter Convertible Sociable Roadster.—Built on the lines of the Centaur Sociable, by licence from that company. The Enchanter is a first-class representative of this form of dual travelling. The frame is of unusually graceful proportions, and from the cross tube above

the continuous axle three uniform tubes, forming the frame, slant to the front, one at each side, with a central support; they join the usual cross tube in front, and have the pilot wheel in the middle, controlled by a central steering band, so that either rider can command it. Above the upper cross tube, which supports the ⌐ pins of the saddles, &c., the three frame legs turn upwards and forwards, forming brackets for the handles. Bown's double driving gear and a powerful ratchet brake are to be found on the left side. A very simple method of conversion is adopted; by simply withdrawing bolts in the axle, upper and lower frame cross tubes, the whole right half of the machine can be taken away; the wheel is then removed from it, and placed on the part of the axle which projects from the remaining portion, when a double driving loop framed single machine is created, being almost a two-tracker, and quite open fronted. The whole machine is one which can be recommended, the price being, with usual finish, plating, enamel, and ball bearings to all parts, including pedals, £28, or with only plain pedals, £24. A 46in. and 18in. machine measured as follows: Length, 69½in.; centres, 37½in.; width, 56in.; wheel tracks, 48½in.

No. 23. The New Invincible Tandem Racer (Surrey Machinists' Company, Limited).—Amongst the improvements, a great reaction in weight is chiefly noticeable—last year we commented on its being the lighest made at 81lb.—now a racer is some 15lb. lighter. In fact, the machine now in

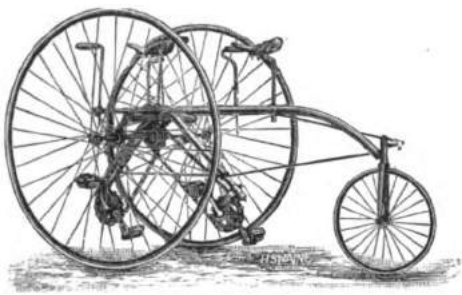


Fig. 15.—The New Invincible Tandem Racer.

use is only 65lb. or 66lb. The weight has been chiefly saved by making the machine *non*-convertible. This allows of great simplification. It will be remembered that the front rider has only to *work;* he has adjustable side handles, but no power over the machine in the way of guiding. The double

driving gear is the same as applied last year—a specialty of the makers—and is placed in the centre of a very light, divided axle, which is joined to the cross tube above it in four places—at either side of the gear box and at the ends—by ball bearings and short arms. From the middle of the tube a strong backbone runs horizontally to the rear, and then dips down suddenly, but in a graceful curve, to the small wheel (see Fig. 15). Instead of weakening the backbone by the Γ pin passing through it, a boss on the backbone holds it at the side, and by a slight crank on the pin the saddle is brought directly over the centre—a plan greatly preferable to the usual method.

The front pin is held in a similar manner, by a boss at the side of the front tube, which supports the chain gear, &c., of the forward rider. The rear pedals, &c., are held by a similar tube, which runs down from the main cross tube and backbone. These tubes are strengthened and made very rigid by brace rods, which join them and then run up to the end of the backbone, near the small wheel, the effect being to prevent the "legs" from "giving" to the pedal thrust. Independent chains pass over the driving gear, and a simple, but effective, plan has been devised to take up any slackness which may occur. For many years the Surrey Machinists' Company have been noted for producing one of the best wheels in the trade. They have the Surrey hollow felloe and strong tangent spokes, with ⅞in. tyres. Short tubes, at right angles to the main cross tube, support the adjustable handles, and the steering rod connected with the shaft of the right rear one is very steady in action; it runs to an arm on the right side of the back wheel.

The bearings are of a specially good type, and are made by the Surrey Machinists' Co. They seldom require adjustment, a great desideratum, particularly to novices. The merits of the machine as a racer have been so abundantly proved that further reference to them is unnecessary; one curious fact may, however, be noted—riders when mounted on this Tandem require a much shorter start in a handicap race than they would receive from the same scratch men when all on single machines.

We took the following measurements from a Racer, with 42in. drivers, geared to 59in., and a 17in. steering wheel. Distance between saddle centres, 21½in.; clear space between back of front saddle and front of back saddle, 13in.; tread (between pedal centres), 8½in. Length over all, 71½in.; axle to centre of rear wheel, 42in.; total width, 38½in.; wheel tracks, 31½in. Price, enamelled, part plated, and ball bearings to all parts, £30.

No. 24. The New Invincible Tandem Roadster.—Built on similar lines to the Racer, but with ⅞in. tyres, of

the best Para rubber. By making it non-adjustable, some 10lb. is saved in the weight, and the machine rendered simpler and neater. As in the Racer, a guard is put over the front chain, making this seat particularly suited to ladies. The machine is really lighter than many singles, and will give new life to riders who are accustomed to the heavy road crushers the generality of makers delight in turning out. A greater distance than usual—26in.—is allowed between the saddles; other details—with the addition of a powerful lever brake on the left side, the power of which is communicated by either rider—are, save being stronger, like those of the Racer; and, with balls to all parts, &c., the price is £32.

No. 25. The Gordon Roadster (London Cycle Supply Association, Limited).—It was with feelings of genuine pleasure that we examined the technical details of this machine. Without going in for any fancy patents of doubtful utility, the makers have used every endeavour to produce as perfect a tricycle for everyday use as possible. To achieve this object they seem to have carefully studied every part, so that the machine is not only adapted for the special class—the "clerical and medical" professions—they claim to cater for, but for the general body of the public who take up tricycling as a health-giving pastime. As shown by the illustration (see Fig. 16), the Gordon is a pilot-steering double driver. Going into details, we find a loop or ⊃-shaped frame of more than usually graceful proportions. As this runs upwards, it is joined to the axle and sleeve by ball bearings, and, continuing higher, bends over to the front, forming strong and rigid supports for the handles. Connected with the right handle is one of the improvements which make this machine so attractive, but which ought to be found on every properly constructed tricycle of this type—times out of number we have denounced the needless, clumsy, and dangerous high steering rod so often put to machines. In the Gordon it is to be found in its proper place, below the frame. The necessarily long shaft to the handle is steadied by passing through a double holder attached to the frame. It has the usual rack and pinion at the bottom, and the connecting rod runs forward under the frame to a cranked arm below the axle of the pilot wheel, where it has even better control over it than when attached high up; while, being out of the way, the machine can be mounted or dismounted from either side, and the appearance is also greatly improved.

There are two other important improvements to be found in the pilot. Mr. Parsons, who is responsible for the design of the Gordon, has abolished, or rather, changed, the position of another part of the machine. The often loose and

generally rattling mud guard, with its brackets, has been done away with, and in its place is a broad splash-guard, attached to the front of the backbone, with a cross-guard below the front of the frame. These are more effective than the old plan, save in weight, and look much better. Excessive vibration from the pilot is a source of evil all front steerers are subject to. In the Gordon it is greatly modified by placing a coil spring inside the socket head; the weight of the rider rests on this spring, which gives a springy motion instead of a jarring bump. It will be seen (Fig. 16) that, between the top of the shoulders and the bottom of the socket,

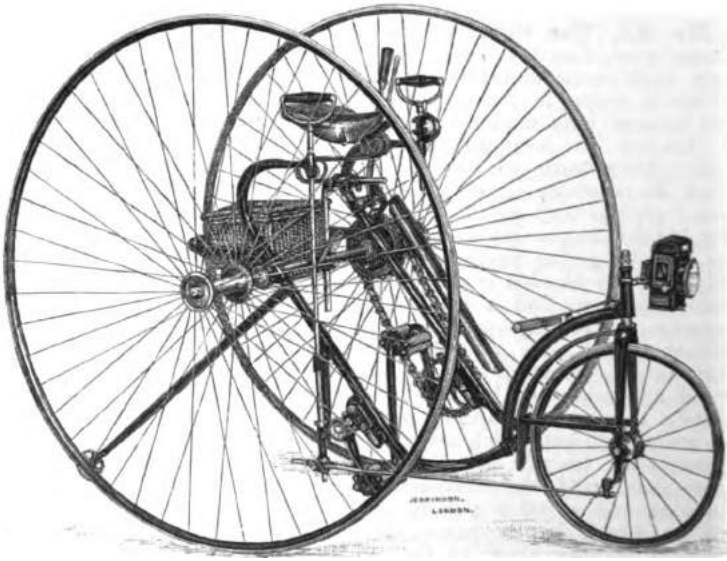


FIG. 16.—THE GORDON ROADSTER.

there is a space to give the desired play to the action of the anti-vibratory spring. Behind the head there is a spring holding a rubber-clothed crossbar, forming a comfortable foot-rest.

A slotted bracket below the frame carries the cases of the ball bearings, which are easily adjusted, either to tighten the chain or the bearings themselves. An endless chain, protected by an effective dress-guard, runs round the pulley on the left end of the crank shaft, and a corresponding one

outside the box, containing Starley's double driving gear, on the axle. Brake power has also been studied, and—the almost necessary addition to the lever form—a quadrant ratchet provided. This keeps brake power—brought into play by the long lever tightening a leather-lined metal strap round a wide flange or drum on the gear-box—at any desired strength, without further attention or straining, as, by aid of the spring catch, it can be "set" according to the steepness of the hill. One of the most comfortable patterns of saddles is supported by an Arab spring, which in turn rests on an Γ. pin, held by a boss before the axle sleeve, and adjustable by a set screw, so that riders of any reasonable height can be suited. Tipping backwards is provided against by a safety tail on the right side. To further show how completeness of detail has been followed up, reference need only be made to the light tubular detachable frame at the back. It is oblong in shape, and is provided with long leather straps to carry any sized parcel, but has in addition a neat basket, containing, when the machine is sent out, bottle of lubricant, oilcan, spanner, polishing paste, spoke brush, wash-leather, &c.—in fact, a complete outfit—all of which are included gratis. We should have also stated that a first-class head lamp, over the pilot wheel, and one of Harrison's double chiming alarums, are also included. Indeed, the items which come within the "inclusive" price would, in most machines, run up the price by fully £2 extra; therefore, those who like ball pedals cannot object to the £1 10s. additional charged for them. The standard size is 46in. drivers, with 18in. pilot (the wheels have direct spokes, moulded rubbers, &c.), and gearing is level or to order. The Gordon is a tricycle we can strongly recommend in every way, and, although but little known at present, is not likely to remain so. The net price, including all the points we have described, with balls to frame, pilot and crank shaft, but with plain pedals, is £21; with ball pedals, £22 10s.; and it is finished enamelled, with the bright parts plated.

No. 26. The Wellington Juvenile Tandem Roadster (W. Townend and Son).—Our boys and girls now share in the joys and sorrows of cycling, and form an ever-increasing corps of cyclists who will, later on, join the regular army of wheelists. No firm has done more to forward this laudable intention than Townend and Son, who have for some years confined themselves almost exclusively to children's machines. So great and varied is the demand, that they have lately moved into much larger premises, and now build an extensive assortment of cycles for juveniles. The Wellington may be described as a double open-fronted single driver. The large

wheels run on a continuous axle; the right is driven by the rear rider, while the left is propelled by the front rider (see Fig. 17). There is a good space between the riders. Regarding the frame,

FIG. 17.—THE WELLINGTON JUVENILE TANDEM ROADSTER.

it is a loop at the back, and the side legs pass over the axle, and extend down in front, to carry the crank shaft in plain bearings. The machine has 36in. wheels, and costs £10 10s.

No. 27. The Wellington Sociable Roadster.—Much the same as the Tandem; the riders sit side by side, and each drives a wheel; in general details it is a reduced copy of some of the large machines. Both riders have foot rests, and there is a double-action brake on the left side. Price, with 36in. to 40in. wheels, £11 10s.

No. 28. The Wellington Juvenile Roadster.—A companion machine to the Herald (No. 29), save that it has a loop frame, composed of flat bars, with a pilot steering wheel. It is only meant for the very young, as the sizes will show—i.e., 22in., £3 10s.; 26in., £4; and 30in., £4 10s.

No. 29. The Herald Roadster.—An exceedingly pretty little central geared single driver (see Fig. 18, which explains the design without lengthened description). In order to make

the little machine run steadier, the pilot wheel is put out a good way in front, and a comfortable foot rest fixed on the

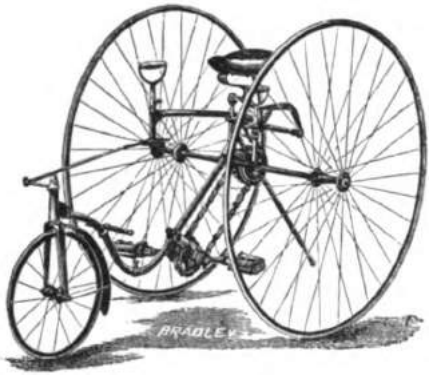


FIG. 18.—THE HERALD ROADSTER.

central tube. Owing to the position of the bicycle cranks, pedals, &c., the rider has a nice vertical position. Of course,

FIG. 19.—THE SKIPPER ROADSTER.

saddle and handles are adjustable. The machine is finished enamelled, and the price is, 30in., £6 10s.; 36in., £8; 40in., £9. We found a 30in. scaled 49lb.

No. 30. The Skipper Roadster.—The best of the group, and the only double driver. Naturally it is more expensive, but is worth the price charged, as, amongst other good points, the steering (see Fig. 19) is carried below the frame, removing, especially to juveniles, a source of danger. All parts are adjustable, and the machine has plain bearings, but is provided with a capital lever brake, foot rest, &c. The price, nicely finished and well made, is, for a 40in., £11 10s.; or, if only a single driver, £10. The former is, however, to be much preferred. Several other types are also turned out by the same firm, but those mentioned serve to give an idea of the whole. They can be had in all sorts of shapes, and nearly any price.

No. 31. The B. S. A. Two-track Roadster (Birmingham Small Arms Company, Limited).—A new introduction for

FIG. 20.—THE B. S. A. TWO-TRACK ROADSTER.

the present season by this noted firm, who, thanks to wars and rumours of wars, have of late been more profitably employed on their legitimate business than for many years past. The cycling branch has not, however, suffered. We have on very

many occasions spoken in terms of the highest praise of the work turned out by this firm, and the present machine (see Fig. 20) is equally deserving of commendation. A sleeve goes over the axle, and, on the right side, a tube runs to the front, bending slightly to the right, so that the pilot wheel is immediately before the right driver, and giving the machine only two tracks. The steering rod is parallel with the tube, from which a perpendicular leg runs down to support the crank shaft, the other end of which is held by another leg, which, however, juts out from the axle sleeve, and then turns suddenly down. Brake power can be applied from the handle, although the old-fashioned lever is generally employed. Starley's gear, driven by an Abingdon chain, is used. A safety tip tail is put on the right rear side, and foot rests are also fitted. Both in materials and workmanship the machine is of the very best. The general size is 48in.; geared to order, and with several parts, including hubs, crank shaft, steering rod, Γ pin and handles, and ball bearings to all parts, including pedals, the price is £23.

No. 32. The B. S. A. Roadster.—A few improvements on detail have taken place since we last described this machine,

FIG. 21.—THE B. S. A. ROADSTER.

which is a loop-framed double of the highest class. As will be seen from Fig. 21, low steering is adopted, and the naked axle is joined to the cross tube above by ball bearings.

There is a safety tail at each side, much preferable to the lop-sided plan of one only. All parts are adjustable, and brake power can, if required, when ordering be made to act from the handle instead of from the lever. These machines are made on the interchangeable system, and any part of one fits the corresponding part of another. In other details, finish, price (£23), it is the same as the Two-track machine.

No. 33. The Zephyr Convertible Tandem Quadricycle Roadster (the Coventry Zephyr Cycle Company).—A new machine for 1885. It will be remembered that this Company introduced a startling novelty in the early part of 1884, by putting the pilot wheel very much farther out in front than usual; the present machine (see Fig. 22) has the same good feature. Steering wheels are put both back and front; in the centre these are steered by a rod running high upon the right side in front, which is joined to a swing rod, bevelled in the centre, below the axle sleeve; the other end joins the rod of the rear steerer, so that the wheels act in perfect unison. The frame is of a somewhat peculiar pattern; the front and rear tubes cross above the axle, and form X-shaped supports for the handles. In order to overcome the inequalities of the road, without straining the machine, the backbone of the rear wheel is hinged to the centre of the sleeve, from which it runs horizontally to the small wheel.

Another peculiarity is the means of driving; the rear rider's chain passes round a pulley on the crank shaft of the front rider; power is, therefore, communicated through his pedals, and the chain on the left, to the double driving gear. By removing the rear chain, backbone, and disconnecting the steering, the machine becomes a single. The Company was one of the first to apply a ratchet to a lever brake; they still use it. A capital form of plain pedals has recently been introduced; screw rings are slipped over the end of the shaft, and the pedal itself is split in halves; on being joined, these screw rings go over a boss and join them together. Altogether, it makes a capital tandem. Ball bearings are put to the frame and small wheels, and rollers to the pedal shafts. The measurements, with 48in. and 20in. wheels, are: Length, 97½in.; from axle to centre of pilot wheel, 44in.; to rear, 33½in.; total centres, 77½in.; width, 41in.; wheel tracks, 38in. Net price, enamelled, &c., £25 13s.

No. 34. The Cunard No. 5 Racer (F. Gibbons).—The pattern of this machine is known to cyclists as the "Cripper," and its shape is shown in Fig. 23, from which it will be seen that the title "Reversed Humber" might also be applied to it.

FIG. 22.—THE ZEPHYR CONVERTIBLE TANDEM QUADRICYCLE ROADSTER.

Commencing with the wheels, we find light tangent spokes, steel felloes, and small-sized rubbers. A special feature is to be met with in the axle. It is of light weldless steel tube, or rather two tubes, as it is divided in the centre. To the outer ends the light saucer-shaped steel hubs are attached. The inner ends have bevel cogs facing each other. Between these—on a short loose axle, passing sufficiently far into each tube to give it the required rigidity—Starley's gear is placed,

FIG. 23.—THE CUNARD NO. 5 RACER.

on the chain pulley. In order to support the axle, it is held up in three places by ball bearings, which are knuckle-joined to short arms of the upper cross tube. Running upwards from this cross-piece there is a perpendicular socket, in which the ⌜ pin is adjustable; below it, the central tube slants forwards and downwards; at the bottom it holds the usual sliding (for adjustment) carriage or bracket, with lower

chain pulley, cranks, pedals, &c. From a point just below the cross-piece another tube runs nearly straight to the pilot wheel, and terminates in a very long socket, through which passes the head of the small wheel up to the bicycle handles, which are carried back towards the rider. Between the shoulders of the pilot forks and the bottom of the long socket there is an anti-vibrator coil spring, regulated to the weight of the rider, which reduces the jarring and jolting considerably.

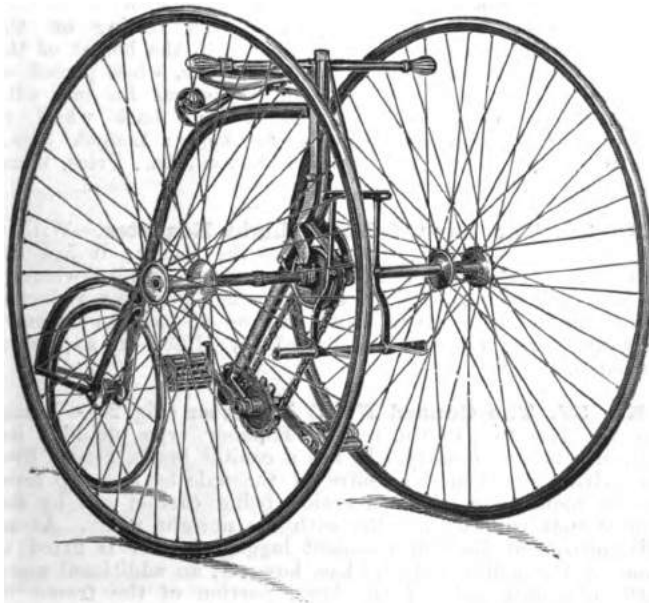


FIG. 24.—THE CUNARD NO. 2 ROADSTER.

Over-steering is a fault common to this type of machine; this is provided against in the present case by a sort of semi-circular holder for two adjustable stud buffers, fixed behind the top of the front forks. These buffers act against a ⊣ piece, which is attached to the front lower tube and regulated by a strong spring. The object is to keep the front wheel straight, a position it naturally maintains, so that there is an absence of the eccentric evolutions of the pilot straining

of the arms, which so many patrons of the "Cripper" pattern complain of. The Cunard No. 5, like the rest of its "stable companions," is a first-class machine in every way, and exceedingly light. It is finished in the usual manner, enamel and plating, and has ball bearings to all parts. Price £23.

No. 35. The Cunard No. 1 Racer.—A wonderfully light specimen of the regular Humber pattern, with the same light framing and central driving gear as the machine just described, but the upright central pillar is behind the axle and it has a light unadjustable backbone, with the end of the spring resting on a double curl resting on the "spine," or made close fitting, according to the height of the rider. We were surprised at the weight, as, when placed on the scales, they only denoted 43lb.; this was for one with 40in. wheels, geared to 60in., with a 17in. back wheel, to which the following measurements also apply: Length, 58in.; centres, 29½in.; width, 38in.; wheel tracks, 33in. Price, usual finish, balls all over, £24.

No. 36. The Cunard No. 1 Light Roadster.—With a few trifling alterations, the same as the Racer; it has the same frame, tangent wheels, &c., but includes a plan whereby the axle can be readily divided for storage purposes, reducing the width to 29in., or sufficiently narrow to pass an ordinary doorway. The weight is increased by 10lb. or so; price unchanged.

No. 37. The Cunard No. 2 Roadster (Fig. 24).—Being, like the last two, of the regular Humber type, detailed description is unnecessary. It has a capital brake, acting over the driving drum in the centre of the axle by a grasp lever on the handle bar, the connection being carried out by flat jointed rods running parallel with the upright pillar. At an extra charge of 15s., an excellent luggage carrier is fitted in front of the hollow axle; it has, however, an additional merit—the extended ends of the lower portion of the frame do duty as foot rests, quite a luxury on a Humber type machine. We found a machine to weigh 70lb. Price, uniform with the others, £24.

