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ELEVATING MECHANISM FOR GUNS HAVING FINE AND COARSE ADJUSTING MECHANISM

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Fig.1

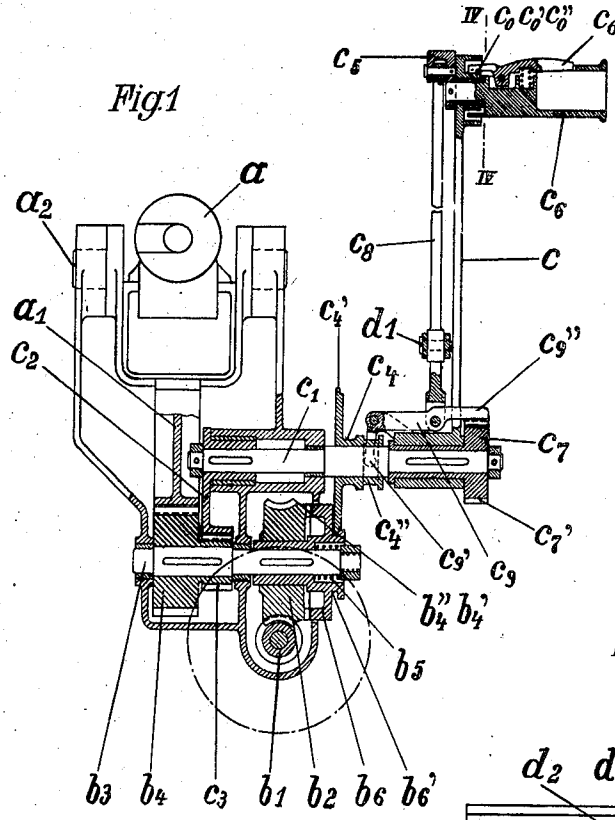


Fig.3

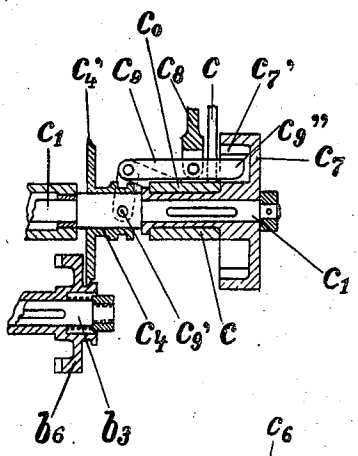


Fig.2

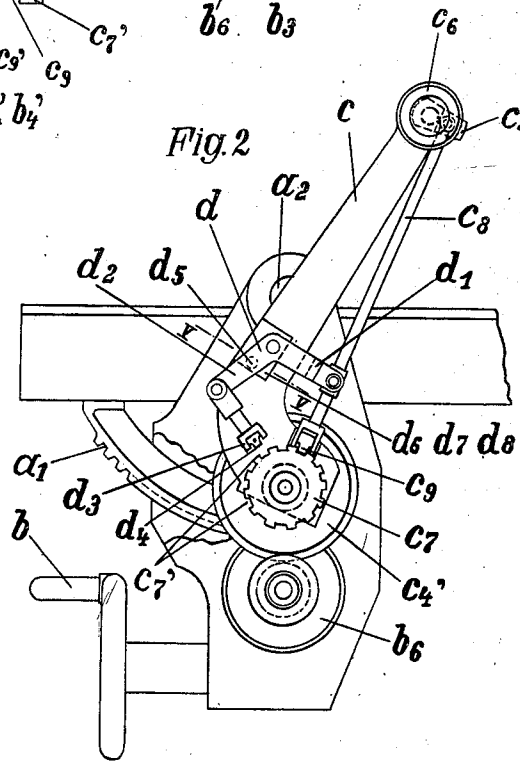


Fig.4

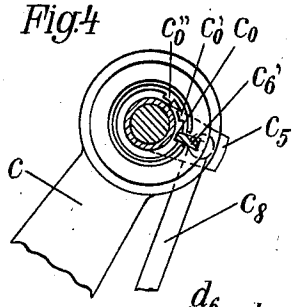
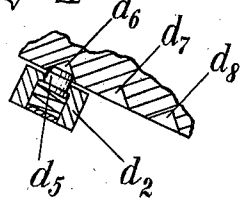


Fig.5



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ELEVATING MECHANISM FOR GUNS HAVING FINE AND COARSE ADJUSTING MECHANISM

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2 Claims. (Cl. 89—41)

The invention relates to an elevating gear comprising a driving pinion which can, when desired, either be driven slowly for effecting fine adjustment of the gun elevation by means of a self-stopping worm mechanism, or can be driven quickly for effecting a rapid movement of the gun, by means of a coarse adjusting mechanism independently of the self-stopping members, for example by an elevating lever.

In the known elevating mechanisms of this type only the self-stopping worm mechanism can be uncoupled from the driving pinion, while the mechanical connection between the driving pinion and the coarse adjusting mechanism cannot be interrupted. In contrast therewith, in the elevating gear according to the invention, a detachable coupling is arranged also between the coarse adjusting mechanism and the driving pinion. Thus the relative angular position can be varied as desired not only between the driving pinion and the fine adjustment mechanism but also between the driving pinions and the coarse adjustment mechanism.

