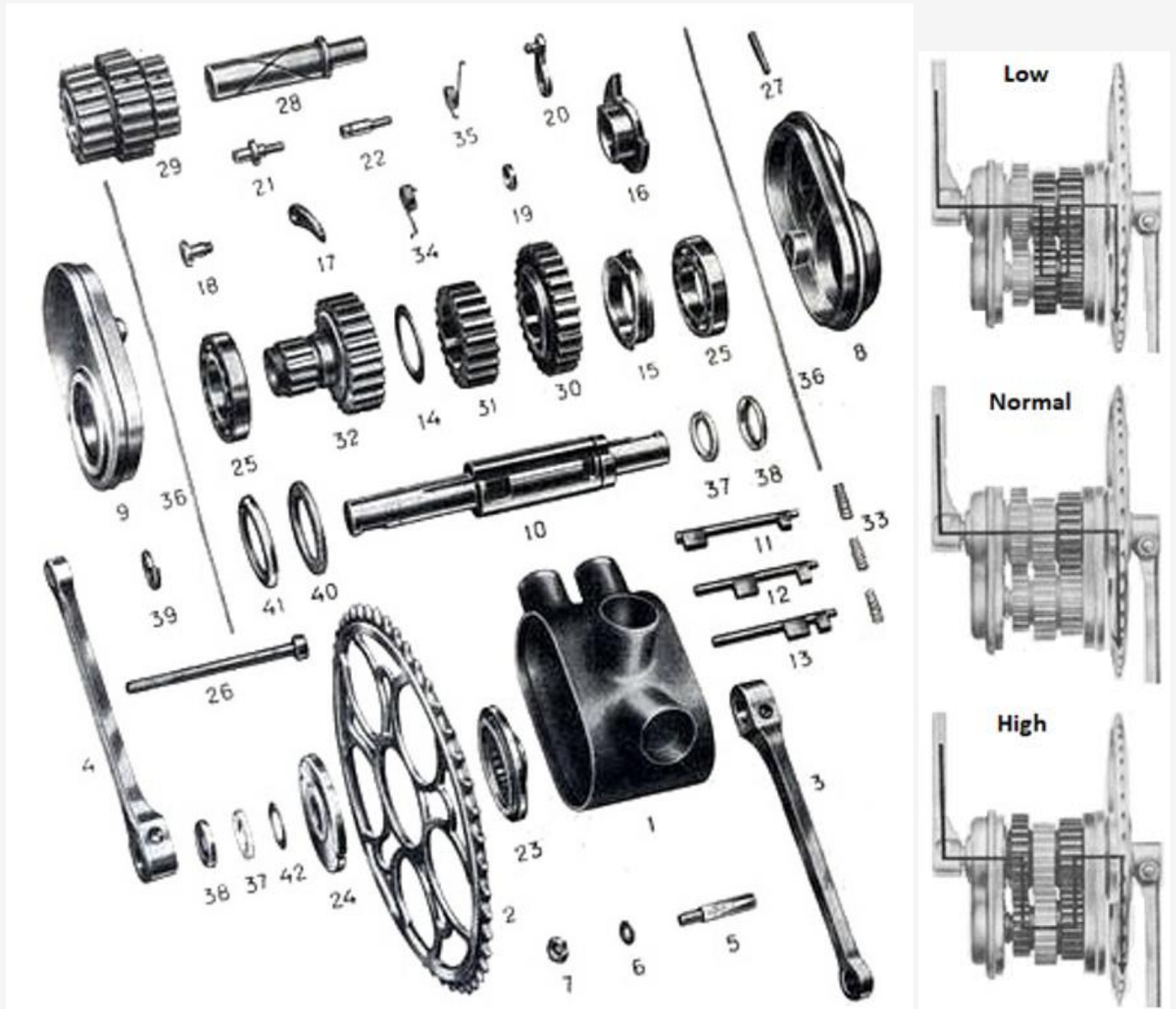


## Phoebus Mutaped 3-speed bottom bracket gears



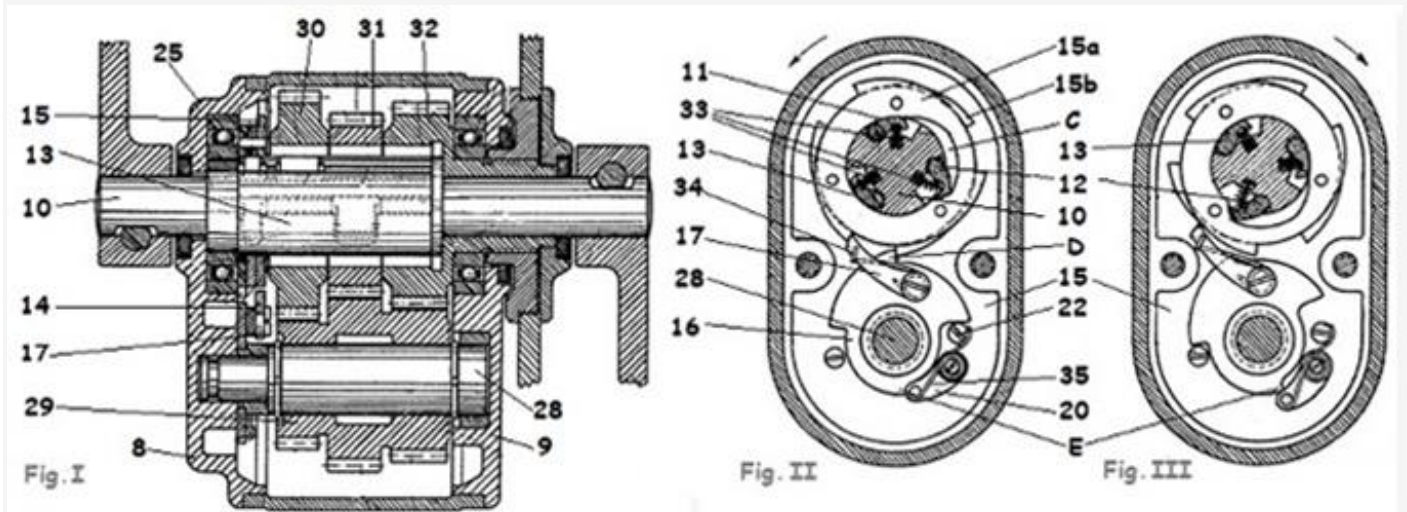
**EXPLODED VIEW AND PARTS**

**SHIFTING SCHEME**

The Swiss company in Bienne called Phoebus (later Sport A.G.) developed 3 speed bottom bracket gears in the 1930's. The design was called the Mutaped. It remained in production for 20 years and was quite widely fitted to Swiss and Dutch bikes. One simply pedaled backwards to shift the gears 123-123 etc. The downside to their approach was the need to back-pedal through 2 gears to shift down (say from 3 to 2). The other practical disadvantage was added uncertainty about which gear was one in at a stop. The gears are -23,5% (low) and +32% high, so overall 173%; for most transmissions this will result 4m, 5m and 7m development.

The gears need no oil, but whenever the gearbox is taken apart, it should be cleaned and fitted again, using 50cc of Mutaped grease.

Fig. I shows the three-speed gearbox "MUTAPED" in cross-section. Fig. II & III show the actions of the shifting mechanism moving the drive pawls, shifting from "High" to "Low" gear.



There are three recesses in the bottom bracket axle (10). Here in lie the drive pawls (11, 12 and 13) regularly distributed over the circumference of the axle (also see Fig. I and Fig. II)

The drive pawls (11, 12 and 13) consist of a wide and a narrow pawl, both connected to the same shaft, like a key. The wide pawls are pushed up by small springs (33)

The narrow pawls are located in the plane of transfer plate 15. The wide pawls in the recesses of the axle can engage with the sprockets (30, 31 and 32 ) in which they are located.