No. 38. The Ladies' Cunard No. 3 Roadster.—A neat and graceful sample of the central geared pilot steering class. A wire guard is put over the chain, a protection which ought to be afforded on every properly constructed tricycle intended for ladies' use. Instead of an ⌐ pin, there is an upright holder, and the plate of the saddle spring is adjustable upon it. There is also another novelty: the cross-piece

carrying the handles is attached to the saddle support, so that they all adjust together (see Fig. 25). A hinge-jointed rod connects the steering handle with the top of the pilot wheel. Brake power is applied in the manner we have so often advocated—from the left handle, by a half turn of which the brake is put "hard-on." This is accomplished as follows, but, unfortunately, is not shown in Fig. 25, though the small bevel cog at the bottom of the handle stem is; this acts on an arm of a lever which tightens the band round the central drum, and

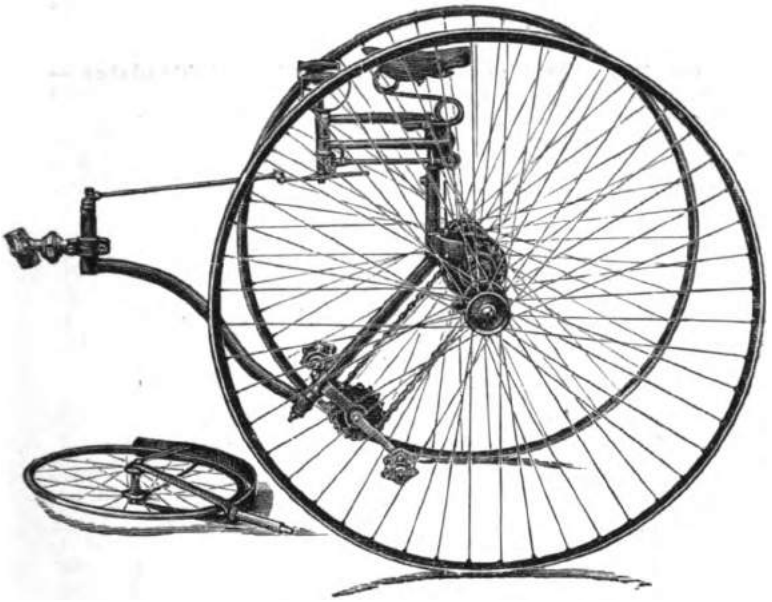


FIG. 25.—THE LADIES' CUNARD NO. 3 ROADSTER

(With pilot wheel removed, showing Tandem connecting joint).

efficiently checks speed, without either straining the hand or compelling the rider to let go one handle and grasp a lever, an entirely useless proceeding, which is productive of many accidents, especially to ladies. In yet another way the machine differs from the ordinary run of this shape. The central tube, which is joined to the axle on either side of the gear by a strong bracket, which is knuckle-jointed to the cases of the

ball bearings, terminates at the bottom; just below the lower chain wheel bracket it terminates and runs into a socket boss of the backbone of the pilot wheel, which has a socket head and good mud guard, &c. By simply undoing the knuckle-joint on the right side of the gear, the right wheel and axle can be removed, reducing it to very narrow proportions. In all general details, including tangent-spoked wheels, &c., the No. 3 is the same as the others, also in price—£24. We found a 44in. driver with 20in. steering wheel to weigh 66½lb. The general measurements are: Length, 64½in.; wheel centres, 31½in.; total width, 37½in.; wheel tracks, 31½in. The machine is one we can cordially recommend.

No. 39. The Cunard Two-Track No. 4 Roadster.—Although only a single driver, it certainly deserves mention, being one of the best of that class and more of the Coventry Rotary than what is generally understood by a "single driver." In appearance it reminds one of the old "One-Two-Three" Excelsior, all three wheels being of a different size (see Fig. 26).

FIG. 26.—THE CUNARD TWO-TRACK NO. 4 ROADSTER.

The frame is very simple, being of an L shape. The short arm is the hollow cross tube in which is fixed the axle of the left large wheel. This runs quite freely. Driving power is communicated to the axle of the smaller, or middle-sized, wheel on the right. This axle only extends partly across the

machine, and is held in ball bearings. A central leg supports the pedals, &c., and as the lower pulley is much larger than that on the axle, the smaller wheel is geared up considerably. For instance, the particular machine we examined had a loose 45in. wheel, a 38in. geared to 49in., and a 21in. pilot. One feature may be noted: instead of the wheel centres being opposite each other, and, therefore, having their wheel bases in a line, that of the driving wheel is 6in. further back. Brake power is applied by a lever on the left, and on the drum of the driving gear. To go back to the frame: The long arm of the ⌊ runs out in front, and bending slightly to the right, brings the pilot wheel directly before the driver—thus making it a perfect two-tracker. An Arab spring holds the saddle on a pillar, which, with the side handles, are adjustable. The luggage carrier, as described in the No. 2, can be, on the same terms, fitted at the back, and, in general details, the No. 4 is identical with the others. Measurements (with 45in., 38in., and 21in. wheels): Length, 66in.; centres, from axle of driver to axle of pilot, 36½in.; extreme width, 31in.; wheel tracks, 26in. Price, all complete, £24; weight, about 70lb.

No. 40. The Cunard Tandem Roadster.—No objection here to the "proximity of the riders," as is commonly urged against ordinary Tandems, as this is made up of two ordinary machines, so that the space from saddle to saddle is about *four feet*, varying a few inches, according to the size and make of the machines employed. Those which form the Cunard Tandem are a No. 3 and a No. 1. Therefore, we need only describe the actual "connections." It really consists of only a small universal joint, having a split ring or short tube on either side of it. The central portion—the ball and socket joint—permits of universal action, and the front is clasped round the lower part of the backbone of a Humber; the pilot wheel of the rear machine is removed, and the other half of the joint is locked round the socket head (see Fig. 27). This operation is easy, as thumbscrews are provided for the purpose of securing the split holders. By this simple operation a first-class tandem is readily formed. Steering remains with the front rider, and the "annexed" machine at the back follows whatever course is taken, in fact, its presence is scarcely felt, so accurately does it steer, or rather, is steered. To show the universal nature of the joint, one machine was laid on its side without disturbing the equilibrium of the other in the slightest, and either machine may be lifted without moving the other.

Provision is made for carrying the detached small wheel of the rear machine in front of the Humber. An upset is highly improbable, and the five-wheeler forms about as safe

a vehicle as could be wanted. Of course, the backbone, and small wheel to which it is attached, must be fairly strong, but there is not so much strain as would at first appear. It is improvements such as this, which separate the riders instead of huddling them up together, that will make the Tandem not only a greater success but more popular. Of course, the Cunard Tandem is only meant for road, not path

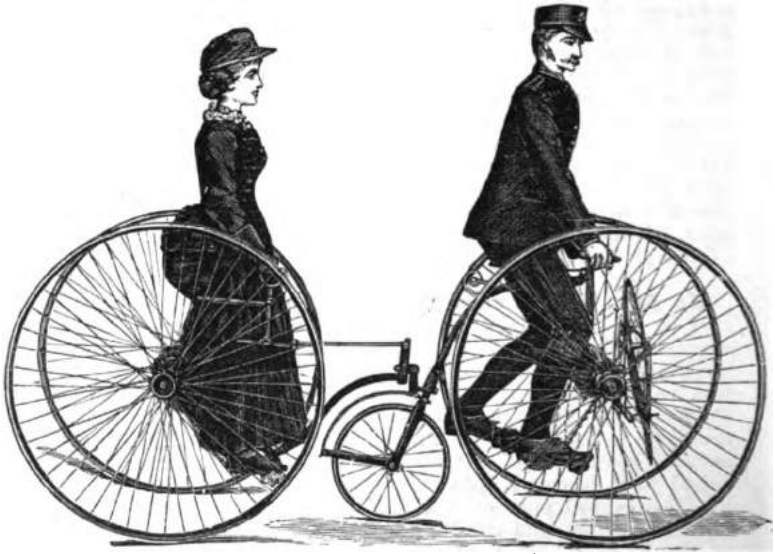


FIG. 27.—THE CUNARD TANDEM ROADSTER.

work, although it might be used for the latter if desired. The price of the connection alone, which will be found a handy and useful adjunct to a cycling outfit, is £2 10s.; or included with the two perfect machines (balls, &c., all parts), £48. The connecting portion can be adapted to some other types of machines at a slight extra cost.

No. 41. The Coventry Cycle Chair Roadster (Messrs. Starley and Sutton).—A glance at the illustration (Fig. 28) will show the design of this machine. The framework of the cycle is the combination of a central gear front steerer and a Rover, the position of the driver being as in the latter. From the axle sleeve, between the large wheels, a stout long tube

slants downwards, runs forwards horizontally, and, as in an ordinary central framed front steerer, arches up over the front wheel. On the part which slants down there is a strong boss, supporting, on a short pillar, an elliptical spring placed crosswise; this is, by a light frame, attached to the bottom of the chair. On the lower—horizontal—part of the tube there is another similar spring.

For extra heavy "passengers" these springs can be duplicated, as shown in the illustration; on these the chair, which

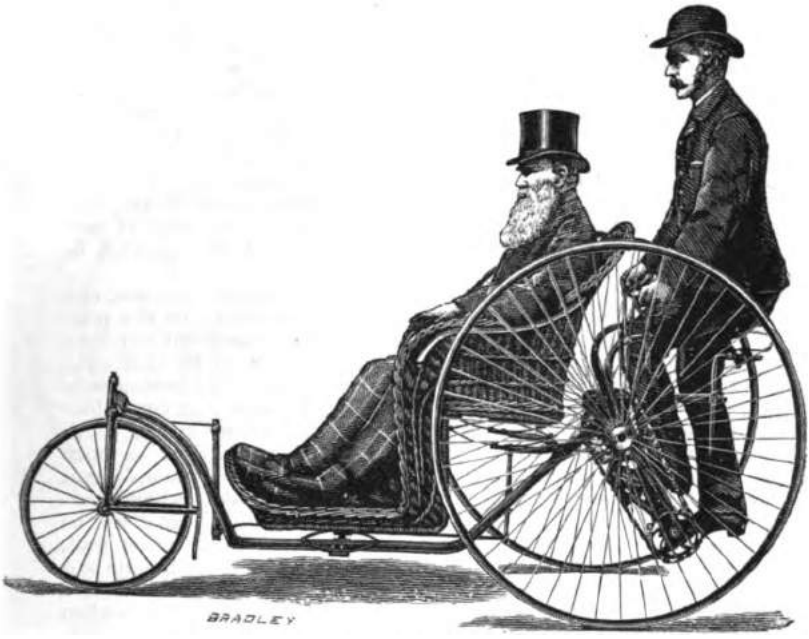


FIG. 28.—THE COVENTRY CYCLE CHAIR ROADSTER.

is of wicker work, nicely upholstered and well made, rides so easily that even the most querulous patient is sure to be pleased at the comfort of the seat. Another advantage is that it is so open at the sides that there is no trouble in getting in or out. The steering is carried out by a combination of rods from the right (spade shaped) handle, which acts by the usual pinion and rack. The latter is supported by an arm running out on the boss of the slanting tube, and continues at the side of

and below the chair to the front; then it, by means of a short pillar, with arms top and bottom, communicates with the stud on the top of the pilot wheel fork.

Perfect control is maintained over the steering, and the driver, occupying a considerably higher seat, can see over or round the passenger. Double driving gear of the noted Salvo type is employed on the left side, and distributes the power equally between the rear wheels. Side tubes run down backwards from each side—as in the Rover—and at the bottom carry the crank shaft. On the left extremity of this is placed the chain pulley, which, being smaller than that on the gear box, gears down the wheels, instead of increasing them, as in most tricycles. By these means the power is augmented but speed decreased, as more than one revolution of the pedals have to be made to produce a complete turn of the wheels, or, in other words, they (46in. actually) become nominally only 40in. But patrons of these vehicles are not likely to desire champion speed, or to demand Adams-like distances to be covered by their propellers in a day's work. On the other hand, however, they are vastly superior both in the rate of travelling and ease of propulsion to the ordinary old "chair"—indeed, they cannot be for a moment compared.

With such a machine safety is naturally a *sine qua non*, and is secured first by the very steady steering—owing to the pilot wheel being such a long way out in front—and by the very powerful band brake, applied by a long lever on the left side, to the drum or box holding the driving gear. The central tube is continued out at the back, and the end forms a socket holder for the Γ pin, easily adjusted at the back by a set screw, which carries the spring and saddle. The driver has thus an open back, rendering mounting or getting off exceedingly simple, and if a down grade is too steep to trust to the brake—which, however, will "hold" the machine nearly anywhere, and can be locked at full power—he can dismount and check it on foot, or push or pull it up hill. For the latter a front handle can be added, in order to drag the load up inclines. The whole is built in the best style of the firm, and ought to—when prejudice is broken down—become very popular. We should have said that the driver has a comfortable foot-rest.

Ball bearings are fitted to all three wheels, or rather, to the pilot and the axle of the rear wheels, but they should also be included to the crank shaft and pedals (£2 10s. extra), when the ease of running will be still further increased. It is finished, enamelled, and may be thoroughly relied on in every way. With 40in. and 22in. wheels it naturally—owing to the long body—takes up a lot of room, the total length being 98in., between wheel centres, 64in.; total width, 47½in., wheel tracks, 34in. Price £30, or with balls to all parts,

£32 10s. Not having yet seen one on the scales we cannot quote the weight.

No. 42. The Despatch Carrier Roadster.—A handy form of carrier has been adopted in this machine, as will be

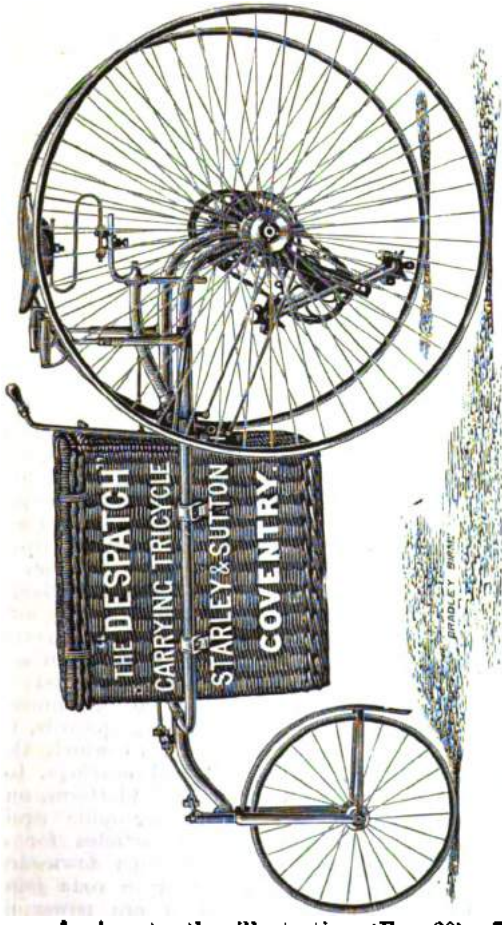


FIG. 29.—THE DESPATCH CARRIER ROADSTER.

seen on referring to the illustration (Fig. 29). The frame is oblong in shape. Two tubes run parallel, some 20in. apart,

from each side wheel to the front wheel; then bend round and join a short single tube running down from the centre to the pilot wheel, to which it is attached by the usual Stanley head. The side tubes are joined by a stout cross piece, and between these the basket, or chosen receptacle, is hung by straps. The one usually supplied measures, outside, about 27in. by 19in. by 19in.; but, of course, the size can be regulated according to any special requirements. It is in a convenient position, easily reached from the saddle, whilst it does not obstruct the view for steering purposes; the guiding is managed by a light rod running parallel with the right frame tubes. From the centre of the cross piece a bracket tube runs upward to the rear to support the ⌜ pin, spring, saddle, &c. Of course, the handles are adjustable.

There is one drawback which must be noted: as at present constructed, the machine is only a single driver of the old Meteor type, the left wheel running free; this can be removed, reducing the machine to about 32in. The brake when "hard on" can be retained in that position by a spring. The wheel is generally geared down; with 40in. and 20in. wheels, the length is 91in.; wheel centres, 61in.; width, 40in., reducible to 32in.; wheel tracks, 31in. Price £20.

No. 43. The Centaur Front Steering Tandem Roadster (Centaur Cycle Company).—To commence with, this machine has one very notable point, the greatly increased distance between the saddles, giving the riders more room and preventing the usual objectionable appearance. This boon alone would be sufficient to recommend the machine to a large circle of riders and would-be riders, had it no other attractive features. A glance at Fig. 30 will show that the machine has a box frame, is larger and longer than usual, and is composed of tubes forming an oblong loop with square front, from the centre of which rises the backbone of the pilot wheel, which is steered by an arm high up on the right fork, and the usual connecting rod; if this were carried below the frame it would be an immense and easily accomplished improvement. Running upwards, the side tubes bend horizontally over the axle, to which they are attached by short tubular arms and ball bearings, to some distance behind it, forming a large level platform, on which there is ample room to carry a photographic equipment, luggage, or a large paraphernalia of articles for an extended tour. At the back the tubes slope downwards and terminate with small rollers. Strong brace rods join front and back tubes, and at the top there are powerful cross tubes; from the centre of the back one of these, a bent arm, with a socket ring and adjusting screw, carries the ⌜ pin

of the rear rider. Steering is either double or alternative; brake power is applied by a lever on the left; all four handles are adjustable and very firm. The rear rider's seat is perfectly open at the back, and he can step on or off without stopping, and the front rider is further forward, being almost in a line with the front of the driving wheels, so that mounting or dismounting is greatly facilitated, and would be improved if the suggested alteration of the steering rod was carried out. As

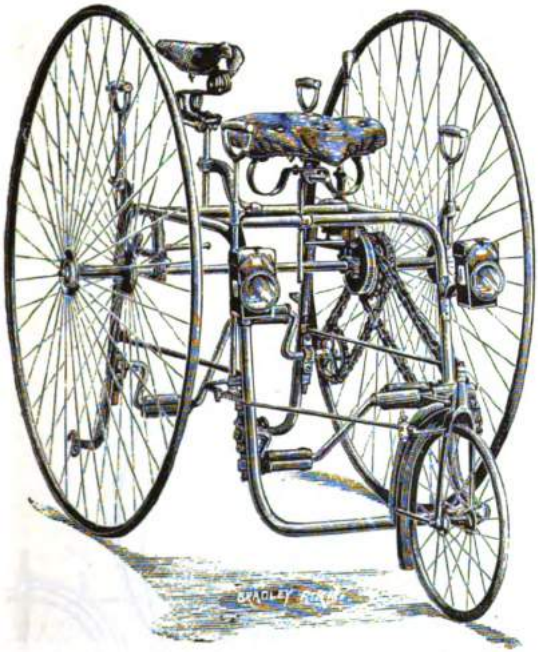


FIG. 30.—THE CENTAUR FRONT STEERING TANDEM ROADSTER.

there is about 6in. range in the position of the saddles horizontally, they should be adjusted according to the weight of the riders, so that the machine is nicely balanced, and nearly all the weight thrown on the large wheels. Attention to this important point will make a marvellous difference in the ease of running, and, consequently, the speed. Owing to the space between the riders, any description of cranks can be used, either clutch

action, quarter section, or "right and left," a choice which is quite unobtainable with an ordinary Tandem, owing to the clashing of the pedals, unless set at one uniform beat. As regards the conversion into a single machine, the whole back portion is easily removed, leaving the front part intact. Starley's double driving gear is used on the left side. Although strength and rigidity are very prominent, the weight is by no means excessive, while the speed is undoubted (a mile has been ridden in 3min. 6sec.), but it is designed as a reliable roadster rather than a racer. It is made in the best style, and can be thoroughly depended on. To suit those with whom easy stowage is a *sine qua non*, an arrangement is provided whereby the axle can be divided and the width reduced 7in. or 8in. This, however, costs 10s. extra. The finish is that usual in high-class cycles—enamelled and part plated. Ball bearings are put to all parts, pilot wheel, axle, both crank shafts, and all pedals. From a machine with 48in. and 18in. wheels, the following measurements were taken: Length, 78in.; centres, 45in.; width, 42in. (divided 34in.); wheel tracks, 35in.; distance between saddle centres, 30in., up to 34in. or even 36in., according to adjustment. Price, inclusive, £31 10s.; or with the "dividing" arrangement, to reduce width, £32.

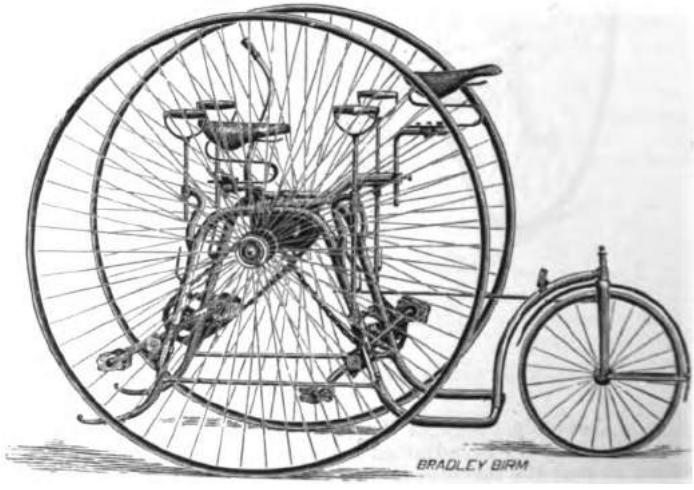


FIG. 31.—THE REVERSIBLE CENTAUR TANDEM ROADSTER.

No. 44. The Reversible Centaur Tandem Roadster.—A new pattern for the current year. In general details it

is like the machine we have just described, only it is "turned round," so that as a tandem (see Fig. 31) it is a rear-steerer, and as a single (see Fig. 32) it is a front-steerer. The double tails on the single machine are extra strong, and to them the second pair of cranks and shaft are attached, together with the second Γ pin, &c. Steering is carried out by the rear rider, who sits much higher than his companion, in order to get a clear view ahead. When the superfluous parts are

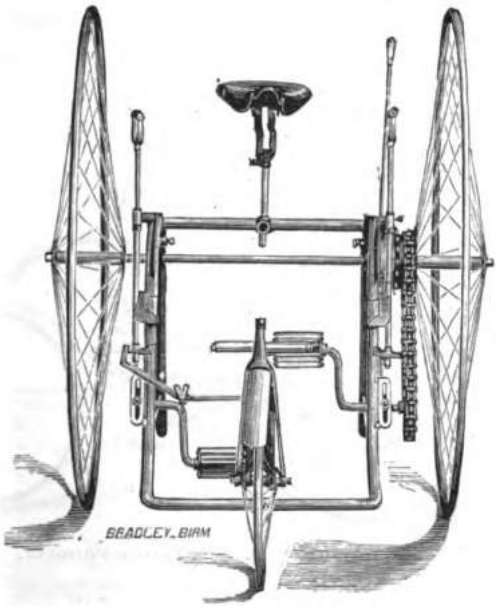


FIG. 32.—THE REVERSIBLE CENTAUR TANDEM ROADSTER (converted into a Single).

removed, the remaining Γ pin is, with the saddle, reversed. Only four nuts have to be removed to free the detachable portions. It can also be used as a rear-steering single. Like the front-steerer, there is a good space between the saddles; it has also most of the good points of that machine. It is, however, lighter and cheaper. Finished and fitted the same way, including ball pedals, the price is £29 10s., or, with dividing axle, £30.

