J. F. MEIGS & H. G. JAKOBSSON.

TRAINING AND ELEVATING MECHANISM FOR GUNS.

APPLICATION FILED JAN. 6, 1909.

958,515.

Patented May 17, 1910.

4 SHEETS—SHEET 1.

Fig. 1.

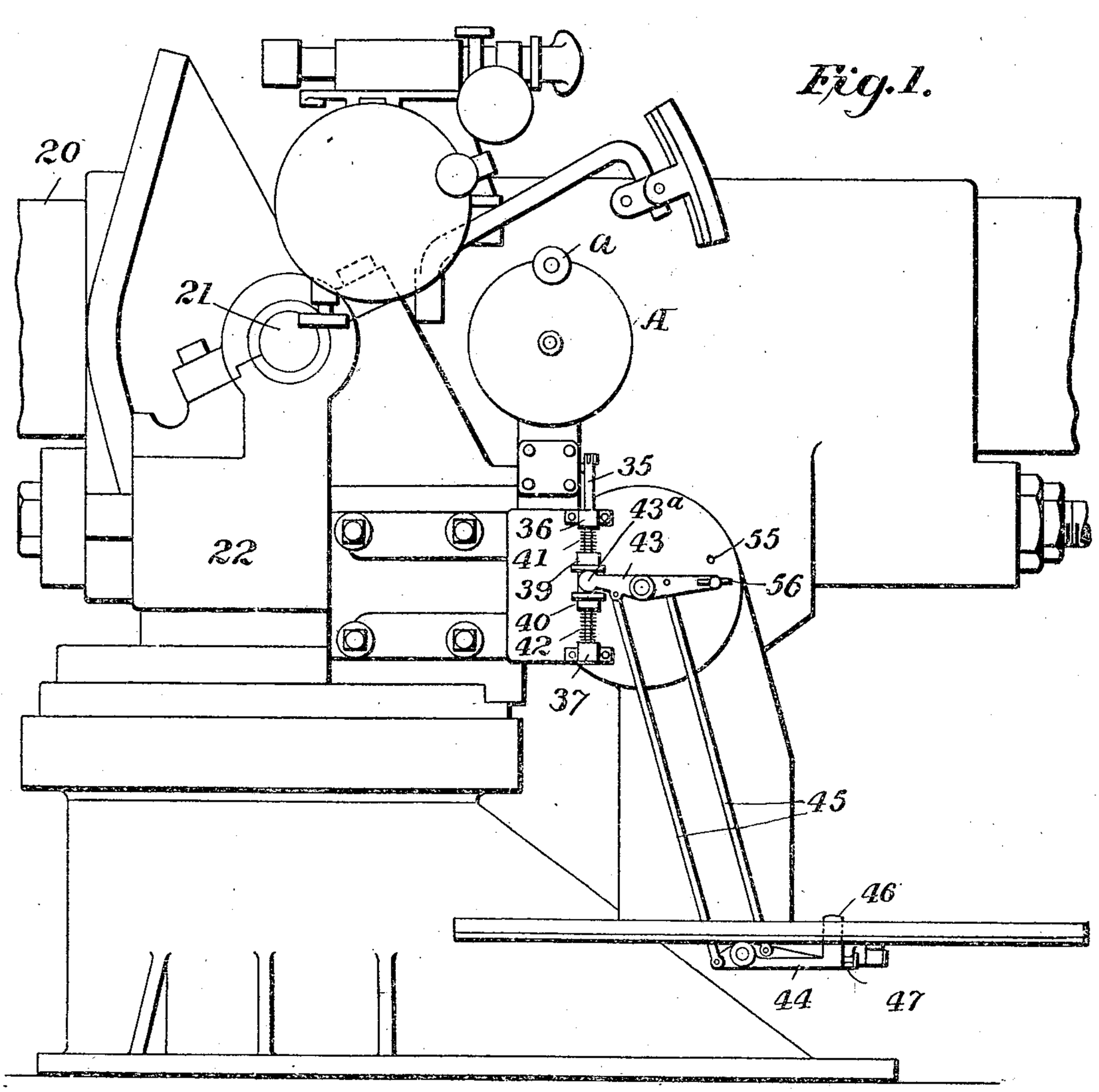

Fig. 8.