Gear 32 is always connected to the chainwheel (2) via lock ring 24 and bearings 23 and 25. If we engage sprocket 32 using drive pawl 11, we also connect it to the bottom bracket axle! Now we are in "normal": the second gear; connecting sprocket 31 gives the low gear and 30 the high gear.

A fixed sprocket block (29) is attached to the auxiliary shaft (28). The opposite teeth are "in constant mesh"; the sprocket block 29 transmits the forces to sprocket 32.

The pawls are held in place by the left ball bearing (25) on one side and by the guide plate (14) on the other side. The wide pawls are pressed upward by spiral springs (33), (see Fig. II and III). The axle 10 is mounted directly in ball bearing (25) on one side, and in an identical bearing on the other side, drilled out in gear 32. Both ball bearings are placed in plates 8 and 9, which close the gearbox.

The real shifting is done by parts 15a/b and 16, see Fig. II. They control the narrow pawls of the drive pawls 11, 12 and 13, and are placed rotatable on the transfer plate (15). This plate is composed of two locking discs 15 a and b, riveted to each other. The locking teeth are directed in opposite directions.

The hole in the assembled plates 15, is provided with an inlet (c), which makes it possible for one of the three narrow pawls, and thus one driver pawl, to deflect upwards and into the space of the inlet C. It is constructed in such a way that just one narrow pawl comes free, takes the wide pawl with it, and engages the gear.

A locking disc (16) is attached to the auxiliary shaft (28), with a locking pawl (17), which is pressed by a spring (34). This locking pawl comes into contact with the locking cams of switching plate 15a.

The disc itself can be rotated up to the support point (bolt head 22). The tooth (D) is a protrusion of disc 16, and rests against the transfer plate (15). Opposite this tooth (D) is a tooth (E), against which the locking pawl (20) abuts, pressed by a spring (35). In Fig. III, the tooth (D) is out of the reach of transfer plate 15b, (i.e. the lower one), and the pawl (20) has been slid over its support point (E), whereby the spring pressure acting on this pawl has been overcome.

By backpedaling the catches are released. By pedaling forward, the wide pawl (in Fig. III i.e. pawl 12) engages in the next gear 31, i.e. in the light gear.



Neue Zésar A.-G.

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Fig. 1.