No. 45. The Ladies' Centaur Tandem Roadster.—With very few exceptions, tandems have only one seat available for a lady—generally the front. In this, however, either is equally suitable, and the machine may be used by two ladies, or, of course, the couple may be made up in any way. The machine is really a variation of the Combination (fully described in "Tricycles of the Year," first series, pages 63-65), combined with the Reversible and front-steerer (see Fig. 33). It will be seen that the frame at the back is carried out horizontally, and that from it a pillar runs upwards. The backbone, or rather holder, of the back wheel runs through the top of this, and extending forwards, offers

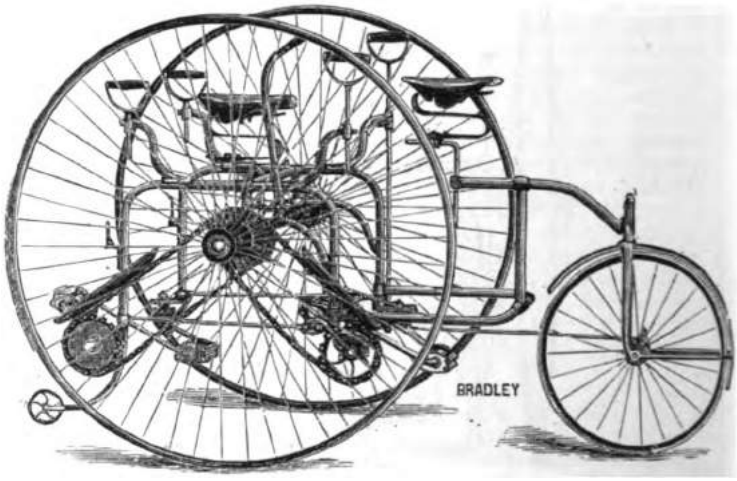


FIG. 33.—THE LADIES' CENTAUR TANDEM ROADSTER.

a support to the ⌐ pin of the rear saddle. Steering is applied in this machine as it ought to be in both the other types—*below the frame*. Guards are put over the chains, and, considered in its entirety, the machine is one we can strongly recommend as possessing many advantages of especial value where a lady is to form one of the riders. It will be remembered from our former description that this machine can be quickly changed from a (1) tandem into a (2) single, (3) carrier, with large basket in front, (4) an invalid carriage by removing front pedals and substituting a foot-board, so that it can be adapted to a great variety of purposes. It is the same price, with similar details, as the

Convertible, £29 10s.; with dividing axle, £30; invalid seat, £1 15s.; carrier hamper, 15s. extra; or clutch pedals (permitting them to be used as foot rests in running down hill) can be fitted to any of the machines at 15s. additional, so that at a comparatively trifling cost one can have an assortment of machines.

No. 46. The Sparkbrook Two-Track Roadster (The Sparkbrook Manufacturing Company, Limited).—The same excellence of construction is to be found throughout the machine as in the other types—of which it more closely resembles the Central Gear, only the centre tube is merely long enough to carry the bicycle pattern cranks, pedals, &c. It is, as in the "Humber," driven from the centre, and a long front tube runs out on the right side, bringing the pilot wheel immediately before the right driver, leaving the machine quite open fronted, and making it particularly suitable to ladies, or anyone who wants a safe, light, easy-running machine. From the front of the middle tube a spring scroll turns upwards, and carries a cross-piece, which affords a comfortable foot rest. Brake power, or rather its method of application, has always been a marked feature in the Sparkbrook. It was the first to abolish the needless and awkward lever and substitute in its place a small grasp handle inside the ordinary spade handle. The same plan is now carried out, and the handle shaft is made hollow, forming a socket, through which passes the inner brake handle support; the latter communicates—by pulling up the inner handle with the fingers—with a powerful strap, which acts on a drum on the axle, so that the hand never has to be removed, the brake being always under perfect control. This arrangement also adds considerably to the attractive appearance of the machine, which is further heightened by the uniformity of having two tail tilt rods instead of the usual lop-sided arrangement of one only. Other details do not call for comment, unless to again reiterate our already expressed opinion of its merits. It is finished in the same way as the others, and the price, all complete, is £25.

No. 47. The Loop Framed Sparkbrook Roadster.—Our description of last year's machine applies, with a few exceptions, to that of this year. The 1885 machine has a much lower frame, it comes within 5in. of the ground, and a step in the right direction has been taken with the steering rod, only it does not go far enough. The rod is carried just above the frame, and, although out of the way, it might be injured by being tramped upon in mounting or dismounting; dropped a couple of inches more it would, below

the frame, be all right. As before, the crank shaft is fitted with an ingenious universal bearing which permits it to be used even when bent or damaged. This has, however, been described in detail before. Average size of driving wheels 48in., and price, balls all parts, enamelled and plated, &c., £23.

No. 48. The Central Geared Sparkbrook Roadster.—Only a few minor changes have occurred in the construction of this variety of the Sparkbrook since we last described it in "Tricycles of the Year, 1884," first series, pages 51-52. The appended illustration (see Fig. 34) is of more recent date than the one then given, and shows the improved brake—particulars can be gleaned from it without description. It

FIG. 34.—THE CENTRAL GEARED SPARKBROOK ROADSTER.

will be seen that the ends of the handle supports are fashioned into lamp brackets. Amongst minor details there is an improvement in the centres of the head, which makes it much steadier, and admits of wear being taken up. Rubbers are generallly ¼in. for light, ⅜in. for ordinary roadsters, and the pilot is nearly always 20in. Price, all complete £25.

No. 49. The Speed and Power Sparkbrook Roadster.—This might be better described as an adjunct to any of the

varieties rather than an individual type. The only difference in appearance is caused by there being two chains and four chain pulleys; between the lower there is a sliding clutch. The control and working of the gear is simple in the extreme, and there is an absence of the complex cogs and mechanism usually associated with power gears, the end being achieved by employing opposite pulleys of different sizes. Thus, for ordinary work, the 50in. wheels are driven from a larger lower pulley to a smaller upper pulley, which makes the machine equal to a 54in.; or, in other words, the pedals revolve only fifty times to fifty-four by the wheels, or, in each mile, the wheels turn 403⅛ times and the pedals only 373⅛. But when power is desired, by a slight movement with the toe the clutch is disengaged from one pulley, slid an inch or two, and engaged with the other. Now the machine is being driven from a smaller lower to an upper larger pulley, the effect being to gear down, or reduce, the 50in. wheels from their "speed" of 54in. to "power" of 40in. This reverses the relative proportions we have quoted, as now the pedals must turn fifty times to forty by the wheels, or, in a mile, 504 times against 403⅛ for a level gear, or 373⅛ for the 54in. Of course, this gearing down gives a wonderful increase in power, and hills unsurmountable with high gearing become easy with the power at work. The proportions we have quoted can be altered to order. If the clutch "halt between two opinions," or remain between the pulleys, the pedals are "free," and can be used as foot rests—of special value in the Humber type. The extra cost of fitting the gear to any of the Sparkbrook machines is £4.

No. 50. The Sparkbrook Humber Roadster. — On several previous occasions we have described and illustrated the remarkably good gear, first brought forward about three years ago, by the National Arms and Ammunition Company, Limited, the last time in "Tricycles of the Year, 1884," First Series, page 51. It was introduced in 1882, since when it has proved a great success. Until last year (1884) it was only applied to side-geared machines, but it proved more effective than ever with the central geared Sparkbrook, and has been adapted to a Humber type of machine. The double driving gear is contained, in an egg-shaped box, in the centre of the divided axle, with the upper chain pulley outside it, and spanned by a strong prong, which attaches the central pillar by ball bearings. The outline is so familiar to all who have the slightest acquaintance with tricycling that we need only refer readers to Fig. 35 for general details.

Brake power in this type of cycle is far from perfect, and

has a tendency to send the rider a "cropper" if incautiously applied. A very important improvement has been brought

FIG. 35.—THE SPARKBROOK HUMBER ROADSTER.

out with the present machine. The grasp lever, with its complex connecting rods, is entirely swept away, and in its place the brake drum is transferred to the lower chain wheel.

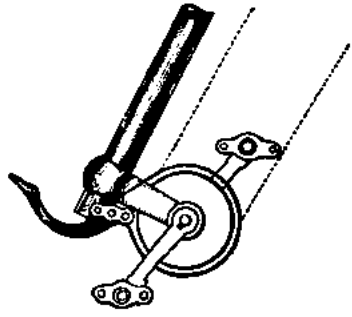


FIG. 36.—THE SPARKBROOK FOOT BRAKE.

Round the flange of this a leather-lined metal strap is made to act, and, in order to make it more effective, both ends are

secured to a short holder, which is pivoted to a pin on the bottom of the central pillar. Running out from this holder there is (see Fig. 36) a curved lever, terminating in a foot-plate. To check the speed, this is pressed down, when the strap is tightened from both ends round the drum, and the machine easily brought to a stand on any hill. Not only is the brake very powerful in action, but, being so low down, there is no fear of a cropper, or its oftentimes dangerous results, when applied, in the ordinary way, to the upper drum. It can be fitted to any Humber or central-geared machine. To those who desire to get as near perfection as possible with safety and comfort with this type of cycle, we would recommend one of these machines, fitted with the speed and power gear and double brake, both hand and foot. We need not go into other details, save to say that the Sparkbrook is a first-class machine in every way, and one of thevery best Humbers in the market. It is very light indeed, and generally has ⅞in. moulded tyres. The measurements of one with 46in. and 18in. wheels are: Length, 61½in.; centres, 31½in.; width, 39in.; wheel tracks, 31½in. Enamelled and plated, with balls to all parts, the price is £24.

No. 51. The Sparkbrook Tandem Quadricycle Roadster.—Novelties are by no means exhausted in tandems, this four-wheeler being another proof that the makers do not all sail in the same beaten track. At the first glance, the machine might be taken to be of the Humber or Club type. An examination brings to light several novel points. Perhaps the most notable of these is the front wheel; it seems rather startling to, apparently, leave it to its own sweet will, without any controlling action. Such, however, is the fact; the wheel steers automatically, on the principle of a castor. The forks slant back (see Fig. 37), and the top, or shoulders, is merely pivoted to the head at the end of the backbone, so that the wheel, instead of guiding the machine, is guided by it. The backbone carries a convenient foot rest, and terminates in a ring socket, through which passes the lower end of the central tube, to support the bracket of the lower chain pulley. The tube slants back, bending perpendicularly upwards; it is joined to a tubular frame, the ends of which are attached by ball bearings to the axle, close to the wheel hubs. On the ⅂ pin, which adjusts in the central tube, there is a sliding block, from which the handles curve out to either side, and the double bow spring rests; all these, with the saddle, adjust together. It will be seen that the front rider—the position is particularly suited to a lady—has only to work the pedals, without further responsibility, save application of a reserve front foot brake. The front half can be separated from the body of the machine

by removing the bolts attaching it to the side bearings, when it leaves a Humber pattern Sparkbrook, already fully dealt with (see Fig. 35), and only differing in the seat being rather higher, to enable its occupier to get a better view ahead. The saddle has an Arab spring, and the foot brake is generally fitted, although a hand lever is substituted if desired. One of the great points in the construction of the machine is that, instead of the weight of both riders being thrown, by the connection, on the centre of the axle, thereby causing it to sag, and bind the bearings and chain,

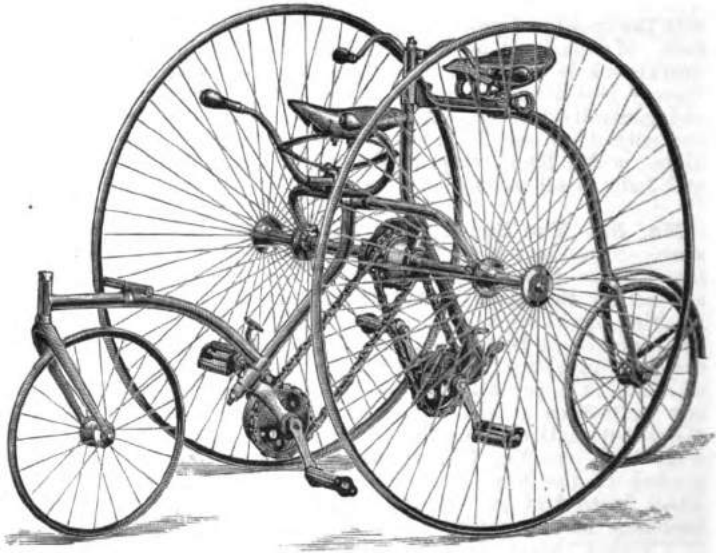


FIG. 37.—THE SPARKBROOK TANDEM QUADRICYCLE ROADSTER.

it is distributed; and, owing to the T attachment of the front portion, the chain, &c., is always in the radius of a circle, so that the machine is not strained in passing over unequal ground. Of course, the National gear, central driving, is used. We were much pleased with the machine, which will be found a first-class mount in every way—light, fast, and strong—whilst the excellence of the workmanship needs no further praise from us. The distance between the saddle centres is 22in. Price, enamelled, part plated, with two brakes, ball bearings all parts (axle four places, crank shafts

four places, four pedals, and the two small wheels), £34; plain pedals, £32. Standard size, 44in. large, and 18in. small wheels.

No. 52. The Central Gear Salvo Roadster (Starley Brothers).—Until last year the productions of this firm were limited to a couple of patterns—the first modern double driving tricycles—introduced by the late J. Starley, whose sons now carry on the business. In "Tricycles of the Year, 1884," First Series, pages 93-97, we described and illustrated the Salvo Sociable, Salvo, Osborne Salvo, and Royal Salvo. Since then several new types have been added, amongst which is the machine under notice. In more than half the machines we review we have occasion to refer to Starley's Double

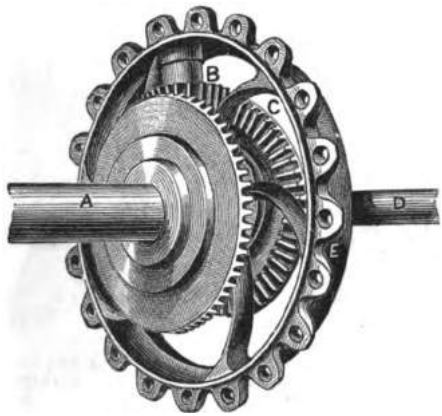


FIG. 38.—STARLEY'S DOUBLE DRIVING GEAR.

Driving Gear. No gearing has approached it in successful application or general adoption, and, for the sake of those inexperienced in such affairs, we will repeat our original description. The sketch (Fig. 38) shows the gear as fitted to the *left* side of a machine. The axle, which extends from side to side of the machine, is shown by D. To the further end of this the right driving wheel is fixed firmly, as is the bevel cog (C); the left is loose, and free to revolve on it, but is attached to the other bevel cog (A), which forms part of the hub. Between these there is a crown pinion (B), the shape of which may be better understood if described as a conical-shaped cog. This revolves on a short centre,

extending from the inner side of the chain pulley (E). It is more clearly shown in Fig. 39, which also shows the skeleton pulley wheel. The crown pinion (B) gears equally into the teeth of A and C, but is also free to revolve on its axis. By a little thought, even the most unmechanical mind can grasp the simple details of this mechanism. When power is applied to the chain pulley, and the resistance offered to the wheels is the same, as when riding straight ahead, B retains its position in A and C, and all work together as if both wheels and the chain pulley were fixed to a common axle; but, in turning the least to either side, the outer wheel and pinion has to travel further, and, consequently, runs round the crown pinion. Perfect freedom of action in the wheels is thus secured by the gear, which might be more correctly termed a *power distributor* than a double driving gear. When the machine

FIG. 39.—INTERIOR OF STARLEY'S GEAR, ONE BEVELLED WHEEL REMOVED.

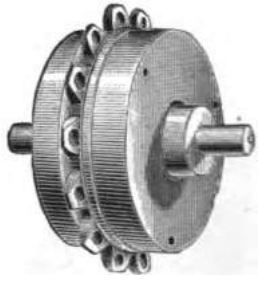


FIG 40.—DRUM INCLOSING STARLEY'S GEAR.

is suspended, the wheels can be spun in different directions, or either held while the pedals are worked. Of course, back pedalling can be applied the same as forward. The whole is inclosed in a box or drum (see Fig. 40), part of which is the flange (E, in Fig. 38) of the chain pulley; on this the strap brake acts.

This description, however, mainly applies to side-geared machines. A slightly different plan is adopted for central-geared machines like the present, and the application also varies according to the idea of the maker. Here there is a continuous solid axle, over which there is a sleeve, or outer case tube; this is divided in the centre. To the outer ends the wheels are attached, to the inner the bevelled wheels. Between these is the chain pulley with its crown pinion (see Fig. 41), as in the other type. The wheels are, therefore,

driven by the sleeves, not by the axle. A box or drum incloses the gearing (see Fig. 40), and is attached to the chain pulley; on the flange of this the strap brake acts, and, by checking the pulley, of course stops the driving power. The plan of using a continuous inner axle adds immensely to the strength and rigidity, although it slightly increases the weight of the machine. By fully describing this gearing now we need not again refer to it at length.

FIG. 41.—THE CENTRAL GEAR SALVO ROADSTER.

An exceptionally neat pattern of frame has been chosen (see Fig. 41). The central tube is without sudden bends, curving gracefully from the head of the pilot, which is a good way out, downwards and then upwards to above the axle, where it is joined by a T piece to the cross tube, which supports the handles, and is joined to the axle sleeves by ball bearings, knuckle-jointed to short arms. From behind the cross-piece a tubular central tail runs down to prevent

back tipping. Brake power is applied by a lever on the left, and is as powerful as of old. General details, including Arab spring, Starley's detachable adjustable bicycle cranks. The whole machine is japanned or painted. Ball bearings are put to all parts, including pedals; bright parts, plated, and *in toto* the Central Gear Salvo ranks amongst the very best tricycles of the day. As a thorough roadster it generally has $1\frac{3}{16}$in. tyres; 46in. geared level is the standard for wheels, but this is regulated to order. Measurements of a machine with 46in. driving and 16in., the standard-sized wheels: Length, 67in.; centres, 36in.; width, 38in.; wheel tracks, 31in. Price £24.

No. 53. The Invalid Salvo Roadster.—This machine is intended for invalids, or rather those whose lower limbs are weak or defective, but who still retain strength and energy in their arms. Too often machines designed for this purpose are but sorry affairs; but in the present case we have a machine equal in constructive detail to any of the rest of the group of Salvos. Of course, considerable alteration in design is necessary, and it may be described as an open fronted, rear steering double driver. Starley's double driving gear is put on the left side of the axle, and is protected by a guard. Below the axle there is a cranked shaft, having on the left end a smaller cog wheel than that on the gear box (otherwise termed "chain pulley"), the effect being to gear down the machine. Behind, and above the axle, there is a small cross-piece, on which long levers pivot; these extend downwards with a curve, and are joined to the cranked shaft by link rods; and as they measure, from the fulcrum (or cross piece) to link, 8¼in., and to the grasp handles, 21in., the great power applied, with little effort, can be readily understood. The handles, although generally fixed, can be made adjustable—a great improvement; the right one is free to turn, and, by a rack and pinion arrangement (see Fig. 42), is attached to a swinging quadrant below the seat, from thence operating upon the back wheel. Full control is had over the guiding, without any wriggling of the body, at all times.

Flat side legs support a very comfortable foot board in front; below it two rods, with small castor wheels, curve outwards, and prevent it from tipping forwards (see Fig. 42). They are in every case fitted, and are useful when mounting the machine. A straight backbone runs out to the steering wheel, and the seat, which is instantly adjustable, has a very strong padded back. The latter is, of course, important, as it has considerable strain to bear. A good "propeller"—we can scarce term the user of this machine a "rider"—will use both the out and home strokes of the levers. We have already

said that the wheels are geared down. Users of this type of cycle are not likely to rush through the country at racing speed, nor are they likely to have the strength, even if they had the inclination. Exercise for those deprived of the use of their legs is a great consideration; therefore ease of propulsion must be secured. This is accomplished by gearing down the 42in. nominal wheels to 36in., therefore the power applied to the

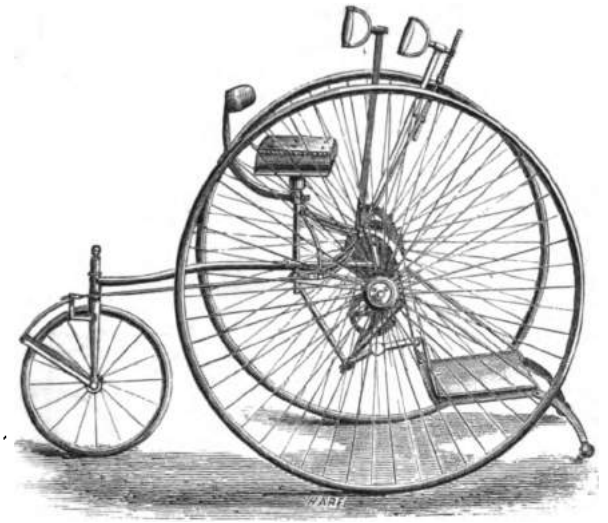


FIG. 42.—THE INVALID SALVO ROADSTER.

wheels is greater than that generated—as 42in. is to 36in.—consequently progressive action is imparted with great ease, and the invalid can, instead of being doomed to be dragged about in a Bath chair, cover ten, fifteen, twenty, or more miles by his own exertions, a change which would soon make a wonderful difference in his health, and repay the cost of the machine many times over. Sufficient brake power can be created by checking the swing of the levers, without any special provision for that purpose. The price is £21, painted, part plated, &c.