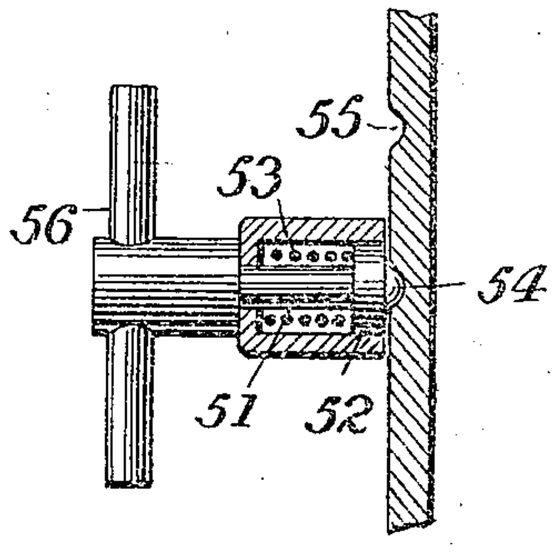

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Fig. 2.

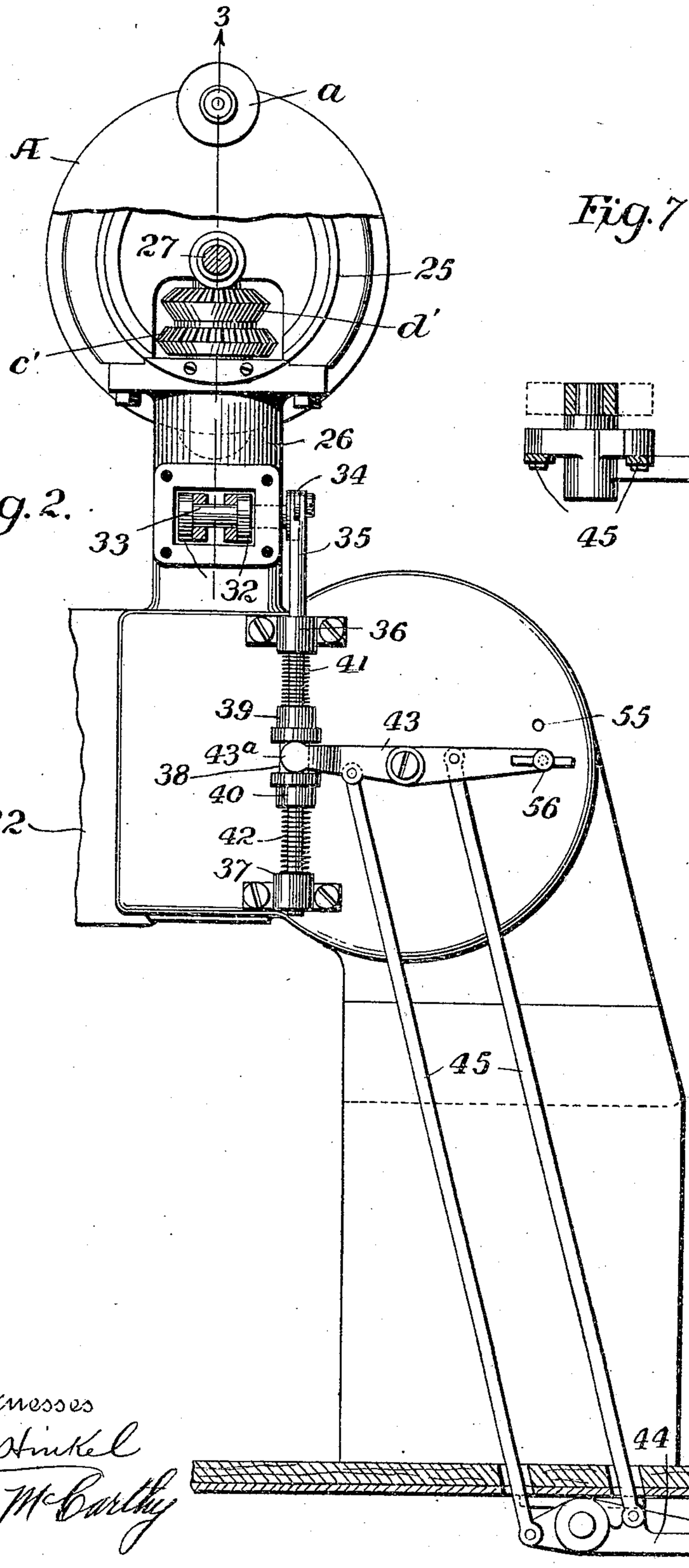
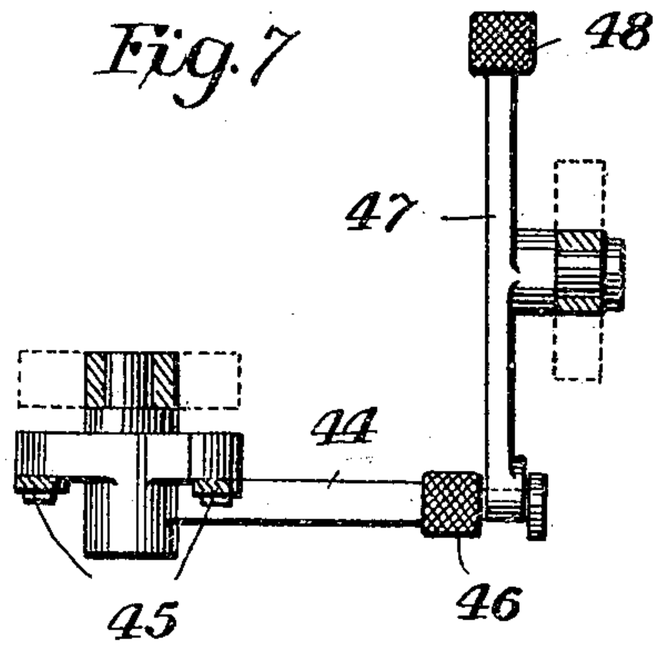