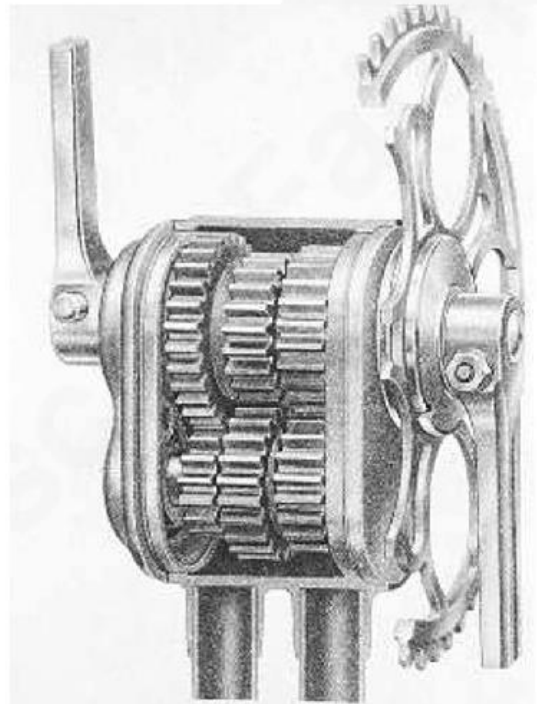
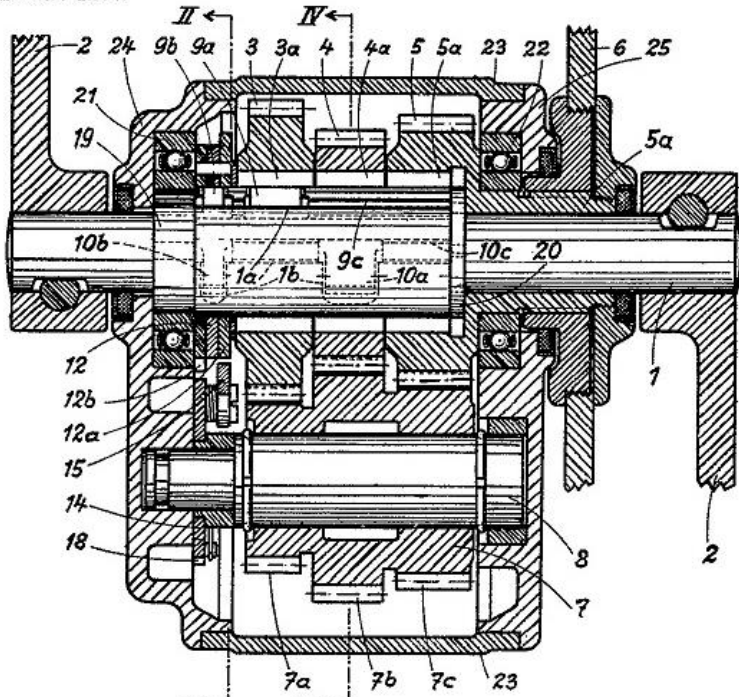
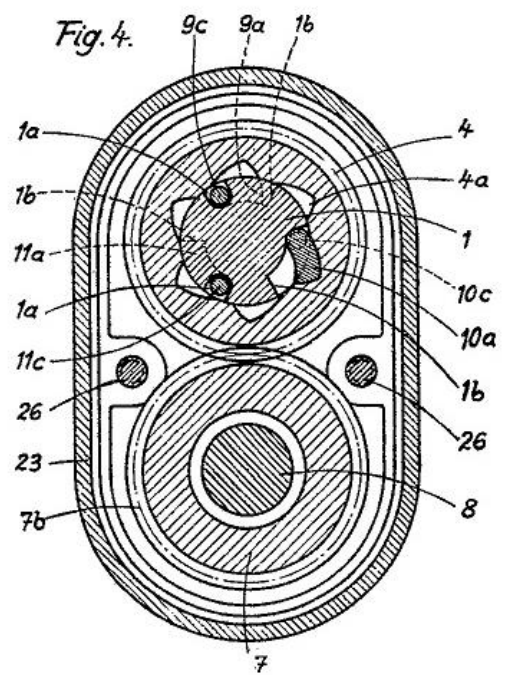
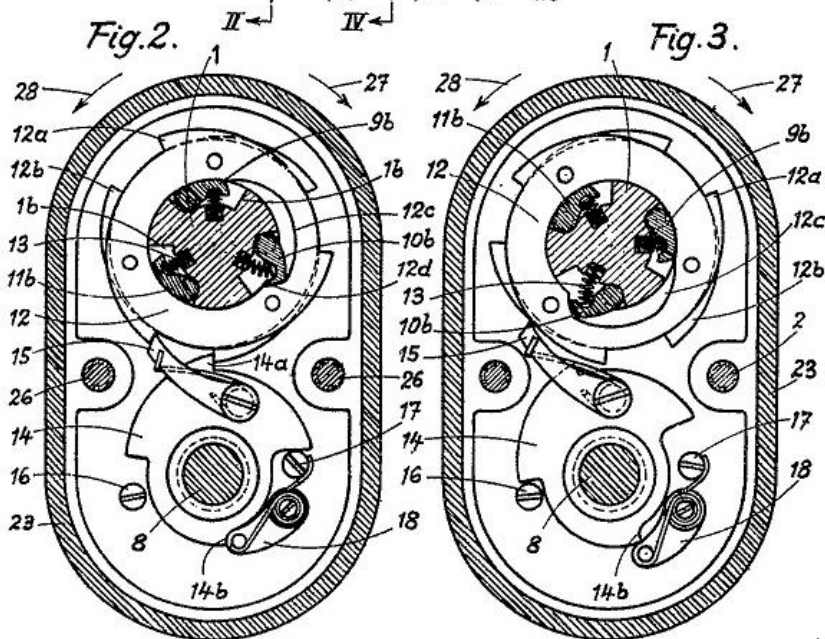