No. 54. The Convertible Tandem Salvo Roadster.—A recent introduction, which has been lately altered. It is an open fronted, central geared rear steerer. The outline can be seen by referring to Fig. 43. The machine has a long

straight backbone, of a T-shape; the cross-piece and short parallel tubes form the frame which carries the adjustable handles. In the centre, at the end of the backbone, it is joined to a central tubular pillar, which slants backwards. This is attached to the axle-sleeve, by a double-armed bracket; from the bottom, where the lower chain pulley, bicycle cranks, pedals, &c., are supported, a brace rod runs to near the Stanley head of the rear wheel, which has the effect of bracing up the machine greatly. The T pin of the back saddle passes through the backbone, which is strengthened by a boss encircling it. Coming to the front or detaching part, we find a very simple arrangement. This is a similar pillar to the back, but slanting for-

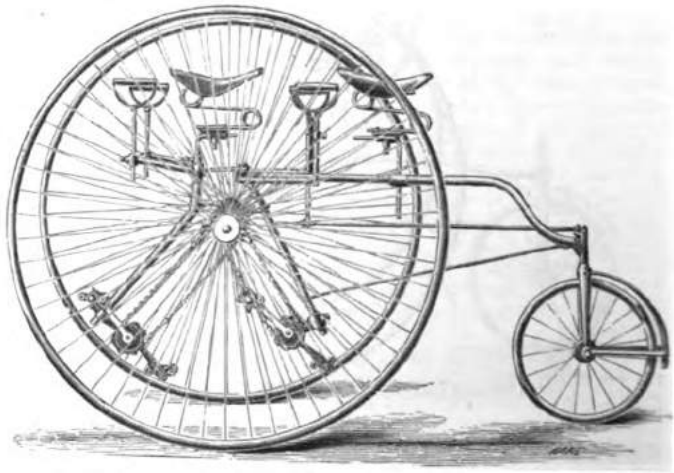


FIG. 43.—CONVERTIBLE TANDEM SALVO ROADSTER.

wards, has the same pedals, &c., and is joined in the same way to the axle sleeve. From this point it is perpendicular, and the top is connected with the head of the rear pillar by a link, to prevent them springing apart. This part of the front pillar also serves as a socket for the ⊢ pin, and has a ⊐ frame for the handles. By simply disconnecting it at the sleeve bearings and link, and severing the chain, the whole front part lifts away, leaving a machine something of the Rover type. In driving action it resembles the Central Gear Salvo, and will be found a first-class machine in every way. A lever brake is provided, and steering is performed by the rear rider. The general size is 46in. driving and 20in. steering wheels. With

roller bearings to axle sleeve, balls to steering wheel and crank shafts, painted, part plated, &c., £28 10s.; with ball pedals, £30 10s.

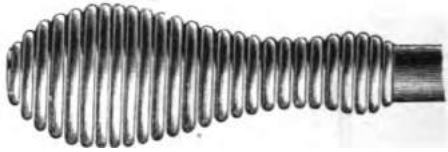
No. 55. The Grosvenor No. 1 Roadster (Hart, Son, Peard, and Co.).—So many changes have been made since we described this in "Tricycles of the Year," Second Series, 1884, pages 86-88, that it is practically a new machine. It will be remembered that it was originally like the Coventry Rotary in shape. The two-track form has been kept up, but, instead of the side wheels being the same height, they are

FIG. 44.—GROSVENOR NO. 1 ROADSTER.

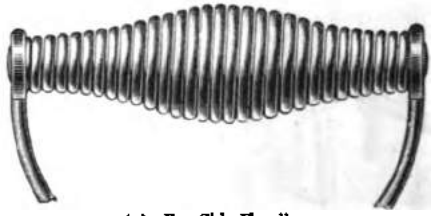
now of different sizes, or what is known as the "One, two, three" style (see Fig. 44). The general sizes are 46in., 23in., 19in., or 44in., 22in., 18in. Central gear (it was "side" last year) is used, with a wide guard over the chain. The axle of the large, or driving wheel, on the left, instead of being placed inside the cross tube, now passes below it, where it works in ball bearings.

The secret system of steering is still carried out. On the right tube there are two balls; one of these, below the steering handles, contains bevel cog wheels, communicating, by a rod, with other cogs within the ball above the pilot wheel. Steering is thus performed silently, and without exposing any of the working parts to the dust. A spring foot rest has also been provided, which closes up to the tube when not in use.

A good lever band brake is applied from the left side, and a curious form of coiled spring handle is fitted to all machines.



(A)—For Bicycle-shaped Handles.



(B)—For Side Handles.

FIG. 45.—THE GROSVENOR SPRING GRIP HANDLES.

Their construction can be understood by referring to Fig. 45 (A and B). They are very comfortable to grasp, and prevent a good deal of the vibration being transmitted to the arm, and can be purchased separately at 5s. per pair. The machine, although only a single driver, is a first-class one. Those who desire can have a clutch action fitted, whereby, on pulling up a small lever, the pedals are freed for running down hill, &c. The measurements of one with 44in., 22in., and 18in. wheels are: Length, 68½in.; centres (of small wheels), 37½in.; wheel tracks, 24½in.; width, 29in. Enamelled, with bright parts plated, price £20; with clutch action, £22.

No. 56. The Grosvenor Convertible Sociable Roadster.—With the exception of the changes in the single, except side gear, which is retained, it is the same as last year, and is

FIG. 46.—THE GROSVENOR CONVERTIBLE SOCIABLE ROADSTER (Single Form).

FIG. 47.—THE GROSVENOR CONVERTIBLE SOCIABLE ROADSTER (Detaching Half).

still remarkable for the fact that it can be converted into a single by undoing one nut, which frees the right half of the machine (see Figs. 46 and 47). It has independent driving, and, finished like the single, the price is £32, or clutch action for both riders, £36. Measurements, same size as foregoing: length, 68½in.; centres, 37½in.; width, 56in.; wheel tracks, 49½in.

No. 57. The Grosvenor Carrier Roadster.—A No. 2, but provision is made at the back for carrying a large and very deep light basket (length (really depth), 31in.; breadth, 21½in.; depth—front to back—13in.). It has a lock to the front, and will hold a large quantity of goods. A safety tail is put below the basket, and altogether it will be found a very useful vehicle. It has plain bearings, and the price is £17 10s. Details of measurement are same as already given.

No. 58. The Centra Caroche Roadster (Caroche Cycle Company).—Of Humber form, this machine has Starley's gear on the left side, with the chain pulley and brake drum in the centre of the axle; in fact, a detailed description is not necessary, as it tallies with its prototype in most particulars. Bown's ball bearings are used throughout, and, by knuckle joints, attach the axle sleeve to the prong of the central pillar. The cowhorn-shaped handle bar is solid, and has a powerful lever brake. Slackness of the chain is easily taken up, only one nut having to be dealt with to carry out the operation. Choice may be had between an ordinary spring with a double shackle to the tail, or an Arab, to carry the Long Distance saddle. The machine is well made, and will prove a useful addition to this well-known firm's output. The standard size has 46in. and 18in. wheels, with ¾in. rubbers, from which the following measurements were taken: Length, 63in.; centres, 31in.; width, 41in.; wheel tracks, 33½in. Net price, all complete, balls everywhere, enamelled, part plated, &c., £21 12s. 6d. Weight of a strong roadster, 75lb.

No. 59. The Caroche Convertible Tandem Quadricycle Roadster.—Another recent addition to the catalogue, and an outcome of the union of the machine just described, the Centra, and their older variety, the loop-framed Caroche (see Fig. 48). At the time of our inspection, only the Centra portion of the machine was made removable, but it was the intention of the makers to alter it, so that it should be a double convertible—*i.e.*, either the front or rear half to be detachable. We do not know if this has yet been carried out, and we will, therefore, deal with it as we found it. At the back, the Humber pillar is joined to the axle by a swinging or hinge joint, which obviates any strain on the machine when passing over uneven ground; it also takes

away steering power from the rear rider, and places the guiding in the hands of the rider in front, the back portion merely following in the wake of the loop frame. Of the latter, little need be said; it is practically the same as described on pages 71-2, "Tricycles of the Year, 1884," Second Series, but high steering is retained. We believe, however, the makers intend to lower this to its proper place, below the frame, and will certainly do so to order. To secure extra steadiness, the pilot has been extended somewhat to the front. Either rider can apply the brake—a lever on the left side. When the "Centra" is removed, a tail can be fitted at the back to prevent tipping. As a

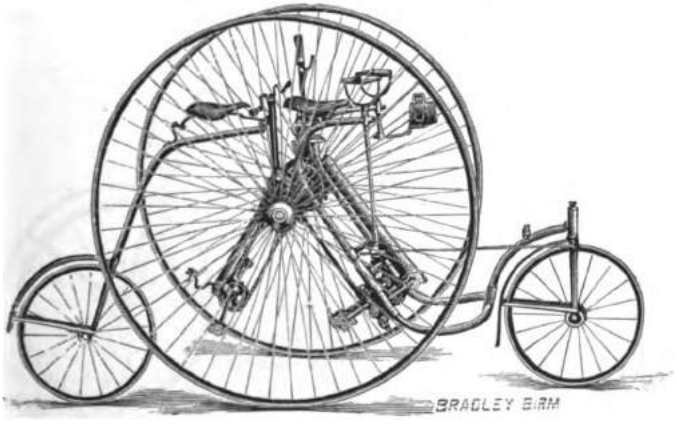


FIG. 48.—THE CAROCHE CONVERTIBLE TANDEM QUADRICYCLE ROADSTER.

whole, the Caroche makes a first-class Tandem. The most generally adopted size has 44in. driving wheels, geared up to 48in.; enamelled, part plated, and with ball bearings to all parts, it costs £31 10s.

No. 60. The Globe Harrier No. 1 Roadster (Messrs. J. and H. Brookes).—Amongst the more recent introductions of this firm is the "Harrier No. 1," which, as will be seen from Fig. 49, is of the prevailing Humber type, and therefore does not need a prolonged review, save to state that it has Starley's gear on the right side, Morgan's roller chain, moulded lever, straight handle bar, lever brake, &c. The tail of the spring rests on a hinged shackle. Other

details as per ordinary. If desired, a combined luggage and foot rest can be added for £1 extra over quoted price, which is, with balls to all parts, enamelled and part plated, £22. A machine with 43½in. driving and 18in. back wheel we found to measure:—Length, 62½in.; centres, 31½in.; width, 37½in.; wheel tracks, 31¼in.

No. 61. The Globe Harrier No. 2 Roadster.—The only difference between this machine and the one just described

FIG. 49.—THE GLOBE HARRIER NO. 1 ROADSTER.

is the substitution of Edge's patent foot brake—elsewhere described and illustrated—for the usual finger lever. It is applied to the lower chain wheel, by pressing down a lever, which takes the place of the usual step. Price £22; with luggage carrier, £23.

No. 62. The Globe Harrier No. 3 Roadster.—Very good value is offered in this machine, the reduction in price being possible owing to plain bearings being put to all parts, except the attachment to axle, where balls are retained. The machine is thoroughly well made. Price only £16 16s.

No. 63. The Globe No. 2 Roadster.—A very good loop-framed, double driving front steerer. The pilot wheel is carried out a considerable distance in front, and made much larger—24in.—than usual. The steering rod is long, and is to be found in its proper place, *below the frame* (see Fig. 50), where it is held by a bracket to give the required steadiness, and is connected with a cranked arm running down from the pilot wheel axle. A capital foot rest is provided in front, and the position of the rider is vertical. The side frame tubes are carried above the axle, and bend forward to support the handles. An improvement is to be found in the brake,

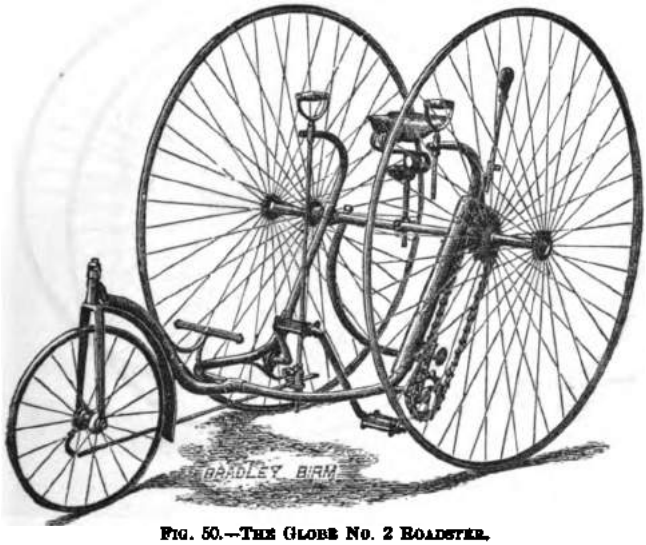


FIG. 50.—THE GLOBE NO. 2 ROADSTER.

termed the Duplex; a separate short lever is attached to each end of the brake strap, and, on applying power, from the left handle, they draw the ends of the strap together, thereby compressing it round the whole drum, instead of only a portion thereof. Solid rims, moulded tyres, and very broad hubs are put to the wheels. Starley's gear and Morgan's roller chain are also used, a guard over the latter. By putting an Universal joint to the ends of the crank shaft it works freer, and is less liable to damage by accident. The machine is to be highly commended for safety, convenience, and adaptability for touring work. With 48in. driving wheels

and a 24in. pilot, the total length is 73½in.; centres, 47½in. (which measurement shows that the pilot is an extra distance in front); width, 39½in., or wheel tracks, 32in. Price, enamelled, part plated, balls all over, £22 10s.

No. 64. The Globe Leni No. 1 Roadster.—The design of this machine is somewhat like Mr. Leni's other invention, the Rover, only adapted for ladies' use. The general "scheme" can be seen by referring to Fig. 51. The frame is a reversed "loop," *i.e.*, the body of the frame is behind

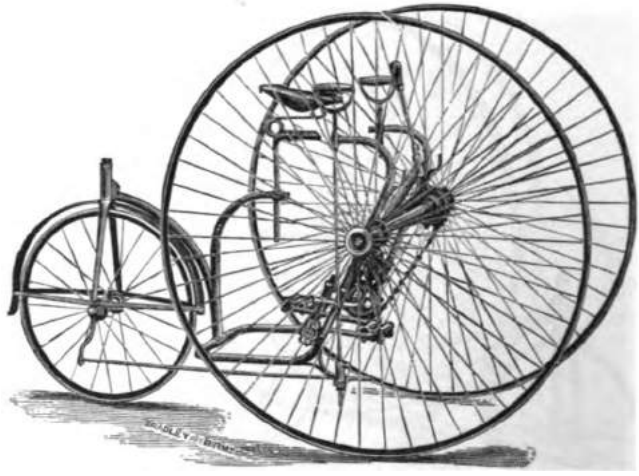


FIG. 51.—THE GLOBE LENI NO. 1 ROADSTER.

instead of before the axle; it is formed by the side tubes, which turn over at the top to support the handles, and, running down almost perpendicularly, support the ball-bearing cases, which carry the ends of the crank shaft, and, continuing lower, bend back horizontally, making a level platform at the bottom, which may be stood upon if the rider wishes to make the machine extra steady when descending a very steep incline. From this position he (or she) still has full command of the steering and brake. An extra large back wheel is fitted, 24in. being the height; this easily accounts for the steady running of the Leni.

A broad mud guard more than half encircles this wheel, and effectually protects the rider. From the rear centre

of the platform a tubular pillar runs upwards; this divides, one portion curving backwards to the head of the trailing wheel, the other forwards, to support the ſ pin, which is topped by an Arab spring and Brooks' saddle. On the left side of the machine, Starley's double driving gear is fitted, and a long lever brake. As might be naturally expected in a scientifically constructed machine, the steering rod is carried *below* the frame; the rider can, therefore, get off at either side, or directly backwards. The machine is a thoroughly reliable roadster. Either the frame,

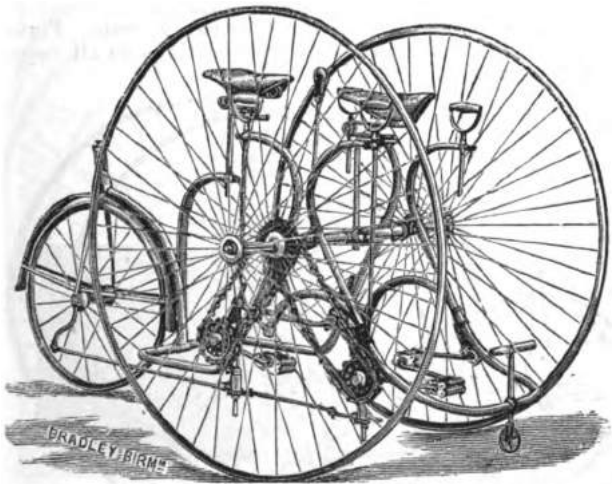


Fig. 52.—The Globe Leni Convertible Tandem Roadster.

as already mentioned, or the axle sleeve—*à la* Rover—may be used as a foot rest. We took the following measurements from a machine with 48in. driving and 24in. steering wheels: Length (overall) 75½in.; wheel centres, 39½in.; width (overall), 38½in.; wheel tracks, 31½in. Price (inclusive, balls everywhere), £22 10s.

No. 65. The Globe Leni Convertible Tandem Roadster.—By the addition of some framework in front, the machine we have just described is converted into a capital tandem, without adding another wheel (see Fig. 52). The chief part of the addition consists of a loop frame, the sides of which form two C's. These are attached to the axle sleeve opposite

the similar tubes of the rear portion. Lower down, bracket tubes arch back, and fit into socket receivers on the rear frame, binding the front and rear portions firmly together. To prevent possible accidents from tipping, a tiny wheel is put under the frame in front, and above, a convenient T foot rest is provided. An improvement in the steering enables either or both riders to control the movements of the machine. The second ⌐ pin is held by a boss in the centre of the axle sleeve, and the saddle is lower than the one at the back. The Leni is one of the (unfortunately) few tandems suitable to two ladies, or in which a lady can occupy *either* seat. No further details are necessary, save to state that the conversion from single to double, or *vice versâ*, is easily made. Finished enamelled, and part plated, with ball bearings to all required parts, price £30 5*s*.

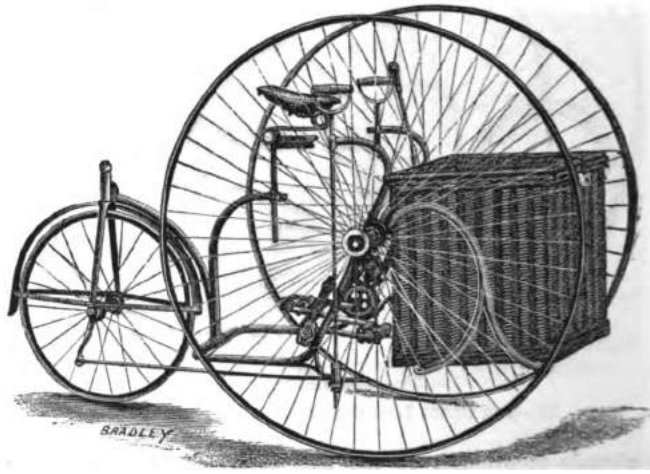


FIG. 53.—THE GLOBE LENI CONVERTIBLE LUGGAGE CARRIER ROADSTER.

No. 66. The Globe Leni Convertible Carrier Roadster.—Another adaptation of the Leni, to which is added a framing, which will carry either a seat for a child, or a basket (see Fig. 53) for parcel delivery purposes. Only £2 more is charged than for the single, or 10*s*. additional for a child's seat. Price, without extras, £23 10*s*.

No. 67. The Globe Central Gear No. 5 Roadster.—A very simple form of central gear—Starley and Sutton's—

is, as in the other varieties, employed. The pilot wheel is put further away, by extending the length of the central tube, thereby giving steady running to the whole machine. A foot rest is supported above the bend of the tube. The gear is put at the left side, with the chain pulley in the centre, above which there is a simple [U] frame for the handles; and, from the boss which holds it, a central tip tail runs to the rear (see Fig. 54). The brake lever on the left

FIG. 54.—THE GLOBE CENTRAL GEAR NO. 5 ROADSTER.

acts on the drum of the central chain pulley. In general excellence, the Globe Central Gear No. 5 Roadster is quite on a par with its many stable companions. Price, usual details, balls all parts, &c., £22 10s.

No. 68. The Royal Mail Two-track Central Geared Racer (The Royal Machine Manufacturing Co., Limited).—This excellent machine is on the same lines as the Roadster (see Fig. 55), but, of course, very much lighter—little more than half the weight. S. Laws' spur gearing is adopted for driving, and is placed on the centre of the divided axle—one end of which passes into the other half. The central tube ends in a bracket, with the usual chain

pulley, which works in ball bearings, with ball pedals, adjustable and detachable cranks, &c. One of Hans Reynolds' noted chains is used for communicating the power. An arm coming out from the axle sleeve carries the left handle.

On the right, the long tube of the ⌙ frame is strengthened by a bracket across the angle, and the end is curved to the "off" side, so that the pilot is brought immediately before the large wheel on the right. Rack and pinion steering is worked by the right handle. Very light tangent wheels are adopted. The spokes are linked through.

FIG. 55.—THE ROYAL MAIL TWO-TRACK CENTRAL GEAR ROADSTER.

and soldered to the hubs, and are again soldered and bound together where they cross in their tangential journey to the hollow felloes—the result being an exceedingly light, but very strong wheel. As a rule, no tail is fixed. One cause of the speed and easy running of the machine is due to the very narrow tread—8¼in.—combined with the vertical position of the rider, and the general lightness and rigidity. A 42in. (geared up highly), with a 20in. steering wheel measures: Length, 62in.; wheel centres, 31in.; width, 33¼in.; wheel tracks, 28in. Weight, 42½lb. Price, balls to all parts, hollow rims, tangent wheels, enamel and plating, &c., £28.

No. 69. The Royal Mail Two-track Central Gear Roadster.—Having so fully dealt with the Racer, very brief details will suffice for the Roadster. It is the same in general design, only built much stronger and heavier. A wire guard is put over the chain in front (see Fig. 55), a single tip tail put at the back, and Starley's double driving gear used. A quadrant ratchet is generally fitted to the brake, so that it can be maintained "on" at any required power, by setting the lever at the required strength; or, better still, it can be made so as to be applied from the left handle, in which case, a short arm from the foot of the brake is connected with a rod above, which, by a link lever, tightens the strap round the drum. An Arab spring takes the saddle, and the machine is one we can strongly recommend. The wheels have direct spokes, ⅜in. moulded rubbers, solid rims, &c. Weight 85lb. Price, enamelled, part plated, balls all over, &c., £27.

No. 70. The Royal Mail Two-track Tandem Quadricycle Roadster.—Here is a genuine novelty—a four-wheeled two-tracker. The front part is identical with the machine we have just described and illustrated; the rear portion, therefore, alone demands attention. On the left side of the frame, at the back, a long backbone is attached, by a hinge joint, with a rear wheel which corresponds to the pilot, which is placed before the right, and the machine is thus perfectly balanced (see Fig. 56). The rear seat is held, by a side arm, at right angles to the backbone, and is capable of being adjusted both ways—horizontally and vertically. It is known as the "Lady's Perch," although she can use either; but it is very close to the front saddle. Strong tubular supports extend downwards from the axle sleeve to hold the pedal shaft, which only extends half way across the machine. Handles are provided above, and the whole of the additional parts are quickly and easily removed. Owing to the position of the riders, and balance of the machine, it can be put along at a fine pace.