This is particularly important for light and medium anti-aircraft guns which must be capable of rapid elevation in order to follow quickly moving aircraft at short range. In this case it must be possible to carry out quickly with the coarse adjustment mechanism a wide range of elevation, for example between —20° and +90°. With guns of this type, the elevating lever which hitherto was firmly connected with the driving pinions of the elevating gear would assume very inconvenient angular positions in the different positions of elevation of the barrel, and this would render it very difficult and sometimes impossible for the gun layer to use at the same time the elevating lever and the sight with which he has to follow the aircraft constantly. Now, with an elevating gear according to the invention it is possible, as soon as the elevating lever arrives in an inconvenient position, to uncouple it from the driving pinion, and to re-engage it with the pinion after the elevating lever has been adjusted into a handier position, and to continue the elevating of the gun with the new lever position.

When the elevating lever is uncoupled care must be taken to ensure that the elevating pinion is coupled with the self-stopping worm mechanism for the duration of the disconnection of the lever in order that the latter can keep the barrel in the adjusted position in spite of a tendency to swinging movements due, for instance, to muzzle or breech loading. For this reason both couplings, which render it possible for the driving pinion to be coupled, as desired, with the fine adjustment mechanism or with the coarse adjustment mechanism, are preferably brought into such mutual dependence that when the coarse adjustment mechanism is inoperative, the self-stopping fine adjustment mechanism is constrained to be coupled with the elevating driving pinion.

Two typical embodiments of the invention are shown in the accompanying drawing, in which:

Figure 1 is a part sectional view of the adjusting mechanism,

Fig. 2 is a side view of the mechanism,

Fig. 3 is a sectional view of a modified detail,

Fig. 4 is a cross-sectional view of the handle taken on line IV—IV of Fig. 1, and

Fig. 5 is a sectional view of the detent taken on line V—V of Fig. 2.

When slow fine adjustment takes place, the gun barrel a, adapted to swing about the trunnions a_2, is elevated by the elevating crank b by means of the self-stopping worm b_1, the worm gear-wheel b_2, the clutch member b_6, the shaft b_3 and the driving pinion b_4 of the elevating gear which meshes with the toothed segment a_1. In rapid manual elevating, the barrel is adjusted by means of the elevating lever c, which is detachably coupled with the shaft c_1 by the coupling lever c_9 and the notched wheel c_7. The shaft c_1 moves the barrel a, by means of the toothed segment c_2, the pinion c_3, the shaft b_3, the driving pinion b_4 and toothed segment a_1.

The worm wheel b_2, which is loosely mounted on the shaft b_3, has, on its right-hand (as seen in Fig. 1) lateral surface, a toothed clutch face b_4'' in which is adapted to mesh a toothed clutch face b_4' on the clutch member b_6, the member b_6 being adapted to be displaced longitudinally on the shaft b_3 against the influence of the spring b_5 but not to be rotated about the said shaft. The elevating lever c can be coupled with the shaft c_1 not only through the coupling lever c_9 but also through a coupling dog d_4 (Fig. 2) which is actuated by a bell crank lever d mounted on the elevating lever, and which is adapted to engage in notches c_7' in the notched wheel c_7.

All three movable coupling members (b_6, c_9 and d_4) can be moved by turning a handle c_6 on the elevating lever c. When the handle c_6 is turned, a crank c_5 moves a rod c_8 which in its turn adjusts the coupling dog d_4 by way of the bell-crank lever d which is pivoted to the elevating lever. The coupling lever c_9 and the coupling dog d_4 are connected with the rod c_8 in such a manner that whenever the lever c_9 engages in one of the notches of the notched wheel c_7, the coupling dog d_4 is out of engagement or vice-versa. In an intermediate position, both coupling members c_9 and d_4 are out of engagement with the notched wheel c_7. Motion is transmitted from the rod c_8 to the clutch member b_6 by a forked arm c_9' of the coupling lever c_9, which arm engages in a groove c_4'' formed in a sleeve c_4 which is displaced longitudinally on the elevating lever shaft c_1. The sleeve c_4 in its turn has an edge c_4'

which engages in a groove b_6' on the clutch member b_6. A spring b_5 normally holds all three coupling members in the position shown in the drawing.

The handle c_6 of the elevating lever and also the rod c_8 actuated thereby are adapted to be adjusted and fixed in three pivotal positions by means of a locking lever c_6' which is arranged on the handle c_6 and which, by suitable turning of the handle c_6, can be placed in one of three notches c_0, c_0', c_0'', Fig. 4, on the elevating lever c. A spring-urged detent d_5, Fig. 5, which is arranged on the bell crank lever which moves the coupling dog d_4 and which is adapted to engage, one at a time, in three notches d_6, d_7, d_8, Fig. 5, of the elevating lever c, makes it possible for the gun layer to feel and hear that adjustment has been effected into one of the three predetermined positions of the rod c_8, that is, so that the locking lever c_6' arranged on the handle c_6 of the elevating lever c has been engaged in one of the three notches c_0, c_0' or c_0''.