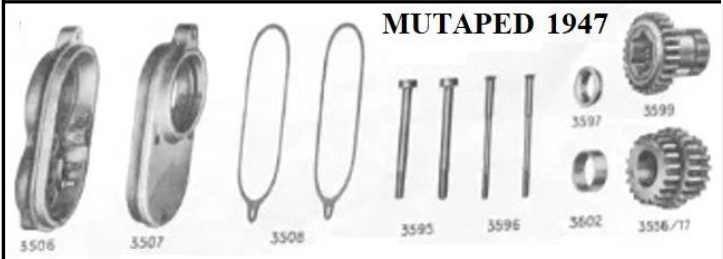
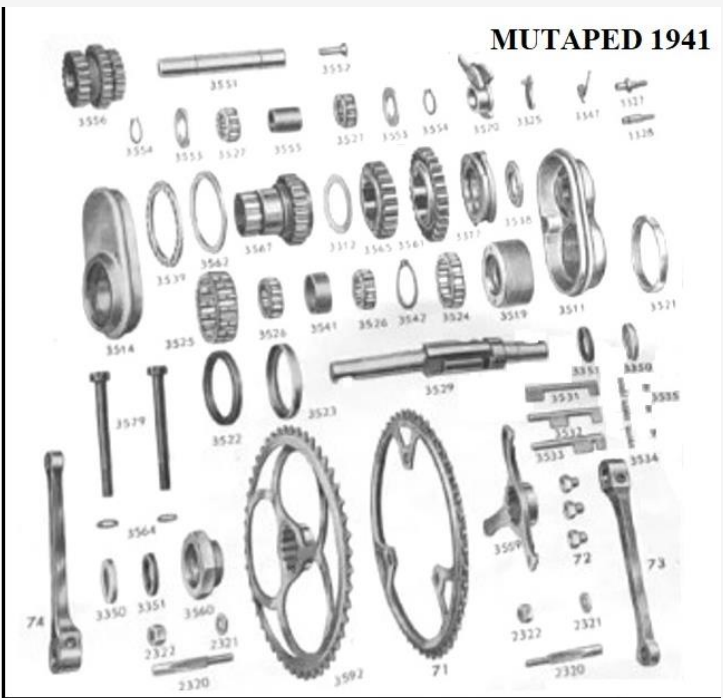
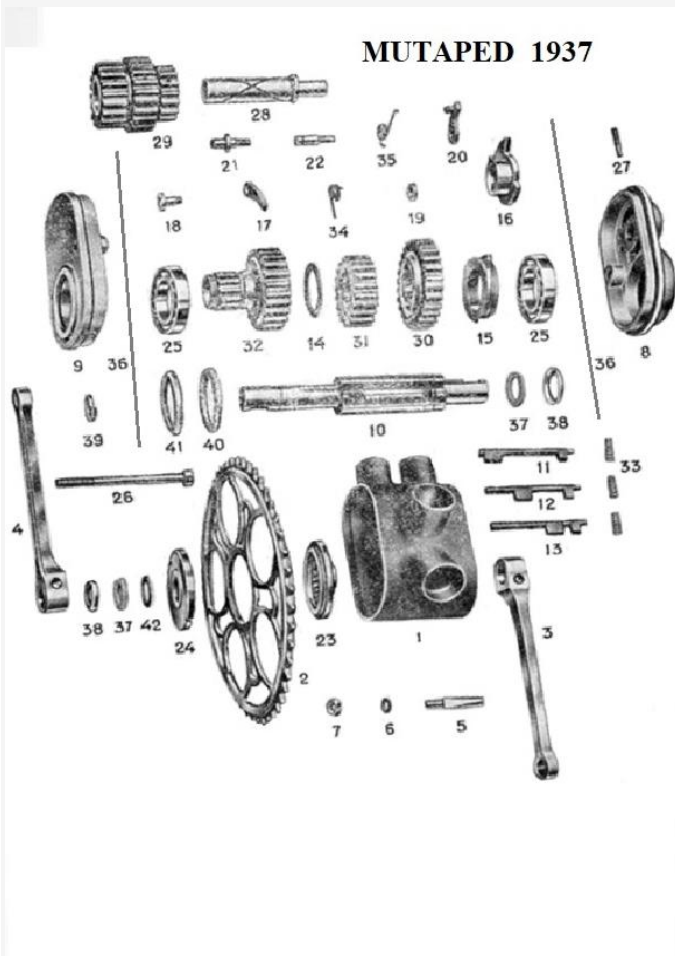