The steering rack communicates with a swing bar below the cross-piece of the frame, and identical rods back and front, so that the small wheels move simultaneously together; the helm is in charge of the rider in front. The illustration given is of one of the early trials, and shows the tandem formed from side-geared machines with one long chain. Now the central gear is used, and two chains. The extreme length, with 42in. driving wheels and 20in. steering wheels, is about 90in., while the width, &c., is the same as in the single. Another good feature about the detaching portion, is that it can be purchased separately, at

a cost of £8, and is capable of being fitted to nearly any "two-tracker," and thus affords a good opportunity for those possessing such a machine to convert it, at will, into a tandem at small cost. All complete, enamelled, part plated, balls all over, &c., price £36.

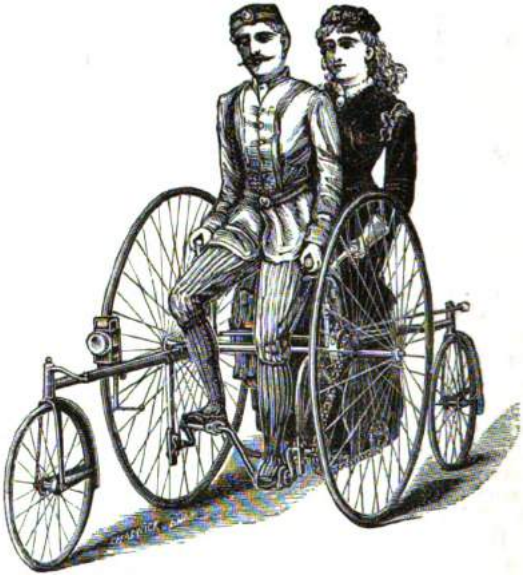


FIG. 56.—THE ROYAL MAIL TWO-TRACK TANDEM QUADRICYCLE ROADSTER.

No. 71. The Bicycle-steering Coventry Rotary Roadster (Rudge and Co.)—We devoted so much space (over sixteen pages, with thirteen large illustrations) to the Rudge machines in "Tricycles of the Year, 1884," Second Series, pages 44-60, that there is scarcely anything new left for review now, save the present machine, which, with the exception of the rider's position and steering, is the same as the well-known Coventry Rotary machines.

Although the first modern tricycle constructed, the Coventry Rotary has always been in the front rank, and may be fairly described as "The King of Single Drivers." As we have already said, the ordinary outline is retained, but, from the short arm of the ⊥ frame, there is a support (⊣), which carries a long pillar. The last named has a

bracket, with cranks, pedals, &c., at the bottom, and at the top a pair of bicycle-like (⌐¬) handles, bent up to make them sufficiently high.

The saddle is held on an Arab spring. The bottoms of the handles are attached to a plate, the support of which passes through the upper portion of the pillar, and works a quadrant-shaped pinion, operating upon a rack rod parallel with the cross-piece of the frame, and communicating with the bar which governs the small side wheels. Using the bar as on a bicycle controls the steering wheels, and the handle rod has a good lever brake. Below the cross-piece, in Rudge ball bearings, the driving wheel axle is held. Fast as the Coventry Rotary has always been, it ought to be even more speedy in its new form. Price, balls all parts, enamelled, part plated, &c., £25.

No. 72. The Club Tandem Roadster (Coventry Machinists' Co., Limited).—Although we have described this machine fully in "Tricycles of the Year, 1884," Second Series, pages 20, 21, recent alterations demand immediate notice. Previously it was only capable of a single conversion—into an Imperial Club Central Gear—the back part being useless, save when used as a tandem; now, by a simple change, it can be readily made either into a Sandringham (Humber style), or Central Gear. In order to accomplish this, there is, outside the bearing case, on each side of the central gear, a strong outer divided cover; each part has an upright pin, and a certain amount of play, or, rather, hinge action. On the prongs attached to the pillar of the rear part, and front tube, there are eyelet holes, which fit down over the four pins. By screwing or unscrewing nuts on the top of these the machine is easily joined or divided.

To remove the back, only these nuts are unscrewed; the pillar, carrying with it the handle bar, backbone, &c., is then lifted off, after the key link in the chain and brake pin have been severed. Each rider has a separate brake; both act, but on different sides of the drum, in the centre of the axle on broad flanges on the upper chain pulley. The front part is removed in much the same manner, when a Sandringham is left; the purchaser has, therefore, three distinct machines, but he cannot produce them all at once. Not only is the bicycle-steering bar of the Sandringham adjustable, but it is also detachable, as, by knocking out a pin, either side of the bar can be pulled out. When desired—at an extra charge of £1—a supplementary spade handle is put at the right rear side, so that, when necessary, the rider at the back can assume the responsibility of guiding, in addition to his other duties. When this is fitted, there is a |×| shaped piece, on

the ends of the cross tube, to support both front and back handles, and there is a hinge joint in the connecting rod, to prevent it binding. Formerly the saddle of the Sandringham was fixed—*i.e.*, the position could not be altered; now it is made adjustable by an Γ pin going through the backbone. A very good method of tightening the chain is in vogue, and is one of the simplest in use. Below the tube there is a small screw rod, attached to the bracket at one end, and

FIG. 57.—THE CLUB TANDEM ROADSTER.

passing through a solid boss, it has a thumbscrew at the other extremity. By slacking the lock nut the required adjustment can be obtained by simply twisting round the thumbscrew (see Fig. 57) with the fingers. Our previous description holds good for the remainder, and we may conclude by saying that, even without the many attractive improvements we have quoted, the Club has proved itself to be one of the best and most popular Roadster Tandems

of the day. With 44in. and 18in. wheels the following measurements were taken: Length, 88in.; from centre of axle to centre of pilot wheel, 35½in.; ditto to trailing wheel, 35½in.; width, 39in.; wheel tracks, 33½in.; between saddle centres, 20in. Price, enamelled, plated, balls all over, &c., £35.

No. 73. The New Stassen Central Steered Telescopic Roadster (J. Stassen and Son).—Readers will doubtless remember that last year we spoke of this machine, or rather its predecessor, as being "the most open fronted central geared machine in the market"—that is to say, a single tricycle, with mid pilot wheel and the usual central tube and

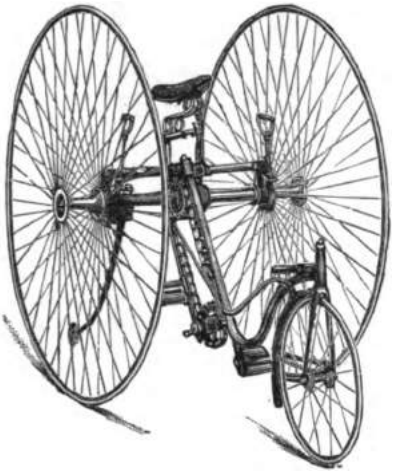


FIG. 58.—THE NEW STASSEN CENTRAL STEERED TELESCOPIC ROADSTER.

gear. Messrs. Stassen are to be congratulated on having practically shown that the dangerously placed steering-rod common to this type of machine is not a necessary evil, and that they at least have the mechanical ability to effectively control the steering wheel without it. The method by which this very important improvement is carried out is shown by Fig. 58. Below the frame, on the right side, the stem or shaft of the right handle terminates with the usual pinion, which acts on a quadrant-shaped rack on a short swing lever pivoted to the cross tube of the frame. The other end of the swing lever is linked to a flat rod running parallel with

the central tube, where it is quite out of the way, and joins a short arm on the head of the pilot wheel, which it effectively guards, without being an element of danger and spoiling the look, and at the same time it removes the greatest drawback to central-geared and steered machines. At present a lever brake, with spring clip, is being fitted, but the makers are about to adopt a strap brake similar to that applied to their Tandem.

We have not yet alluded to the best known feature of these machines, that which has chiefly brought them into notoriety—their method of telescoping, decidedly the simplest in vogue. All that has to be done is to apply a small key to

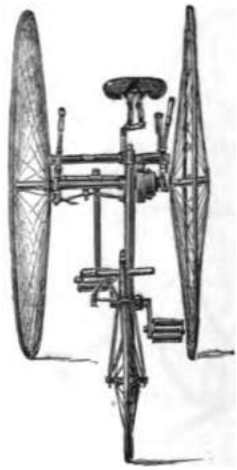


FIG. 59.—THE NEW STASSEN CENTRAL STEERED TELESCOPIC ROADSTER (Telescoped).

the square end of the axle, in the outer hub of left wheel, when, by simply "winding," the wheels gradually close, until they assume the position shown in Fig. 59, in which form the machine can be wheeled about, no part having to be removed. The frame consists of three tubes placed triangularwise, the left half sliding within the right by the action of the screw pin within the divided axle. Of course, unwinding draws the machine out again to its normal width; the operation is facilitated and the rubber saved if the left half of the machine is raised from the ground during the closing process. An Arab spring, on one of the

usual ⌜ pins, carries the saddle, and a tip tail is put to the right side, at the back; the whole machine is enamelled and part plated. Measurements, with 46in. and 18in. wheels: Length, 76½in.; centres, 34½in.; width, 36½in.; wheel tracks, 30½in., or, closed, some 8in. narrower. Price, balls all parts, including pedals, £22 10s.

No. 74. The New Stassen Central Geared Non-Telescopic Roadster.—With the exception of a few details, this machine is like the foregoing. Instead of three sliding tubes, there are only two rigid cross tubes; otherwise, it is practically the same machine. Price £22 10s.

No. 75. The Stassen Tandem Telescopic Roadster.—As will be seen from Fig. 60, this machine is somewhat like the Humber Tandem Roadster in outline, but differs considerably in details. The frame has the same triangular arrangement of three cross tubes. These, in the centre, are jointly supported and held in position by a strong bracket, which, in front, additionally holds the top of the central tube. This, as in the Humber, has only a tiny castor wheel—a preventative against tipping over forwards. The tube, bending slightly upwards, terminates in a ⊤ foot rest. At the back the bracket supports the rear pillar. A simple and effective plan is carried out to adjust the chain and brace up the central, front, and rear tubes. From the lower bracket (front), carrying chain pulley, &c., a tubular rod runs upwards, and joins, by a cross-piece, a similar tube from the lower rear chain bracket. By screwing these down from the top, both chains are tightened, and the tubes are kept from springing apart. The ⌜ pin in front can only be raised about 3in., but has a saddle spring (Arab) block, from which "Whatton" handles branch to each side, affording a comfortable grip for the rider. Instead of a regular Stanley head at the back, the portion of the neck which forms the centres forms a socket, through which passes a pin, screwing into the solid part of the head at the bottom, and held by the usual lock-nut at the top. This permits the backbone and rear wheel free play to "trail" after the machine, and prevents the strain being thrown on the centres, which so often breaks them in similarly constructed machines.

Instead of a bicycle-like steering rod, side, or "spade" handles are used, and from the left one, by a small inner pull-up handle, the strap brake is applied. The brake, which acts on the driving drum of the divided axle, is extra wide (1½in.), and the metal strap has an inner one of leather, ⅛in. thick. The back ⌜ pin, instead of passing through and weakening the backbone, is carried at the

side by a boss, which encircles the "spine," but, being cranked slightly, it is brought directly over the centre, and is topped by an Arab spring, and has the usual adjustments. The driving gear—much on the same system as Starley's—is put in the centre of the divided axle, and is driven by two independent chains. It is the front part which removes; to do this, only four nuts, including the key link of the chain, have to be removed, when the whole front portion is detachable, leaving a machine of the Cruiser-Humber type.

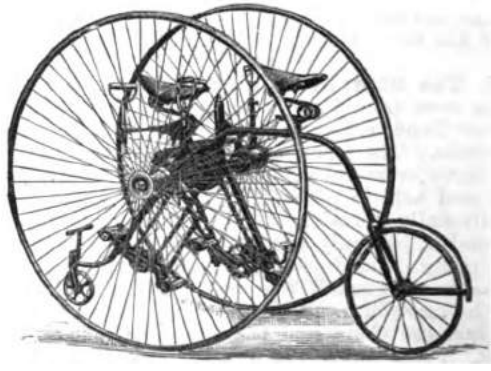


FIG. 60.—THE STASSEN TANDEM TELESCOPIC ROADSTER.

All parts are strongly and well built, and may be implicitly relied on under all conditions. As a rule, the wheels are 48in., geared level; they have stout spokes, large size moulded felloes, &c. The machine is telescopic, on the same plan as the Central Gear, and it is finished the same. It is also made non-telescopic at the same price. Measurements of a machine with 48in. and 18in. wheels are as follows: Length, 74½in.; centres, 31½in.; width, overall 37in., telescoped 28½in.; wheel tracks, 31in. Price, enamelled, part plated, balls everywhere, £33 10s.; plain pedals, £31 10s.

No. 76. The Non-Telescopic Stassen Roadster.—This is the Cruiser-Humber-like machine we have spoken of as forming the rear part of the Tandem. It is made as a single, independently of the Tandem, and has only two, instead of three, cross-bars. The same description of head is used, and full command is had over the steering by the side handles. Instead of the pillar joining the axle at the sides of the central gear, it is fixed to the cross tubes, which, by ball bearings, are attached to the axle close to

the wheel hubs at each side. General details conform with those of the other machines already described. Measurements, with 46in. and 18in. wheels: Length, 76in.; centres, 34in.; width, 35½in.; wheel tracks, 30in. With balls to all parts, enamelled and part plated, &c., the price is £22 10s.; plain pedals, £21 10s.

No. 77. The Spinaway Roadster (Griffiths and Company).—Although only produced in the present year—1885—the Spinaway possesses so many special features that it is sure to be well known ere long. All experts agree that an

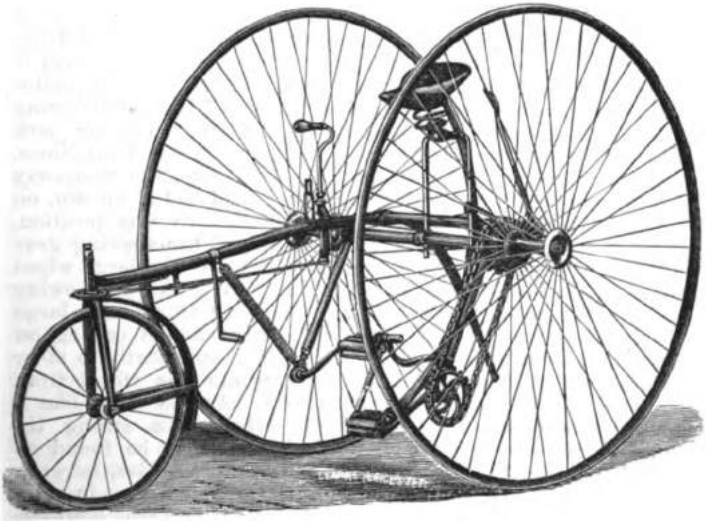


FIG. 61. THE SPINAWAY ROADSTER.

erect attitude is by far the best, both for work and appearance. The method by which this position is ensured in the machine under notice is exceedingly simple. Instead of the usual rigid frame, the side legs swing upon the main, continuous axle; and in front support the crank shaft in ball bearings. To control the swing of this part of the frame, it is attached to the long arm of the ¬ frame by a very strong spiral spring (see Fig. 61). By the aid of this the rider can, with the slightest inclination of the body, regulate the swing to suit the contour of the road—an action that becomes perfectly natural to anyone who knows the machine.

When mounted for the first time, the swing—something like that of the Otto, only not so free—feels rather queer, and the rider does not seem to put proper power into the pedals. This only lasts a very few minutes, and very soon the swing is quite forgotten, so naturally does it adapt itself to the rider's requirements.

One other very important feature is peculiar to the Spinaway. Instead of the commonly adopted rack and pinion, which is often shaky, and frequently rattling, the pilot wheel is operated upon by a steel cord. Above the shoulders, or below the Stanley head, there is a double-grooved pulley, round which the cord crosses and passes in opposite directions to a small guide pulley below the frame (see Fig. 61); running further back it goes round, and is fixed, both ends, to a drum pulley at the bottom of the right handle shaft. In action it is singularly pleasant, being noiseless and *certain*. The pilot requires less attention, the slightest move of the handle being at once responded to, without any of that rasping jerk frequently met with in the rack and pinion steered machines.

Although nominally a "two-track" machine, the Spinaway is not so actually, as the leading wheel is placed about 4in. on the inner side of the right driving wheel. In this position, however, it preserves the balance better, and the steering gear is comparatively free from the flying mud of the large wheel following it. Another point worth noting is that, owing to the good balance imparted by the swing frame, the large wheels carry nearly all the weight, only enough resting on the pilot to enable it to grip the ground sufficiently to steer correctly; furthermore, the swing prevents this wheel from being lifted off the ground by a jerk. At the back—like a continuation of the long frame tube—there is a strong tip tail, and in front a comfortable foot rest is to be found at each side. The Γ pin of the saddle is held, by a boss, between the axle sleeve. Of course, the handles are fixed—*i.e.*, in relation to the swing portion of the frame; they are, however, adjustable in height. Brake power is applied from the left by a long lever to the drum, which contains Starley's double-driving gear. All the rest of the machine is well made; the wheels, &c., are of the usual pattern. We are glad to notice that the makers do not pander to the present fancy for dwarf wheels, but make 48in. driving and 20in. pilot their standard size. Finished enamelled, part plated, and balls all parts, the price is £22; if with laced spokes and hollow rims, £2 extra. Two-speed gear is added for £4 4s.; or, if a 54in. machine is wanted, it is 10s. additional. To those who prefer a three-track machine, the pilot can be bent round so as to come nearly in the middle, when a central foot rest is provided; but we greatly prefer, and would recommend, the regular pattern.

No. 78. The Cheylesmore Carrier Roadster (Coventry Machinists' Company, Limited).—The majority of "Carriers" are so very expensive, that the Coventry Machinists' Co. have, with the one under notice, endeavoured to supply a handy

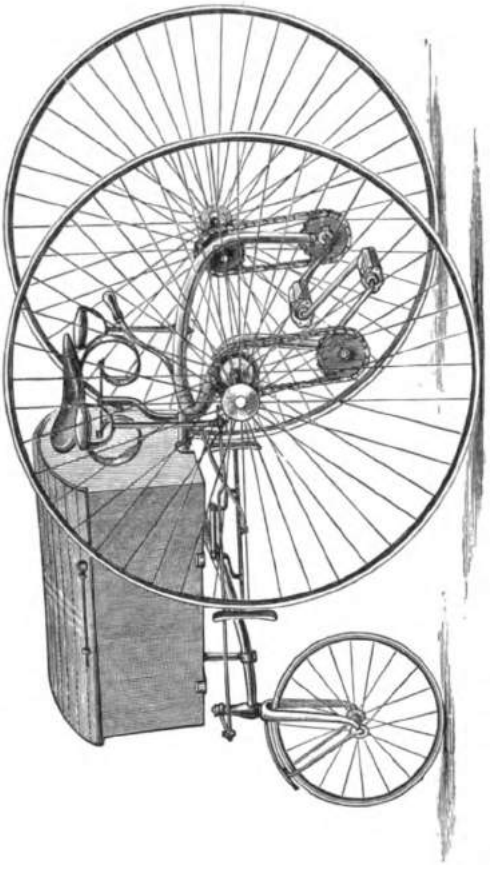


FIG. 62.—THE CHEYLESMORE CARRIER ROADSTER.

trading tricycle at the price of an ordinary machine. As will be seen from the illustration (Fig. 62), it consists of an ordinary Cheylesmore—the oldest and most popular form of rear-steering double driver, and which we have described

on several occasions, notably in "Tricycles of the Year, 1884," Second Series, pp. 11-15, when the clutch action of the pedals, swing brake, &c., were illustrated. The only additions to the frame are a T pin, near the tail of the backbone, and another cross-bar, higher up (see Fig. 62); on these a large receptacle can be placed. Unlike most "carriers," the rider has a perfectly open front and an uninterrupted view of his course. Brake power, applied by a swing lever, is very efficient, and the pedals do not revolve going down hill. All necessary parts are adjustable, and the machine will be found a thoroughly efficient "carrier." Of course, the box can be detached, leaving an ordinary Cheylesmore. With ball bearings to the crank shaft and driving wheels, handsomely painted and part plated, a 44in. machine costs £23 10s.

No. 79. The Club Carrier Roadster.—An adaptation of the Sandringham (see "Tricycles of the Year, 1884," Second

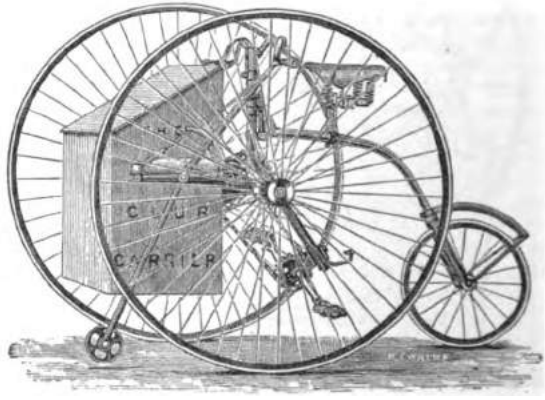


FIG. 63.—THE CLUB CARRIER ROADSTER.

Series, pp. 9-11) to carrier purposes, by fixing a box in front; this is held by a slight additional framework, which will also, when the box is taken off, support an invalid's or children's seat; or, when removed, a regular Sandringham remains (see Fig. 63). Brake power can be applied either by the usual "grasp" on the bicycle-like handle bar, or by a push-out lever. A tip rod, with safety wheel, is provided in front. When loaded, the extra weight balances that of the rider, and makes the propulsion comparatively easy. Finished like the ordinary Sandringham, the price is £27.