When the rod c_8 is in the position shown in the drawing, the locking lever c_6' is engaged in the notch c_0. When the rod is in this position, the coupling lever c_9 and the clutch member b_6 are engaged, while the coupling dog d_4 is disengaged. The spring-urged detent d_5 lies in the notch d_6 of the elevating lever c. This position of the rod c_8 is called the initial position.

If the crank handle c_6 of the elevating lever c is turned in such a manner that the spring-urged detent d_5 springs into the notch d_7, then the crank handle c_6 is in such a position that the locking lever c_6' can fall into the notch c_0'. If, in this position, the locking lever c_6' is allowed to so fall in, then the rod c_8 is in a position which may be called the mean position. In this position, the clutch member b_6 remains coupled with the worm wheel b_2, while the coupling lever c_9 comes out of engagement with the notched wheel c_7 and the coupling dog d_4 still remains out of engagement with the notched wheel. Thus the elevating lever is adapted to turn freely in relation to the elevating shaft c_1 while the self-stopping worm mechanism is still coupled with the driving pinion b_4 of the elevating gear.

If, after disengagement of the locking lever c_6', the lever c_6 is turned into the position in which the spring-urged detent d_5 springs into the notch d_8, then the locking lever c_6' can fall into the notch c_0''. The position may be called the end position. In this position, the coupling lever c_9 is out of engagement with the notched wheel c_7, the coupling dog d_4 is, therefore, in engagement and the coupling member b_6 out of engagement with the worm wheel b_2.

When the rod c_8 is in the initial position, the gun can be swung about the trunnions a_2 by the fine adjusting mechanism, i. e. by means of the elevating crank b and the self-stopping worm mechanism b_1, b_2. In this case the elevating lever c joins in the adjusting movements.

When the rod c_8 is in the mean position, the elevating lever is freely movable; it can, therefore, be moved in any desired position in relation to the elevating lever shaft c_1. In this case the self-stopping worm mechanism is still coupled with the driving pinion b_4 of the elevating gear, so that no unintentional movement of the gun barrel can occur.

When the rod c_8 is in the end position, the elevating lever c is coupled, by means of the coupling dog d_4 with the elevating lever shaft c_1, and the driving pinion b_4 of the elevating gear, and the self-stopping worm mechanism is put out of operation by the disengagement of the clutch member b_6. The gun barrel can, therefore, be moved freely by the elevating lever c.

In the second example of construction illustrated in Fig. 3, the notched wheel c_7 of the elevating lever shaft c_1 is internally toothed. Whereas in the first example of construction, when the rod c_8 is in the initial position, the coupling lever c_9 is in engagement with the teeth of the coupling wheel c_7, in the form of construction according to Fig. 3, when the rod c_8 is in this position, the coupling lever c_9 is out of engagement with the teeth of the wheel c_7. So long as the clutch member b_6 is in engagement with the worm wheel b_2 and, therefore, the worm mechanism is operative, the elevating lever c is, therefore, uncoupled from the elevating lever shaft c_1. Owing to its weight the lever c hangs downward or assumes a position suitable for ready seizure by hand and this position can be determined by arranging a balance weight on the bearing sleeve c_0, and the lever c is not moved by the fine adjusting mechanism when the gun is elevated. If the rod c_8 is moved into its other end position, then the coupling lever c_9 is in engagement with the notch teeth of the wheel c_7. On the other hand, however, the coupling member b_6 is disengaged, so that the elevating gear can be actuated freely by the elevating lever c. In this form of construction the coupling dog d_4 and the bell-crank lever d which actuates it, are not necessary. A mean position of the rod c_8 is also not necessary. The engaging and disengaging movements of the coupling members b_6 and c_9'' are preferably so arranged that their periods of engagement partially overlap each other in such a manner that the one member is not completely disengaged until the other has arrived in the coupling position. Thus a position of the two coupling members which liberates the barrel is avoided. The elevating gear according to this form of construction thus has only two working positions and, therefore, on the whole is simpler than that according to the first example of construction.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. Elevating mechanism for guns comprising an elevating shaft, a self-stopping fine adjustment mechanism for slowly operating said shaft, a coupling device to couple or uncouple the fine adjustment mechanism with the shaft, a coarse adjustment mechanism for rapidly operating said shaft, a shaft and toothed segment in operative connection with the elevating shaft, a coupling device to couple and uncouple the coarse adjustment mechanism with the shaft and segment, and means to couple one coupling device while uncoupling the other coupling device.

2. Elevating mechanism for guns comprising an elevating shaft, a self-stopping fine adjustment mechanism for slowly operating said shaft, a coupling device to couple or uncouple the fine adjustment mechanism with the shaft, a coarse adjustment mechanism for rapidly operating said shaft, transmission means coupled with the elevating shaft, a coupling device to couple and uncouple the coarse adjustment mechanism with the transmission means, and means to couple one coupling device while uncoupling the other coupling device.

ALFRED KRUM.