Fig. 7



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4 SHEETS—SHEET 3.

Fig. 4.

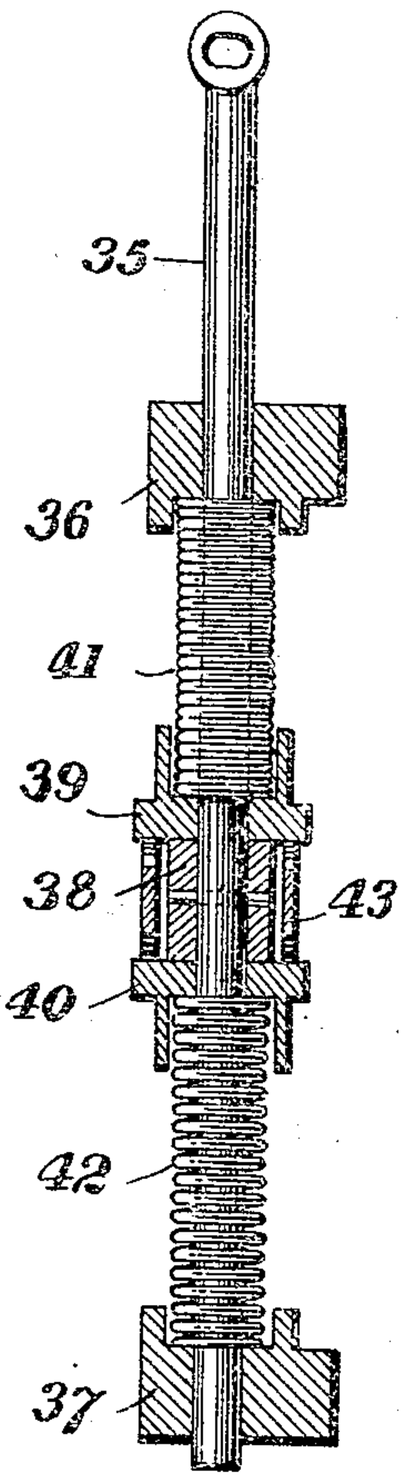


Fig. 3.