No. 80. The Ranelagh Club Roadster.—Bicycle steering applied to tricycles became so popular at the close of 1884, that this type of front steerer was designed to meet the demand. It derives its cognomen from the noted Ranelagh Harriers Club, and has already made a name for itself. In appearance it is like the Central Geared Imperial Club, with the side handles abolished in favour of an upright pillar, and bicycle steering rod placed before the saddle. The box containing the double driving gear is placed on the right side of the

FIG. 64.—THE RANELAGH CLUB ROADSTER.

axle, and the upper chain pulley in the centre. The latter is spanned by the bracket of the tube, the top of which forms a socket for the ⌐ pin. Lower down it supports the other chain pulley, cranks, pedals, &c. (see Fig. 64), and curves up to the Stanley head of the pilot wheel. Several improvements have lately been made in the 1885 pattern. These include a slight alteration in the steering pillar, which is now more forward, giving more room to the rider, and making the

machine less liable to tip backwards. It (the steering pillar) consists of an upright tube, working freely in a socket holder, at the bottom, on the central tube, from the upper part of which a short arm runs out to steady it. At the top there is a curved hollow bar, in exactly the same position as the steering rod of a bicycle. Both the bar and the saddle possess the advantage of being adjustable. Attached to the lower part of the handle pillar there is a short cross-piece, or holder. From the ends of this, two rods run parallel to a similar cross-piece on the head of the pilot wheel. Steering is thus direct and steady. Provision is made to carry a lamp in front of the head. The ball pedals have a narrow tread, but the cranks are bent slightly outwards, to prevent the heels striking the chain.

A new system of applying the brake has recently been adopted. Instead of being put on by pushing out a lever beside the pillar, or from the steering rod, in bicycle fashion, a connecting rod is carried out in front, and, when the feet are on the rest, it can be applied by pressure of the heel—or this can be used in conjunction with the "push-out lever" (see Fig. 64); either cause a strap to be tightened on a drum connected with the upper chain pulley. All mounting and dismounting must be done from the back, and to facilitate the operation a step is placed on the strong central tail. The Ranelagh is not only light but decidedly fast, and, especially to a bicyclist, will be found a splendid machine for either road or path. It is made in the best style of the Coventry Machinists' Company, and finished either plain, enamelled, or painted, part plated, and with balls to all parts, including pedals. Price £25. Measurements of a machine with 44in. and 18in. wheels: Length, 64½in.; centres, 33½in.; width, 40in.; wheel tracks, 33½in.—a good wheel base, which gives extra steadiness.

No. 81. The R. & P. Roadster (Robinson and Price).—Although not possessing any novel or striking feature peculiar to itself, the R. & P. is a capital roadster of a popular type. It has a loop frame, with the steering carried below, and therefore out of the way. Bown's double driving gear is placed on the left side, and, for £2 extra, the same maker's power gear is fitted—a considerable advantage in a hilly district. All the usual details are to be found, including adjustable handles and saddle; Arab spring to latter, &c. The wheels have laced tangent spokes, and are generally 48in. or 50in., with a 20in. pilot. Well built, finished neatly, enamelled and plated, and balls to all parts, the price is £22; with power gear, £24.

No. 82. The Humber Roadster (Messrs. Marriott and Cooper).—Owing to a split in the original firm, the junior

partners have retired, and are now trading on their own account under the above title, but they retain the right to the original names, hence the reason of there being two Humbers in the market. By referring to the illustration (Fig. 65), it will be seen that the original "Humber" lines of construction have been strictly adhered to in every detail; in fact, to all appearances, the now rival machines are practically

FIG. 65.—THE HUMBER ROADSTER.

identical. The frame is of the same simple construction, but a rather lighter spoke is used for the wheels, and Morgan's roller chain for driving. The machine, as a whole, is light, fast, and elegant, whilst the workmanship and material are of the best. Enamelled and part plated, the price is, with balls to all parts, £24 10s.; if built extra light, with hollow felloes,

&c., £26 10s. By having a straight bar and plain pedals, the price can be reduced by £1 10s. Measurements of a machine with 44in. and 18in. wheels: Length, 64in.; centres, 33in.; total width, 37½in.; wheel tracks, 31½in.

No. 83. The Humber Tandem Roadster.—A counterpart of the "Original" Humber, which we have elsewhere described, with a few minor alterations, and one important improvement—in the brake. Instead of the single grasp lever on the right side of the steering bar of the rear rider, the brake has two levers, enabling power to be applied by *both* hands. This considerably augments the power, which is applied to the drum connected with the driving pulleys in the centre of the axle. In order to give the rear rider, who has sole power over the steering, a better opportunity of seeing where he is going, his saddle has been raised some inches. As the front seat is suitable for ladies, their garments are effectually prevented from getting mixed up with the gearing by an efficient guard being put over the chain. Another feature which should be noted, is the capital luggage carrier at the back; this consists of a light frame, which fits on the backbone and over the rear wheel, and is capable of carrying a good large parcel, without inconveniencing either rider; it is included in the price. Practical trials have proved that the Humber Tandem is almost equal to the bicycle in speed on the path, and some very fast and long distance road runs have also been accomplished. This is, in a great measure, accounted for by the perfect balance of the machine, and only three wheels being on the ground. In other details it is the same as the single, and of course the front part can be quickly removed. Price, ball bearings to all parts, &c., £34; if with hollow felloes and laced wheels, £36.

No. 84. The Humber Automatic Steerer, or "Cripper" Roadster.—This popular mount is shown in Fig. 66. The connecting tube, or brace, which runs from the steering pillar to that which supports the saddle spring, is now taken across higher up, still further strengthening the machine. The pedals are also put slightly more forwards, allowing more room for the rider's feet.

A coil spring, between the shoulders of the front forks and bottom of the socket above, does away with a great deal of vibration, and makes the foot rest, placed in front, more comfortable. Brake power is applied from the cross handle in front, and communicated, by a series of rods, to the drum in the centre of the axle. The chain (Morgan's roller), saddle, and steering rod, are all easily adjustable. For those who

like to introduce a good deal of the bicycle into the tricycle it will be a capital mount. It also includes the luggage carrier. Measurements, with 42in. and 18in. wheels: Length, 61½in.; centres, 31½in.; width, 38½in.; wheel tracks, 33½in. Price, enamelled, plated, balls all parts, &c., £25.

FIG. 66.—THE HUMBER AUTOMATIC STEERER, OR "CRIPPER" ROADSTER.

No. 85. The Springfield Tandem Roadster (Singer & Co.).—A very novel form of tandem, introduced in June, 1885, and of which an outline description will be sufficient, as some alterations are in contemplation for the 1886 type. It is different in design from almost any other in the market, the most prominent part of the frame being a very long tube, of stout proportions (1½in. diameter), which extends from the head of the pilot wheel, where it curves gracefully down, and runs the whole length of the machine, forming, at the rear, a safety tail.

It is supported by tubes slanting from back and front up to the frame; these form sockets for the saddle ⌜ pins. The frame has two cross-pieces to carry the handles, and is this shape (⊣⊢); and steering is arranged to be applied by either or both riders. In addition to a lever brake,

applied by the rider in front, there is a reserve screw brake behind, put on by turning a handle in front of the saddle; it is very powerful, and will bring the machine to a dead stop, making it almost immovable. This brake will remain "on," at any desired power, without being held. When we examined the machine, there was one long triangular endless chain, but it is probable that a change will be made in this. The lower chain pulleys work in ball bearings, held by brackets on the long tube. Arab springs are placed on the ⌐ pins. One special point is the space between the saddles—28in. to 30in., according to adjustment.

FIG. 67.—PATENT SPRING FORK.

A novel form of spring fork has been introduced, in order to save pilot wheels from the great vibration to which they are subject. It can be applied to any tricycle front wheel which has ordinary forks. Last year (see "Tricycles of the Year, 1884," First Series, pages 65-80) we described fourteen varieties, and gave ten illustrations of Singer's machines, therefore we will now only note the new points in this machine which are also applicable to others. It will be seen from Fig. 67, that there is a sort of double fork. Instead of continuing to the axle, the bottom of the fork legs bend out, and are pivoted to a second but lighter fork, which

runs upwards from the axle; projecting forwards from the shoulders of the main fork there are two short rods. On the shoulders of the secondary, or front fork, there are ring bosses, through which the short rods are passed. Between these bosses and the end of the rods there are coil springs

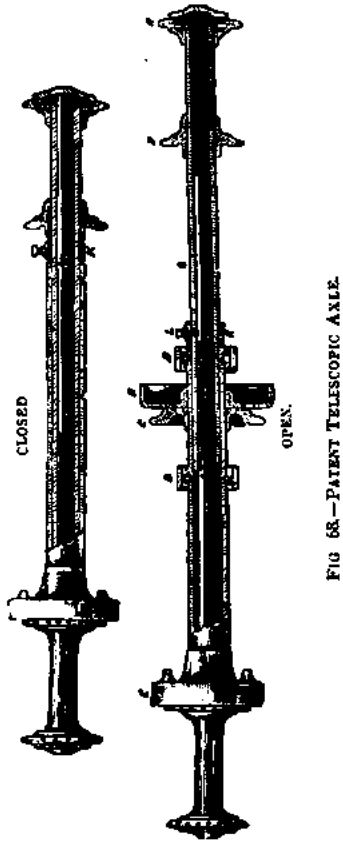


FIG 68.—PATENT TELESCOPIC AXLE.

of medium strength. When the pilot meets with a shock, it is thrown upon these springs, which absorb by far the greater part of the vibration, transmitting a very small portion to the machine or rider. Although useful in this way, it is almost as rigid as an ordinary fork, and its

presence would scarcely be noticed, save by a great diminution in the vibration. It is fitted to new machines at an extra charge of 15s., or it can be added to any pilot wheel (in which case, only the forks have to be sent to the Challenge Works) for £1, which will prove money well spent.

Another capital invention, which deserves separate notice, is the Telescopic Axle; we have commented on it before, but are now enabled to illustrate its action. Outwardly it presents exactly the same appearance as an ordinary continuous axle (see Fig. 68). Instead of being all in one piece, there are really three axles: First, the solid steel axle (F), on which the left wheel runs loosely, driven by the gear (E). Outside this there is a double sleeve—i.e., two tubes, one within the other; on the right portion (G), which is secured to the solid axle, and revolves with it, the right wheel (H H) is fixed; but this part slides within the left—a larger sleeve, or outer case tube—when the machine is telescoped. To accomplish this, the nut (L) has to be slackened, in the collar (K), when the axle can be shut up, as in Fig. 68. This reduces the width from 38in. or 42in. to 27in. or 30in., narrow enough for the machine to be wheeled through a doorway. The action is simplicity itself—only the nut has to be slackened, when the machine can be at once closed; in either form it is firm and rigid. To the left side the frame is attached, by ball bearings (B), to the outer sleeve, and on the latter the chain pulley (C) and brake drum (D) are placed. This axle can be applied to the Springfield, or any of Singer's machines, for £2 extra.

A very good luggage carrier is added for 15s. The Springfield Tandem appears to be a very steady running machine. The one we saw had a very broad wheel base, and was well balanced. Measurements, with 45½in. and 18in. wheels: Length, 66½in.; centres, 35in.; width, 43in.; wheel tracks, 35in. Price not yet decided.

No. 86. The Carver Roadster (James Carver).—It is nearly eight years since the cycling world was somewhat startled by this maker bringing forward a very novel invention, in the form of *hollow spokes*. The novelty of the idea brought the maker into notoriety, and the Carver bicycles were prominent for some time, but, owing to a revival in the lace trade, in which Mr. Carver is largely interested, they were allowed to almost die out. During last and the present year he again devoted considerable attention to cycles, this time to tricycles, and the result has been very satisfactory. The first machine of the group is a more than usually neat example of the prevailing Humber type.

The brake is fitted with a small ratchet, on an arm projecting horizontally from the steering rod, close to the knob on the right extremity. On the grasp lever there is a spring clip, which engages the teeth of the rack, so that when the hand lever is drawn towards the bar power remains "on," without further trouble, at whatever strength desired. By slightly raising the lever with the fingers, it can be immediately released. Power is communicated from the end of the lever down the side of the pillar, by flat rods, to a leather-lined metal strap, which encircles the drum—connected with the upper chain pulley—in the centre of the axle. Absolute accuracy in fitting has always been a characteristic of Carver's machines; for instance, the chain pulleys are machine cut so exactly true, that the chain works over them with very little friction. The central pillar is hinged, by a bracket, to the cases of the ball bearings, at each side of the brake drum. Double driving gear is carried in the box on the right side. The tail of the spring works on a suspended shackle on the backbone, which is nearly horizontal near the top, and then bends down suddenly to the trailing wheel. To prevent the pedals slipping the cranks are slotted. Other details scarce need mention—light gauge direct spokes, gunmetal hubs, steel. crescent felloes, and moulded or fluted tyres, make up the wheels. The Carver is finished enamelled or painted, part plated, and has ball bearings to all parts. We found a machine with 42½in. driving and 17½in. trailing wheels to measure: Length, 62in.; centres, 32in.; width, 40in.; wheel tracks, 33in. Price £23.

No. 87. The Carver (Extra) Roadster.—The same in general detail, but the noted hollow spokes are put in. These consist of rolled sheet steel, which is, by powerful pressure, rolled up into the form of a small tube, equal in diameter to that of an ordinary spoke—thus, a 12 gauge is ·125in. diameter. A plug is brazed into either end for a couple of inches, so that the parts which screw into the hub, and are held in Warwick's hollow felloe, have abundant strength. An Arab replaces the shackle spring, and the steering bar is bent cowhorn shape. With the twofold purpose of forming a foot rest and carrying luggage, a light frame is fixed in front; otherwise it is the same. Both machines include three wrenches, mud guard, lamp bracket, &c. Including the "extras" we have specified raises the price to £27 15s.

No. 88. The Lady's Carver Roadster.—It must not be presumed from the name that the machine is only suitable for the fair sex, although, owing to its lightness and easy running, it is admirably adapted for ladies. As will be seen from the

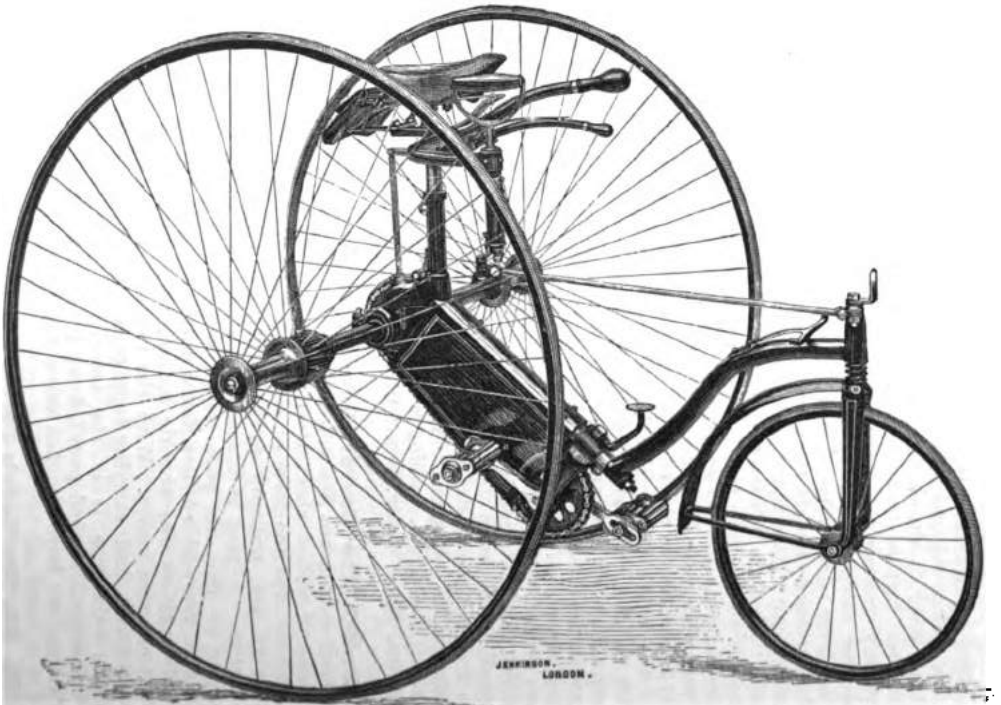


FIG. 40.—THE LADY'S CARVER ROADSTER.

illustration (see Fig. 69), the machine is a central geared, front steering, double driver; the wheels, axle, driving gear, &c., are identical with those of the Humber type Carver we have just described. The central tube is in two parts. The upper portion is joined to the axle sleeve by a bracket, with double prong attached, by a hinge joint, to the ball-bearing cases, and forms a socket for the T pin, which carries, on a small plate at the top, the "Whatton" handles and bow spring of the saddle. These all adjust together, so that the saddle and handles must always maintain one fixed height in relation to each other, as they have not independent adjustment. In front, the tube slants straight down, and passes through a ring socket, on the end of the backbone of the pilot wheel. Above the shoulders of the front forks there is a coil spring, under the socket head; this relieves the machine of a good deal of vibration. On the backbone there is a cross foot rest, with extra thick rubber pads; and steering is effected by a rod high up on the right side.

An efficient guard covers the chain and gearing (see Fig. 69). Brake power is applied by a pull-up lever under the left handle, which acts on the central drum in the usual way. In other and general details it is identical with the Humber variety, except the price, which is £1 more—*i.e.*, £24; or the following additions cost the respective sums named: Hollow spokes, £2; Arab spring (which ought *not* to be extra), 8s.; hollow rims, £1; or, together, they bring the price up to £27 8s.

No. 89. The Carver Tandem Quadricycle Roadster.—One of the first tandems to fulfil what will undoubtedly be looked upon as an almost indispensable condition in machines of the future—that of being converted into two distinct machines. As a whole, it is made up of the two machines we have just described—or, rather, one perfect machine and part of another (see Fig. 70). In front, we find a perfect Lady's Carver; at the back, there is the pillar, pedals, backbone, &c., of the Humber machine. In order to give the rider a better view of the road ahead, the rear saddle is some inches higher than the one in front. Separation or union is easily effected; the bracket on the rear pillar is rather smaller than that of the front part, and, going inside, it joins a second set of bearing cases by a hinge clasp. By simply unlocking this, and severing the chain, the rear part is detached, or, by a similar operation with the outer bearing cases, the front part can be taken away. In any or all of its three forms the machine is a first class "mount"—light, easy running, and made in the best manner. Double brake power is used on the tandem. As in the singles, the machine is coated with Harrington's enamel, or painted, with

bright parts plated, and with balls to all parts, including pedals. Price £34. Measurements, with 42½in. and 17½in. wheels: Extreme length, 81½in.; from axle to centre of each

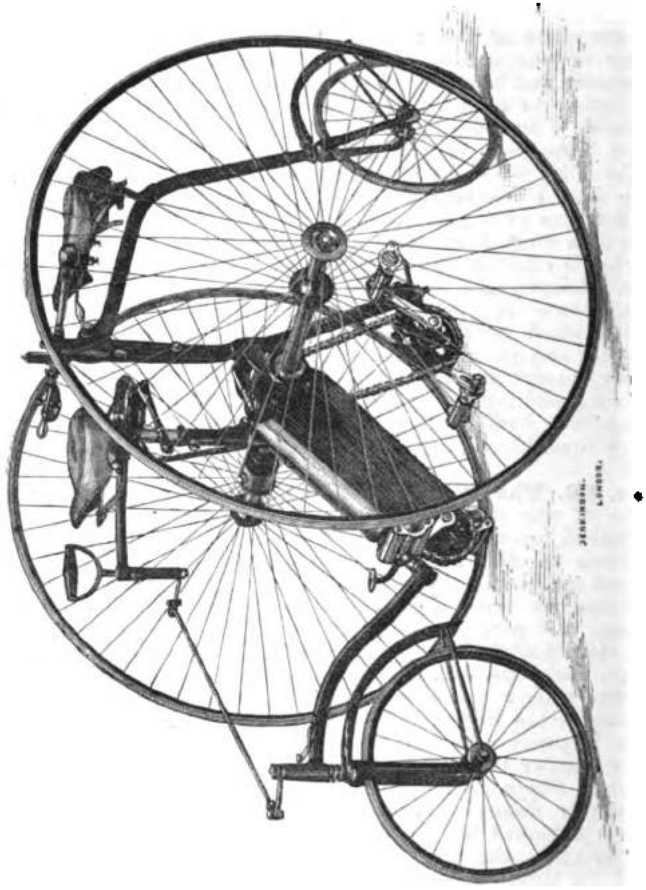


FIG. 76.—THE CARVER TANDEM QUADRICYCLE BOLDFIX.

small wheel, 32in.; between saddle centres, only 16in.; width, 40in.; wheel tracks, 33in.

No. 90. The Hanson Roadster (Speed and Wiles).—We are glad to be able to close our present work by so remarkable a machine as the Hanson, which calls for special notice. It is the outcome of three years' experimenting and study by the inventor, Mr. Speed, who has succeeded in producing a wonderfully good machine, not only for practical purposes, but from a mechanical point of view. Indeed, it requires one to be something of a mechanic to fully appreciate the skilful adaptation of the sliding clutch, which makes the machine a double driver, so that it works automatically in connection with the steering. The scheme of the machine is that of a two-track front-steering double driver. The last-named point is an important feature, and is carried out in a novel and effectual manner, and the machine is an absolute and certain double driver, unless when turning. We will deal with this part of the machine first, but it is impossible to do full justice to the technical details by a brief description. The ordinary steering rod runs parallel with the right tube, and acts on the pilot wheel by an arm projecting from the top of the fork. By means of a right and left-hand screw on the rod it can be adjusted should it wear loose. Upon the shaft of the right (steering) handle there is an eccentric ring. Acting against the flat side of this there is an adjustable pin which runs through the clutch lever, the forward end of the latter being pivoted to a short arm running out from the handle shaft in front (see Fig. 71). The other end of the lever is in connection with a novel clutch-gear on the right side of the axle. The axle is divided, and about two-thirds is tubular, the right side (solid) fitting into the left portion (hollow). On the extremity of the left portion there is fixed a spur (or small cog) wheel, with the teeth slightly on the slant. Close to this, but on the solid—or right—part of the axle, there is a strong boss, which carries on opposite sides two rocking pawls, or "balancing angles"; these are pivoted to it in the centre, so that they rock freely to either right or left.

Between this boss and the right bearing case, which joins the frame to the right part of the axle, there is a sliding clutch and pinion wheel, similar to the one on the main shaft. This is kept in position by a coil spring, which acts against the bearing case already referred to, and keeps the clutch in position, so that the rocking pawls, or "balancing angles," are equally in connection with both pinion wheels. When in this position, the axle becomes a solid shaft, and therefore the machine a perfect double, as it is impossible for one wheel to turn more than the other, and both are equally acted on by the driving gear. To go back,

the lever we mentioned is connected with the sliding clutch, and the act of steering causes the eccentric on the handle to press out the lever, and throw the right wheel out of gear, by withdrawing the sliding clutch and pinion from connection with the rocking pawls, or "balancing angles." The effect of this is to make the machine travel in a straight line, so that the steering may, on a fairly smooth road, be left to itself and the hand removed; also on meeting an obstruction the wheel merely goes over it (supposing that to be practicable), without slewing the machine round in the disagreeable manner common to nearly all machines which are driven by differential gear. This makes the machine most valuable as a roadster; not only is it much easier to learn, but it is very safe in the hands of novices, who are, to a great extent, free from the eccentric evolutions common to beginners, by reason of over-steering. Especially when travelling at night, on a strange road, is the safety and importance of this manifest.