Fig. 2.

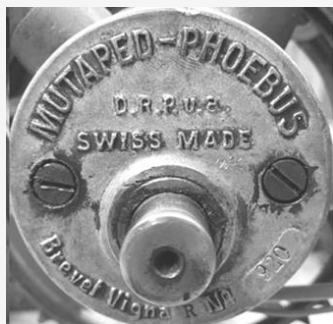
Fig. 3.

Fig. 4.





As we can see there have been some modifications in the design in 1941, and again in 1947. This model was according to the new CH253158 patent. The bracket remained the same.



The 2-speed from 1935.



The 1937 bracket used 2 bolts.



From 1947 on, they used 5 bolts.



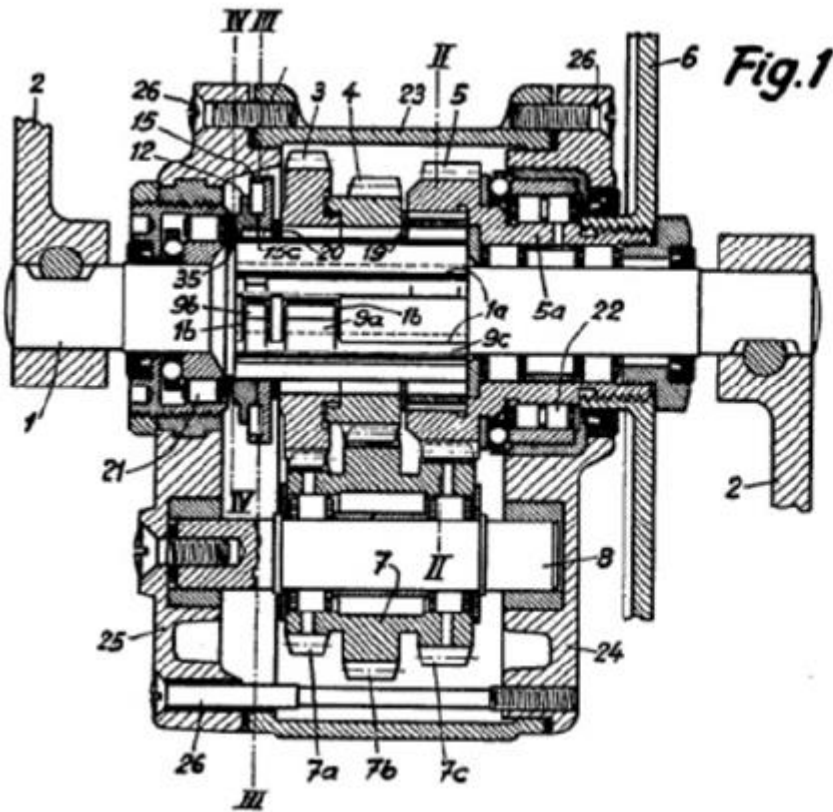