Another decided novelty is to be met with in the driving gear. The axle, instead of being straight, has, in the centre, a long double crank with a 7in. throw. The frame, which is, of course, rather different to that depicted in the illustration (see Fig. 71), is very strong indeed. Owing to its formation, it is practically impossible to sag the axle, as it is supported in four places—two in the centre, like the other pattern, and at the sides close up to the hubs. If the axle were to sag, the whole frame must bend with it, and so well is it designed that no fear need be felt on that score. From the lower part of the frame, in the centre, two tubes run down to near the ground. The rod joining these acts as the fulcrum of two levers, which are tubes arching upwards in front; at right angles to these are the pedals. The experimental machine we rode had ones of the Facile pattern; but these are regulated to order. From the top of these curved levers light steel rods run to the ends of the central three-throw crank. By this means, although the pedals have only a throw of 4½in., they drive a 7in. crank—*i.e.*, the total rise and fall of the pedals is 9in., of the cranks 14in. Great power is, therefore, put into the wheels, the propelling power being comparatively light, and there is no loss of power owing to chains. There is far less friction than with the ordinary system; furthermore, there is no sag or give in the pedal—every ounce of power goes to drive the wheels; also there is no dead point, and whatever may be the position of the pedals, on pushing down the higher, the machine is propelled. The pedal action is neither that of an ordinary lever, nor is it rotary, but rather a blending of both—two-thirds lever, and one-third rotary—and about the pleasantest action we have ever met with, and one that is far

more easily got into than the rotary by beginners, being very like walking. In fact, the machine is pre-eminently suited to novices.

On each side of the machine there are upright standards, with adjustable straps, which support the saddle. Here, too, is a novelty. The saddle is formed of cork, on a firm foundation, padded for comfort. As most readers well know, especially those of piscatorial tastes, cork is the best non-conductor of cold and damp. No fear here of the ill effects which have so often resulted from damp leather. Even if this saddle does become wet, no evil results will arise—a welcome boon to those who suffer from hæmorrhoidal affections. Although not so pretty to the eye, the saddle is very comfortable, as there is an entire absence of vibration. In order to regulate its position, and prevent excessive swing, it is additionally held, back and front, by adjusting straps, which attach it to an arched tube, which curves out from the top of the frame, so that any cant can be arranged at once, to even a greater and more varied extent than by the new patent tilt, recently introduced. Already we have run to considerable length, but have not exhausted all the specialities of this really remarkable machine. The grasp bars of the handles rest, at each side, on coil springs—another anti-vibrator worth notice. All necessary parts are adjustable. At present the wheels have direct spokes, &c., but a much lighter type will, in future, be adopted, with tangent spokes, smaller rubbers, &c., which will reduce the weight considerably. A lever band brake is used, but back pedalling power is enormous.

In every way the machine is a first-class one, which we can safely recommend, and if it meet with the success it deserves, the inventor will soon find that his undoubted mechanical ability has not been misplaced by the demand which will arise for it. Ball bearings are put to all necessary parts, and the machine is finished in the usual style. One very important point—far more so than is generally thought—is that the pedals have an exceedingly narrow tread, as they only measure 7in. to 8in. from centre to centre—another reason of the great power the rider possesses over the machine. Regarding measurements, the Hanson we measured was the first two-track built, and some alterations will naturally be made. In future, 48in. and 20in. will be the standard sizes of the wheels. The one we saw had 50in. and 19in. wheels; length, 70½in.; centres, 30in.; width, 38in.; wheel tracks, 31in. As regards weight, the test was not a fair one, as the strong roadster we put on the scales caused them to register over 90lb.; 80lb. to 85lb. will be more like the future weight. Price, all complete, £21.

No. 91. The Hanson Front Steerer Roadster.—The machine just described overleaf, with modifications and improvements. So far as the mechanical details, working parts, &c., are concerned, it is the same, but the frame is altered into a square loop (see Fig. 71), and the pilot wheel brought to the front centre. The pedal action shown in Fig. 71

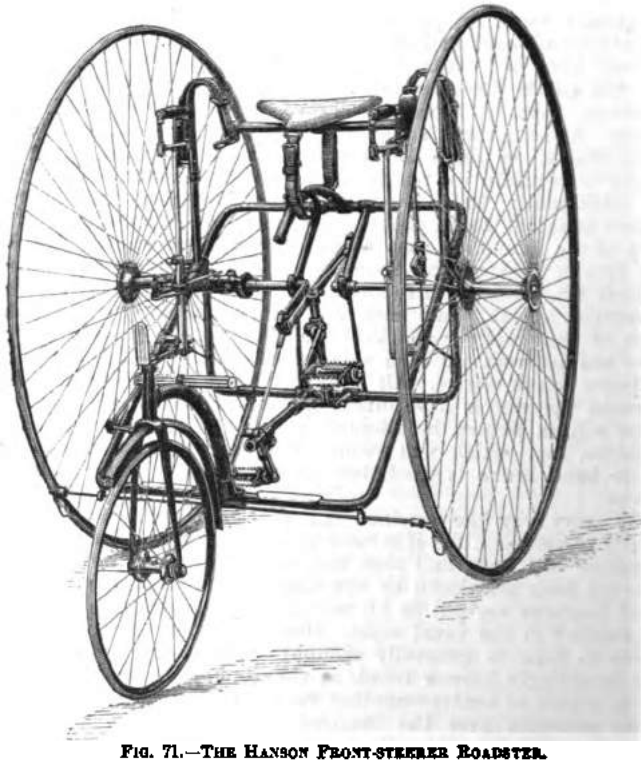


FIG. 71.—THE HANSON FRONT-STEERER ROADSTER.

was that first introduced, and will give place to that used in the two-tracker. Brake power is applied either by the spoon bar, or by the ordinary band and drum. The steering rod is put below the frame to order. In all other details it is the same as the machine previously described, including price—£24. This make closes the list of Tricycles of the Year, 1885.

ACCESSORIES.

Introduction.

GRADUAL improvement rather than striking novelty has characterised this branch of cycling industry during the past year. Happily for the comfort of riders, the vigorous rivalry between the two chief firms of saddle makers has caused greater attention to be bestowed on that most important portion of a cycle; consequently, riders reap the benefit, not only in increased ease, but in health. Lamps have reached so high a standard of perfection that there was but little room to further improve them. Those riders who take a pride in keeping their machines in "apple-pie" order have now ample opportunity for gratifying their laudable desire by the number of implements provided for that purpose, prominent amongst which is Hawkins' Tool Chest—an invaluable compendium of useful auxiliaries.

The wedding of Art and Athletics, by combining the camera with the cycle, has been of great mutual benefit. Many, both amateur and professional, photographers have taken to tricycling as the handiest, cheapest, and pleasantest method of reaching fresh fields for the pursuit of their delightful art. Cyclists also have, in vastly increased numbers, taken up the study, and hundreds of riders, instead of mere flitting memories of the scenes they have visited, have now permanent pictorial records, which are more eloquent than words to induce non-riders to not only become riders, but to go and do likewise.

Last, but not least, ladies are now patronising the pastime in such ever-increasing numbers, that outfitters are taking special pains to provide, not only suitable, but, what is of more importance to the feminine heart, becoming costumes.

Prominent amongst these firms may be noted Harris Jones and Co., and others, in London; while, in the North of England, G. E. Young and Co., of Liverpool, have designed several charming costumes for the fair sex. All these firms, and many others, make up the special C. T. C. designs—now greatly improved, and decidedly "taking" in appearance.

In general outfitting, the well-known firm of Goy is still the most prominent.

Bags, Valises, &c.

Like every other department of cycling, progressive improvement is shown in bags and other etceteras which come under this heading.

No. 1. The Telescopic Luggage Valise (J. B. Brooks and Co.).—It is exceedingly awkward to have to carry about a large bag with only a small amount of luggage, which gets shaken and jolted about. On the other hand, if only a small receptacle is carried, it may not be equal to a sudden accession of goods and chattels; this valise (Fig. 1) meets both

FIG. 1.—THE TELESCOPIC LUGGAGE VALISE.

ideas. It is a very handsome bag, of best solid leather, shaped to fit the curve of a backbone (hence chiefly suitable to the Humber type). It is divided, the lower part sliding within the upper, so that the length is adjustable from (when closed) 16in. long to 26in., by 9in. wide and 4in. deep. At the back there is a strong clasp, which goes round the backbone, in lieu of the usual strap. Price £1 6s. 6d.

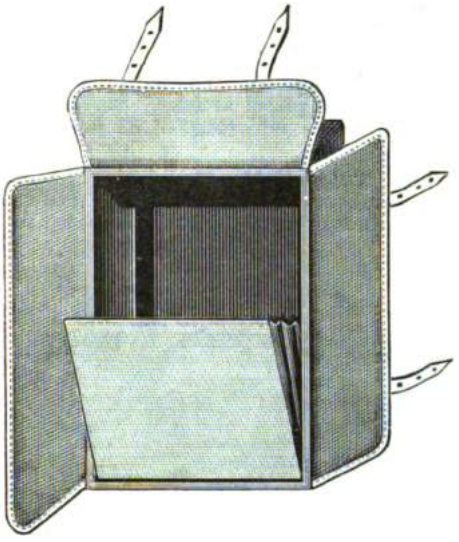


FIG. 2.—THE OPEN VIEW TRICYCLE KNAPSACK (Open).

FIG. 3.—THE OPEN VIEW TRICYCLE KNAPSACK (Closed), with larger turndown flap and outside pockets.

No. 2. The Open View Tricycle Knapsack.—Instead of having to haul out the greater part of the contents before

discovering what is wanted, as is the case with the ordinary bag, nearly everything is at once exposed to sight in the Open View (see Fig. 2). It is also made with a larger turn-down flap and outside pockets (see Fig. 3). The latter are invaluable for small and frequently required articles. Size 14in. by 10in. by 4½in. Price (Fig. 2) 18s. 6d.; (Fig. 3) £1 1s.

No. 3. The Tricyclist's Tourist's Knapsack.—This also is very useful, and is of the same size and material (waterproof tweed) as the one just described. It also opens

FIG. 4.—THE TRICYCLIST'S TOURIST'S KNAPSACK.

wide, all four flaps folding back, and has pockets at each end and on the flap (see Fig. 4). Price £1 1s., or, without pockets, 18s. 6d. Tourists *on foot* can adapt it to the purposes of an ordinary knapsack.

No. 4. The Rear Steering Frame Luggage Carrier (Lamplugh and Brown).—Suited to any machine where the spring support—generally the ⌜ pin—is sufficiently high to carry the frame, on which can be strapped a bag or parcel of any convenient size.

No. 5. The Criterion Tool Bag (J. B. Brooks and Co.).—A small but very handy bag, of a very good design. When opened, all the contents are exposed to view; they include all the tools likely to be required, so that there is no hunting after any implement. Price 5s.

No. 6. The Tricycle Bag (Lamplugh and Brown).—A small hard leather bag, 12in. by 9in. by 6in., with thick leather sides, solid ends, and a carrying handle at top, making it useful when off the machine. There is a pocket inside the flap. Another bag, which holds a large amount, is round, 14in. long, and 7½in. in diameter.

Bells and Alarums.

No. 7. The Reversible Bell.—A 2in. sleigh bell, held by an arched bracket secured to the handle bar. By simply turning it upside down all sound ceases. Price 3s.

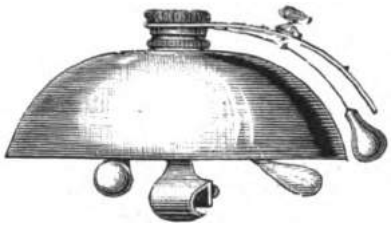


FIG. 5.—THE COMBINATION GONG.

No. 8. The Combination Gong (J. Lucas and Son).—A blending of silence or continuous ringing at will. The gong attaches to the handle bar, and, by pressing down the lever, under the dome, it can be struck at will; if the screw on the arched arm from the top be turned, the outer hammer strikes by vibration, and keeps up a continuous ringing (see Fig. 5). Prices: 3in., 4s.; 4in., 5s.

No. 9. The A B C Gong (R. Nagle and Co.).—Riders of six or seven years ago may remember the Arab Alarum; it was fully described in "Bicycles and Tricycles of the Year, 1878-9." The A B C reminds one very strongly of it. The gong is of large size, and is fixed in front of the head; a lever, having a roller on its lower end, and a hammer on the upper (see Fig. 6), projects beyond the handle-bar, and from it a cord runs to the left handle. On pulling this, the roller is pressed against the

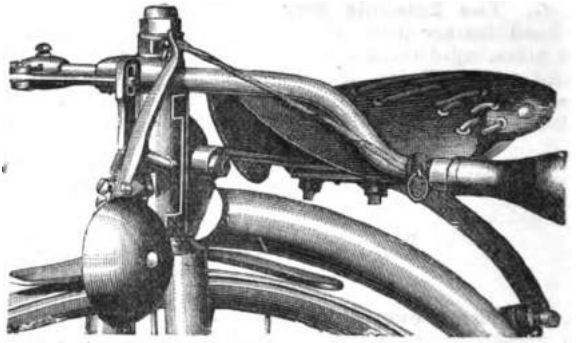


FIG. 6.—THE A B C GONG.

tyre, and the hammer made to beat violently and loudly against the gong, producing a terrific din. The price, plated, is 7s. 6d.

Distance Recorders.

Our American cousins have lately taken up this branch of cycling, and, with their customary ingenuity, have devised numerous clever recorders; most of these show figures of the actual record—by far the best plan, as no mistake can then be made in reading. The Butcher is on this principle.

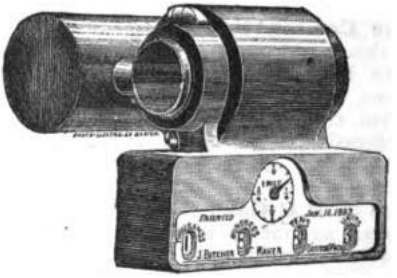


FIG. 7.—THE BUTCHER CYCLOMETER.

No. 10. The Butcher Cyclometer (Hillman, Herbert, and Cooper).—The split sleeve or tube above the dial box

is made in two parts—inner and outer; the former opens to pass over the wheel axle, to which it is firmly secured. On this there is an eccentric flange, which, when the outer sleeve and instrument are attached, operates upon a small pin which is connected with the internal machinery. Every turn of the wheel forces this pin against one of the wheels inside, without fail, and so registers—first upon the small quarter-mile dial, which gradually advances until the mile is completed; then the figure 1 appears in the unit division below; and so on up to the magnificent total of 10,000 miles (rather an improvement on most of the wretched little English affairs, which are hardly equal to recording a club run). The figures come and go in the manner which is now being advocated for clocks to show "railway time." The Cyclometer is connected with a counterpoise, which so balances it, that the face is always upwards; or it can be made to act in conjunction with a hub lamp. It is a pity the Butcher (see Fig. 7) is so expensive, as it would be sure to command a large sale if it could be put on the market at a more reasonable price. At present it costs £2 5s.

Lamps.

Comparatively few additions have been made to our light-givers. The firms of Lucas and Son, and Salsbury and Sons, continue at the head of affairs, and the former has lately gained an important action against a firm who were making lamps with a hinge barrel. Messrs. Platts, Kitson, and others, also produce good lamps.

FIG. 8.—THE PEERLESS HEAD LAMP.

No. 11. The Peerless Head Lamp (W. Platts).—A well-made specimen, of the ordinary variety, with red and

green side, and large front glass (see Fig. 8). It has no special features, but will be found cheap and serviceable. Price 6s. 6d.

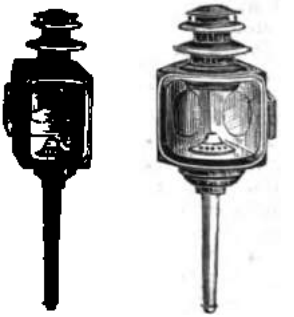


FIG. 9.—THE NEWHALL TRICYCLE LAMP.

No. 12. The Newhall Tricycle Lamp.—An adaptation of the carriage candle lamp, and of very handsome appearance. It is made in two varieties (see Fig. 9). The long tube below the body of the lamp contains a candle, pushed up by a coil

FIG. 10.—THE NO. 1 MONARCH HEAD LAMP.

spring. At the top there is a double dome, and two inner sides of the body are highly plated, with a rounded bevel glass

front, which gives a very wide arc of light. Plated, the lamps are £1 1s. per pair; or, japanned, 15s. Another type is made with square side glasses; a dark shadow is thrown in the centre. Price, japanned, 14s. per pair. For 3s. extra the lamps can be made to burn either oil or candle.

No. 13. The No. 1 Monarch Head Lamp (H. Millar).—A fine light-giver, with large oval glass in front, an enormous reservoir for oil, and a bright clear reflector at the back. The red side lights show from both back and front. In order to allow air to circulate, the reservoir is raised slightly above the floor of the lamp. It takes a wick—adjustable from the outside—1¼in. wide, and provision is made for carrying a small supply of petroleum, for touching up the wicks when lighting, which operation can be performed from the side, without opening the door (see Fig. 10). Price 7s. 6d.

No. 14. The Winner Hub Lamp.—A small size, and plainer lamp; plated reflector and red "danger" glass at the back. Price 7s. 6d.

Saddles and Saddle Springs.

Seats have—very rightly—entirely disappeared from the market, and are only fit for use on invalid carriages. Under no other circumstances should any rider be induced to use one.

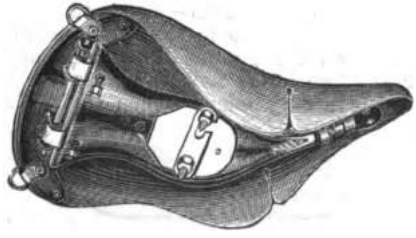


FIG. 11.—THE LEVER TENSION SADDLE (Under View).

No. 15. The Lever Tension Saddle (J. B. Brooks and Co.).—A further improvement on the capital saddle we

noticed last year. It will be remembered that this firm made a brilliant *début* at the 1883 Stanley Show, and ever since have held a very prominent place. They were the first to recognise the necessity of good deep side flaps, to save the legs from friction and rubbing against the generally sharp edges of the old-fashioned saddles. Formerly, the greatest evil in saddles was the constant stretching they underwent, for which there was no remedy. Last year the tension principle was introduced, by which the stretching could be taken up by screwing the nuts on the under side (see Fig. 11). This elongated the stretching frame, and brought the leather back to its original state. This year the idea has been further improved, and it now has a triple tension, which effectually tightens the saddle in all directions. Additional comfort is gained by the saddle being well padded, which gives a good and firm shape to the seat; and further ease is gained by double springs being put under the scroll-plate, below the back of the saddle. It is depressed in the centre, at the top, to avoid undue pressure (see Fig. 12).

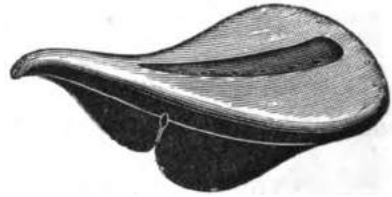


FIG. 12.—THE LEVER TENSION SADDLE, WITH DEPRESSED SEAT.

One very important, but simple, improvement, is now applied to all saddles made by the firm—the Patent Bar—which is employed to fasten the saddle to the spring, more particularly in bicycles. Every rider knows the trouble and annoyance of the old bar and two nuts; now the cross bar is made this shape (see Fig. 13); only one nut has to be slacked, when

FIG. 13.—THE PATENT BAR.

the bar is removable, and the saddle can immediately be lifted off; it is secured as easily. A small spanner, to fit these nuts, accompanies each saddle. The saddle is one of

the very best made. The price is, according to size, 10s. 6d. or 12s. 6d.

No. 16. The Simplex Saddle.—Somewhat like the one just described, but with less complication, and without the springs to the end of the scallop-shaped frame (see Fig. 14).

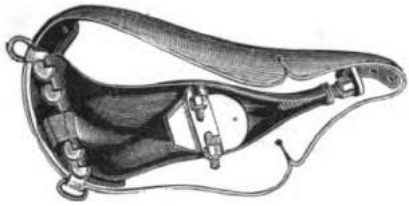


FIG. 14.—THE SIMPLEX SADDLE (Under View).

Adjustment is made from the front. Most of these patterns are provided with hook-rings at the back (see Fig. 14) for attaching the straps of bags to. Prices 9s. 9d. and 11s. 6d.

No. 17. The Long Distance Tension Saddle.—Deep turn-down flaps (see Fig. 15), and very elastic. The leather

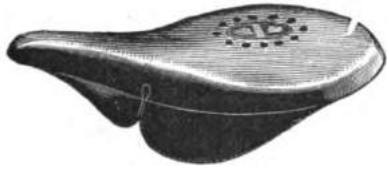


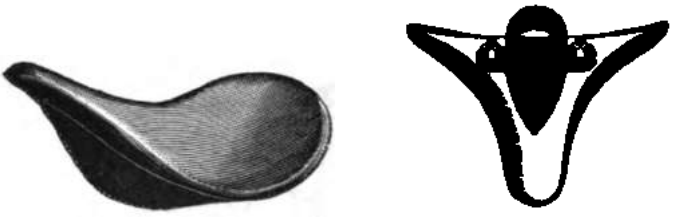
FIG. 15.—THE LONG DISTANCE TENSION SADDLE.

is simply stretched and suspended by the lever tension frame below. It is very comfortable, and largely used by those who go in for long distance rides; hence the title. Prices 9s. 9d. and 11s. 6d.

No. 18. The Long Distance Saddle.—A cheaper form, without lever tension or suspension, but the same in other details.

No. 19. The Racer Saddle.—Until last year makers seemed to think that anything was good enough for racing

men, and most of the saddles were wretchedly uncomfortable. At last, however, the march of improvement has reached even this section of saddlery, and the plain, light, but easy saddle, illustrated at Fig. 16, has been produced. Instead of the



UPPER VIEW. UNDER VIEW.

FIG. 16.—THE RACER SADDLE.

old sharp edge, there is a good gusseted flap, and the saddle is fairly suspended, giving the required rigid seat, but easy enough to overcome the absence of a spring, as the clip (see Fig. 16) merely passes round the backbone, saving weight, and bringing the rider nearer his work, a considerable gain when a man is riding a large machine. Price only 6s. 6d.