Fig. 1

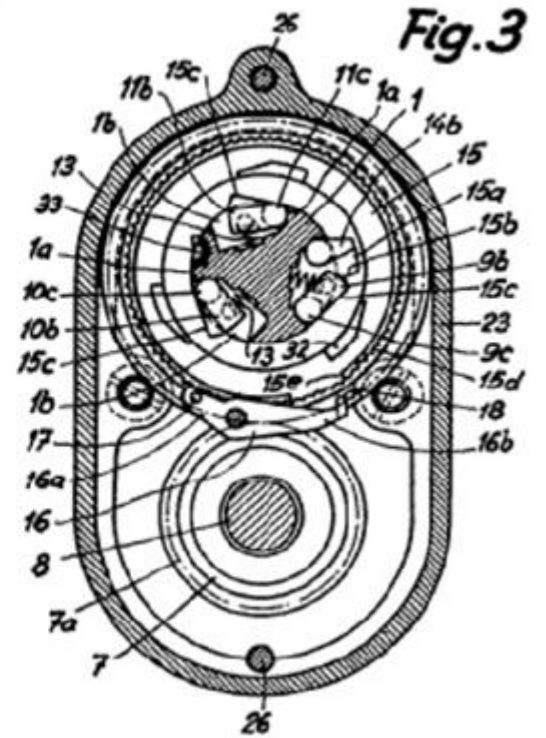


Fig. 3

Patent CH253158, 16 November 1948

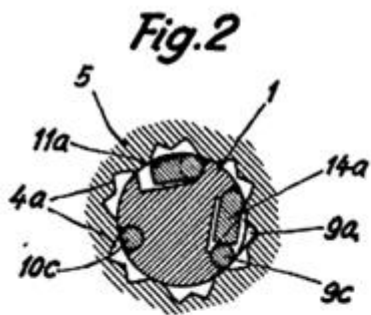


Fig. 2

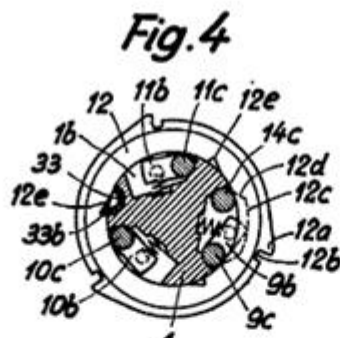


Fig. 4

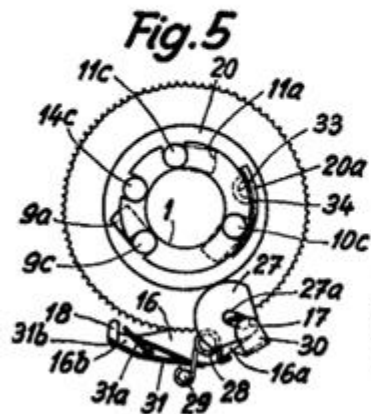


Fig. 5

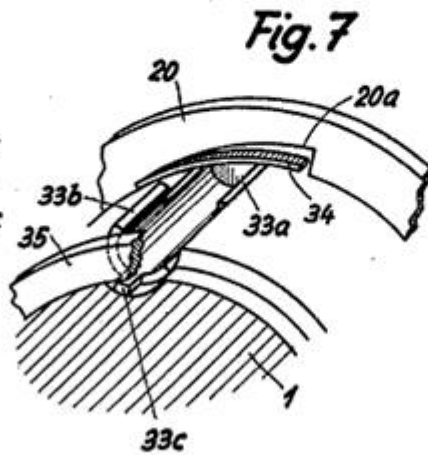


Fig. 7

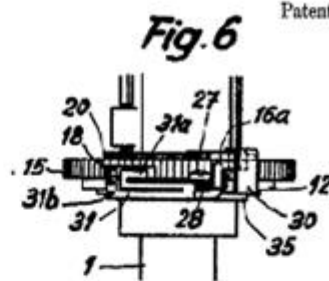


Fig. 6

Patent Nr. 253158