No. 20. The Crocodile Lever Tension Saddle.—Made of genuine crocodile hide (see Fig. 17), which improves greatly

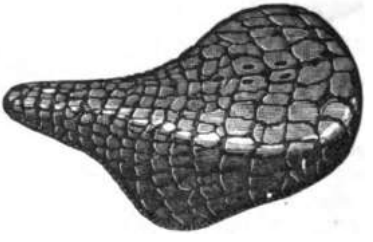


FIG. 17.—THE CROCODILE LEVER TENSION SADDLE.

in appearance by constant wear. For those who desire novelty, and like to have some easily recognised character about their machine, it is to be recommended. The price is: 9½in. by 11in., 14s. 6d.; 10½in. by 12in., 17s. 6d.; 10in. by 10in. (for ladies), 16s. 6d. A large variety of other saddles are also made by the firm.

No. 21. The See-Saw Saddle (Ashford and Winder).—Something quite new, introduced by a very old-established firm of high standing in the (horse) saddle trade. Running round the back of the saddle there is a long spring, lying against the lip of the saddle flange, to the side of which the ends are attached. Running towards the rear centre there is, on each side, a single horizontal curl; then, just above that, it is again secured to the saddle frame. Three more curls, and the central portion is bent up and secured to the frame, the whole being in one. Before being made into saddle form,

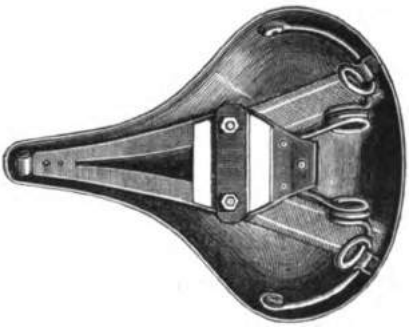


FIG. 18.—THE SEE-SAW SADDLE.

the leather is subjected to very great pressure, to prevent stretching afterwards. A small iron carriage in the fore end holds the metal frame which supports the stout webbing at the back. In the centre, a light frame and cross-bar is fixed, for attaching it to the spring of a machine (see Fig. 18). The construction permits a rocking, or "see-saw" action to each side, allowing more power being put into the pedals, without any friction between the rider and saddle. It is very pleasant and easy in use, and ought to be better known. To suit those who use close-built machines, it can be made to fit direct on the backbone, and, in that position, ought to be very valuable on racers, where every ounce of power tells. The price is 10s. 6d.

No. 22. The Combination Saddle (J. R. Whitehouse and Co.).—Suspended leather on a web foundation. The under frame consists of a T-shaped piece of metal, pivoted at the back, with each arm resting on a coil spring, beneath which is a broad leather pad (see Fig. 19). It is very well stuffed, and is

more than usually comfortable, and gives, to a certain extent, a rocking action. The rider who purchases a Combination is

FIG. 19.—THE COMBINATION SADDLE.

sure to be well pleased with his bargain. Prices: Bicycles, 8s. 6d.; tricycles, 10s. 6d.

No. 23. The Buffer Saddle (Lamplugh and Brown).—A short time ago we had the pleasure of inspecting the extensive works of this noted firm, and the process of manufacture of this and other types of saddles, for which they have gained so good a name. It will be seen from the illustration (see Fig. 20) that the saddle is a very different affair from

FIG. 20.—THE BUFFER SADDLE.

the wretched things in use a few years ago. Comfort, and freedom from objectionable pressure, has been carefully studied. The under frame is ⏜ shaped, with a tension screw at each joint, giving triple adjusting power. Beyond the ⏜ there is a ⏜ shaped support at the back. This is covered with a thick rubber buffer (see Fig. 20), over which the

saddle leather is stretched. In the centre it is cut away, to avoid the injurious pressure common to the old type. In front, the "nose" is turned down, and broad deep flaps protect the legs at the sides. Altogether, it is one of the best and most comfortable saddles ever put on the market. The other types are the same as described last year.

No. 24. The Lace Saddle (R. Nagle and Co.).—Introduced early this year, this saddle attracted attention by reason of its peculiar construction. It will be seen (Fig. 21), that the front and rear portions of the saddle leather are joined by laces, which do not, as would appear to be the case, cut or

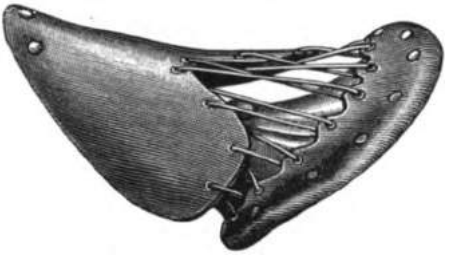


FIG. 21.—THE LACE SADDLE.

hurt one, but render the saddle adjustable, to take up any stretching caused by wear, and make an extremely comfortable seat, which may be suspended from any hard part of the framing. Perineal pressure is avoided, and the saddle is well worth the 10s. charged.

No. 25. Starley's Patent Saddle Tilt.—As in other things, tastes vary as to the position, or rather, the cant, of the saddle. All can now be suited, as, with this ingenious invention, the saddle can be placed as required — level, inclined forwards, or raised in front and depressed at the back. This is accomplished by adjusting an eccentric holder between the saddle and spring. It can be fitted, at a very small charge, to nearly any saddle.

No. 26. The Matchless Sliding Spring (W. Bown).—This capital spring will prove of great value to the majority of tricyclists. Owing to the ordinary saddle being fixed, the rider cannot employ his weight so much as is desirable. With this spring he—or she—can at once change their position, by simply pressing down the small handle, and either

drawing forward or pushing back the seat. Thus, in ascending a steep hill, it is advisable to have the weight as far forward as possible—in descending, the opposite. In order to facilitate the action, the saddle, in addition to resting on coil springs (see Fig. 22), which greatly reduce the vibration, is mounted on a carriage, having four grooved wheels, working between parallel bars (see Fig. 22); the whole rests on an

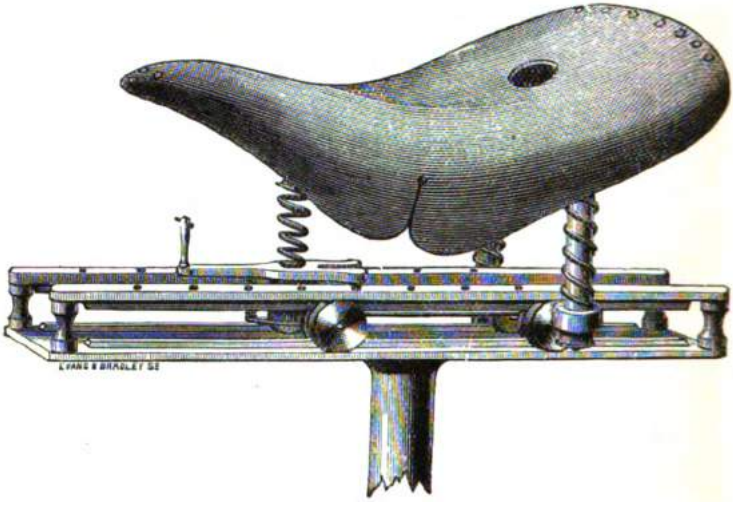


FIG. 22.—THE MATCHLESS SLIDING SPRING.

upright pillar, instead of the usual ⌐ pin. On the upper face of the bars there is a series of holes, in which the spring clip works when regulating the position of the saddle. Mr. Salaman, sen., has done so much for the cycle trade, and put into it so many excellent inventions, that we are glad to note that his ability in this direction has been inherited. Price £1 1s.

No. 27. Harrington's Special Adjustable Tricycle Spring (J. Harrington).—A recent adaptation of the Arab spring to suit different weights. In front there are two parallel rods, joined to the pin going through the neck of the Stanley (or similar) head. It passes under the saddle, takes a double curl, the ends being held by an adjustable boss on the backbone. By altering the position of this, the

spring is made more or less elastic (see Fig. 23). Any saddle can be used, but it can only be fitted to Humber type machines.

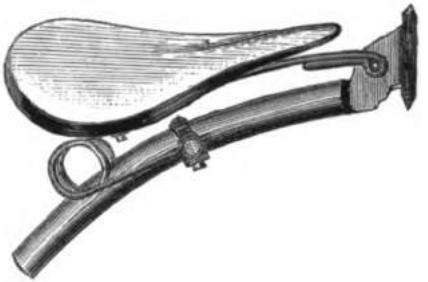


FIG. 23.—HARRINGTON'S SPECIAL ADJUSTABLE TRICYCLE SPRING.

No. 26. The Arab Cradle Spring. — Each spring consists of but a single piece of steel rod, either $\frac{13}{32}$, $\frac{11}{32}$, or $\frac{11}{31}$ in. in diameter, according to the rider's weight. It is,

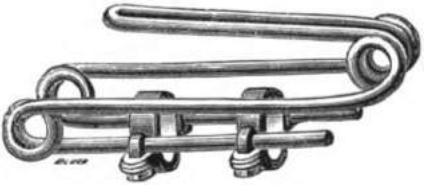


FIG. 24.—THE ARAB NO. 1 SPRING.

by powerful machinery, bent into the shapes shown at Figs. 24 to 26. The forms shown are adapted to various machines,

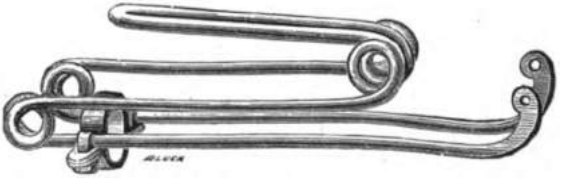


FIG. 25.—THE ARAB NO. 2 SPRING

thus: No. 1 (Fig. 24) is for attaching to the ⌐ rod; No. 2 (Fig. 25) is suitable to Humber type machines which have a

backbone like a bicycle; No. 3 (Fig. 26) goes on upright rods where horizontal adjustment is not made.

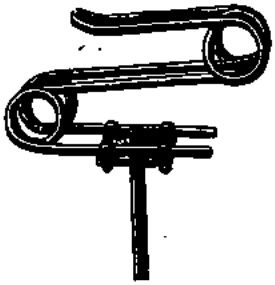


FIG. 26.—THE ARAB NO. 3 SPRING.

The construction of the spring permits free play in all directions, allowing enough side roll to put extra power into the down thrust of the pedals, while in ascending hills the rider can go forward to his work, or sit back when running down inclines. The price of the first three patterns is 15s. each, the invalid seat being, complete, £1 13s. 6d.

No. 29. The Arab Coil Spring.—Instead of side springs under the saddle, the wire composing the spring is twisted into the shape of a cone, which gives an "all round" motion to the saddle, allowing play in all directions.

No. 30. The Illston Patent Spring (Illston and Co.).—Although fitted as a speciality to the North Mail bicycles and (Humber type) tricycles, this spring can be used on any machines of the latter class. It is fastened to the neck in the usual way, and consists of the usual flat steel, but, at the tail, it is hinged to a triple curl—*à la* Arab—secured to the backbone. It gives an easy pleasant motion to the rider.

Various.

No. 31. The Block Ball Pedals (W. Bown).—Instead of the usual round rubbers for the feet, the pedal has a flat face, with square rubber blocks, slightly slanting toward the pedal pin, so that the foot has always a firm surface to rest on. Price £1 1s. a pair.

No. 32. The Lilwall Patent Hub (A. Lilwall and Co.).—In forming a tangent wheel, the spokes have to be twisted at the hub, thereby straining the grain of the wire and weakening it. By this invention, however, the evil is avoided, and, instead of the spoke being bent, the hub is corrugated, the edge of the flange being pressed into the shape shown in the illustration (see Fig. 27). The hub

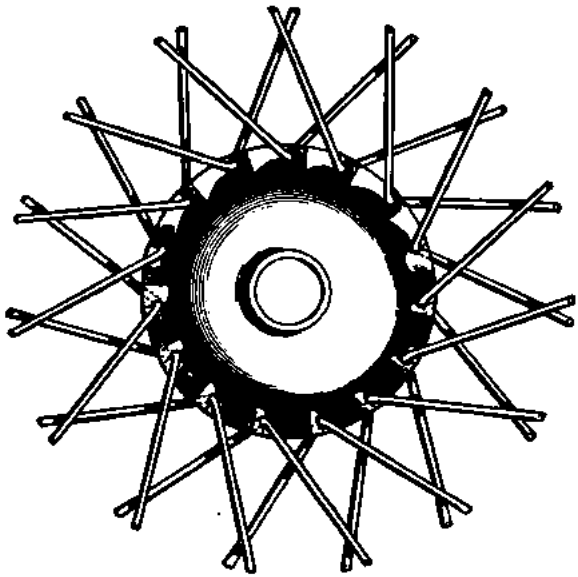


FIG. 27.—THE LILWALL PATENT HUB.

is of a good shape, and the spokes can be carried at right angles through the flanges. To all ordinary sized wheels sixty spokes (of 13 gauge) are put in, the outer ends, which screw into the nuts within Warwick's hollow rims, being protected by pipe nipples. The spokes cross twice (see Fig. 27). At the first cross they are soldered and bound together, at the second fastened by fine wire, so that the whole makes a very strong but light wheel.

No. 33. The True Tangential Wheel (St. George's Foundry Company). — Ever since the first tangent wheel

was brought out by Haynes and Jefferis, early in 1876, followed by the Acme rigid wheel, there have been many endeavours to form a rigid wheel. Within the last few years

FIG. 28.—THE TRUE TANGENTIAL WHEEL.

the tangent principle has again come into favour, and, although scores of unsuccessful attempts have been made to perfect the tangent principle, this wheel has been built up with something

approaching the theory of a tangent—*i.e.*, "a right line, which touches a curve, but which, when produced, does not cut it. The result is that, on seeing the wheel for the first time—so truly is the tangential system carried out—the spokes appear to run from rim to rim, merely passing by the edge of the hub flange. A close inspection will reveal the fact, that each spoke is headed in the light steel hub, and carried at a right angle to the felloe, being exactly straight, and, when upright, perfectly perpendicular, not slanting, as is the case with many so-called tangents. The effect can be partly seen by referring to Fig. 28. The consequence is, that there is no cross or twisted strain, and, for the first time, we have a wheel which is really suspended, so that each spoke, instead of being a sort of lever, acts on the rim or felloe by the direct pull of a straight spoke, thereby preventing any twisting or loss of power at the hub. The head of the spokes rests in a countersunk hole drilled in the steel flange; the latter measures—extreme depth, 4½in.; between spoke heads, 3⅜in.; width, 5⅛in. The spokes cross for the first time about 3in. from the hub, where they are bound together with wire and soldered, thus forming what is equivalent to a second hub, 10½in. in diameter; beyond this they again cross, and are similarly treated, making a third or outer hub of 22½in. This arrangement adds immensely to the strength of the wheel. The spokes are of 14 gauge (·083in. diameter), and are, by a long pipe nipple, screwed into nuts within the hollow felloe. A spoke can be removed without disturbing the rubber. Altogether, it makes up a grand wheel, and one that can be fitted to any machine, and is employed in the construction of the Rapid bicycles and tricycles.

No. 34. The Norpa Waterproof Apron (B. Benjamin and Sons).—Designed originally for equestrians, the Norpa has been adapted for tricyclists. It consists of a waterproof sheet, measuring, folded in two—when it is a "leg of mutton" shape—32½in. in the longest, and 25½in. in the widest part. Apart from being an apron, it (for gentlemen) is made to fold round each leg; dress reformers would doubtless recognise in it something akin to the divided skirt. At the top there is a safety catch to attach to the waistcoat, and buttons to secure it at the sides; it then forms knickerbockers, of the shape of loose Turkish trousers; which not only keep the legs perfectly dry, but also the lower part of the body, which is generally unprotected, owing to the space between the top of ordinary leggings and the bottom of the jacket. Although not pretty to look at, it is thoroughly efficient, and can be rolled up into a small parcel. For ladies it is similar, but is attached rather differently. On horseback it

is still more valuable, and, attaching to the saddle in front, protects the parts of the legs most exposed, and also acts as a saddle cover. The price, complete, is 15s.; by post, 15s. 6d.

No. 35. The Abingdon Patent Single Link Chain (The Abingdon Works Company, Limited).—This engineering firm is well known for turning out the very highest class of work, and may be depended on for the most absolute accuracy. If 10,000 links were selected at random, they would all be found true to the *one-thousandth of an inch* ($\frac{1}{1000}$in.). This is of imperative importance. Many common chains are used, which would not stand even a comparatively rough test of measurement; consequently, they considerably increase the friction, and require endless adjustment, which proves only temporary when effected. Another advantage in the Abingdon is its simplicity, there

FIG. 29.—THE ABINGDON PATENT SINGLE LINK CHAIN.

being only two parts in it—the link and the pin. The studs, or pins, fit into the cross tube, and bear the whole strain on the thick portion; the ends merely hold the links in position. The links are made in two sizes, a pitch of 1·268—from centre to centre—and 1in. dead; the former is 1s. 5d., the latter 1s. 9d. per foot. Adjustment—independent of that effected by the machine frame—can be made by removing the connecting pin (see Fig. 29), and filing off one end of a rivet; one link is then removable, and the length is reduced by an inch, or 1·268in.

No. 36. The Abingdon Balls, for Bearings.—These also are beautifully true, and are all tested to the $\frac{1}{1000}$th of an inch. We tried several by a standard gauge. They would exactly pass through the hole marked ·187in., but could not be forced through ·186in. The Abingdon Works Company also make several other parts, all of equal merit.

No. 37. Edge's Patent Foot Brake (Edge Brothers).—Humber type machines are rather weak in brake power, having

to rely upon the bicycle-like grasp lever in front of the steering rod. This is often insufficient, and back pedalling must be resorted to; besides which, the force being applied high up on the axle drum, often produces involuntary dismounts. With the Edge brake, which may be used separately, or applied in conjunction with the ordinary lever brake, the checking force acts on the lower chain pulley, which has attached a (concave) bevel drum, with deep coned edge. Facing this there is a corresponding plate, with a (convex) bevel flange, which slides upon the crank shaft. On the outside of the sliding plate there are a series of strong inclined ratchet teeth; these are operated on by similar fixed teeth secured to the bracket ball

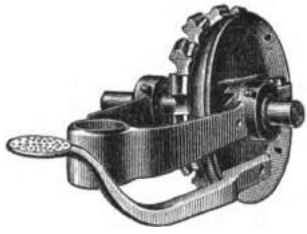


FIG. 30.—EDGE'S PATENT FOOT BRAKE.

bearing which carries the crank shaft. Attached to the sliding plate there is a foot lever (see Fig. 30). Pressing this down causes the teeth to slide up the inclined ones on the chain pulley, and press the convex cone (which is leather-lined) into the concave cone. The force can be regulated to the greatest nicety, and, as soon as pressure is removed, a spring draws back the sliding plate from contact with the chain pulley. As may be easily imagined, great power can be exerted, without the, often disagreeable, results of the old plan. Not only Humber shape, but almost any central gear machine, can be fitted with this brake, which is not, be it remembered, dependent upon any strap or series of light rods. All parts bearing strain are simple and strong. It can be made to suit any chain or gearing, if the lower bracket and chain pulley are sent to the inventors. When this is done, we would recommend riders to keep both brakes; a reserve brake is of the greatest benefit, and conduces more to safety than anything else. Price 25s., complete.

No. 38. Combination Pliers (J. Lucas and Son).—A *mul-*

tum in parvo tool; it includes wire cutters, spoke tightener,

FIG. 31.—COMBINATION PLIERS.

turnscrews, and wrench for small nuts (see Fig. 31). It is now included in the King's Own Tool Bag.

No. 39. Wheel Washer (G. Singer). A simple but useful addition to the outfit of those cyclists who like to keep their machines clean. It consists of a trough, with rollers

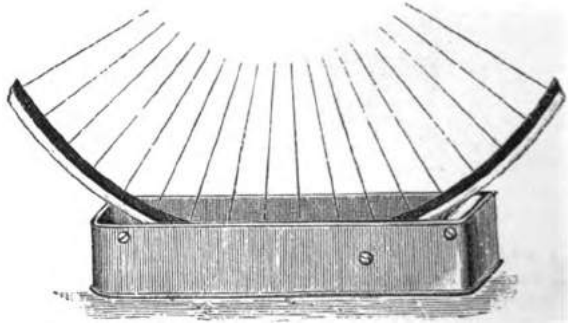


FIG. 32.—WHEEL WASHER.

inside (see Fig. 32), so that the wheel may be turned freely. Aided by a hard brush and water, all traces of dust and dirt are soon removed. Price 7s. 6d.

No. 40. Sharp's Metal Polishing Liquid (H. Sharp).—We have, on several occasions, used this remarkably effective brightener. When rubbed on plated goods its effect is instantaneous. The dim tarnish gives way to brightness, and the prize cup, machine, &c., is made to look like new. Price 1s. per bottle.

No. 41. The Camera Case (Coventry Machinists' Co.).—A light, well-made waterproof case, measuring 12in. by 7in. by 4in., or, of another shape (see Fig. 33), 7¼in. by 6¾in. by 6in.

Either holds an excellent camera (by the Stereoscopic Co.), dark cloth, top of tripod, six dark slides, supply of plates, and the necessary accessories for the practice of the art. There is a neat handle at the top of the box, so that it can be

FIG. 33.—THE CAMERA CASE.

either carried by hand or attached to the machine. The folding tripod is also easily carried, or an arrangement can be added by which the camera can fix direct on to the machine. It is particularly suited to the machines made by the Coventry Machinists' Co. The cost is not yet certain, but will be very moderate.

No. 42. Letts's Route Book (Letts, Son, and Co., Limited).—In order to make the work, "The Roads of England and Wales," more convenient, it has, with considerable additions, been split up into three divisions—Southern, Midland, and Northern Counties—as the majority of rides are confined to one or other of these divisions. All superfluous matter has been omitted (such as condition of roads, objects of interest, &c., which are given in the larger work), but special attention has been paid to distances, in both directions, and between each village. Every cross or divergent road is carefully noted, and where it leads to clearly specified. In addition to the main lines, there are numbers of cross routes—long and short. In fact, it will prove an invaluable guide to touring riders. Only Part I., "Southern England," has yet been issued, but the others will soon be ready. It is of a handy size (6½in. by 4½in. by ½in.), and is bound in a fairly strong limp cover, which will not be damaged by crushing or bending. Price 1s.

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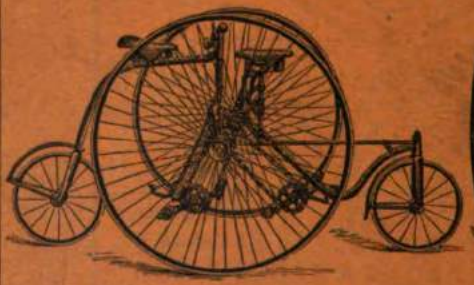

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