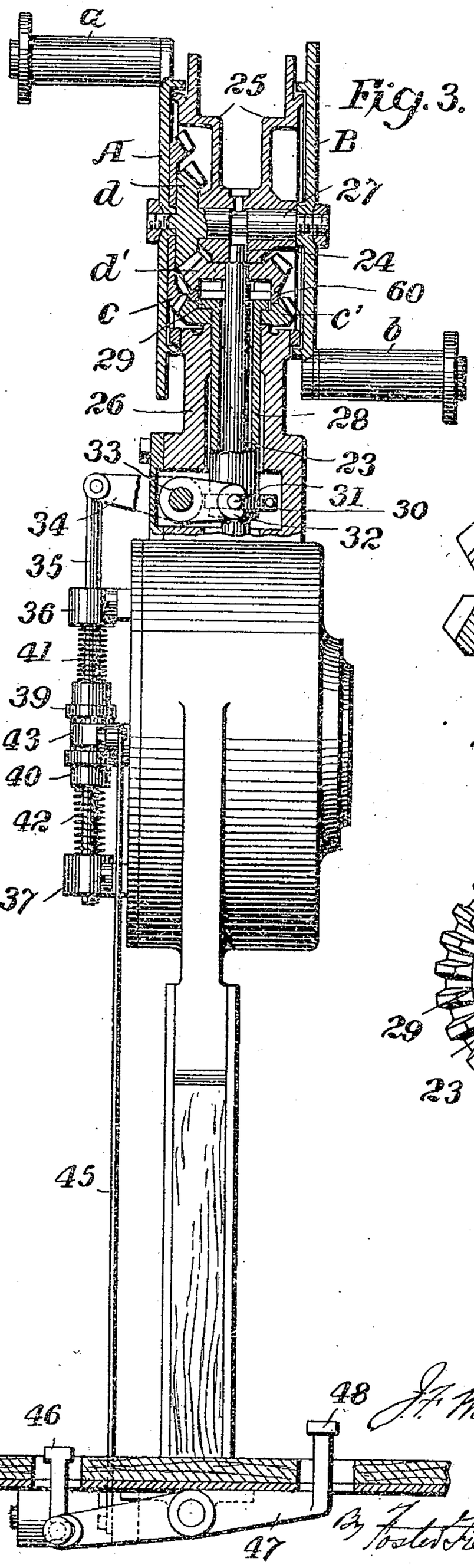


Fig. 5.

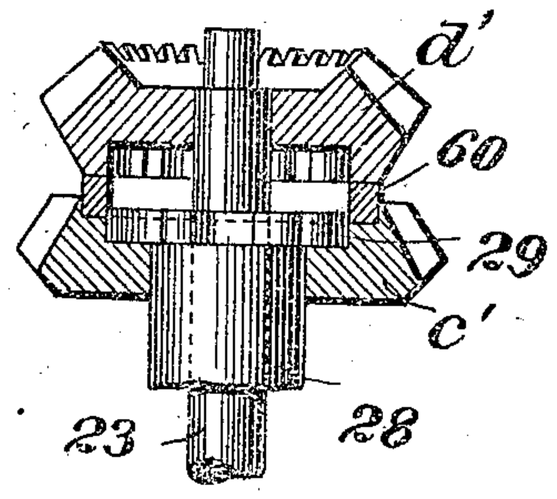
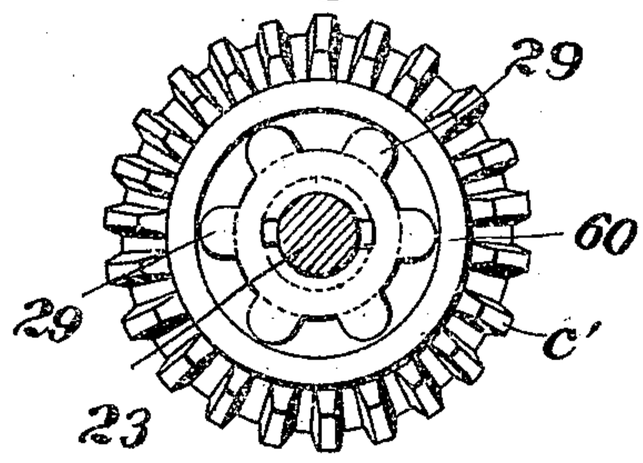


Fig. 6.



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4 SHEETS—SHEET 4.

Fig. 9.

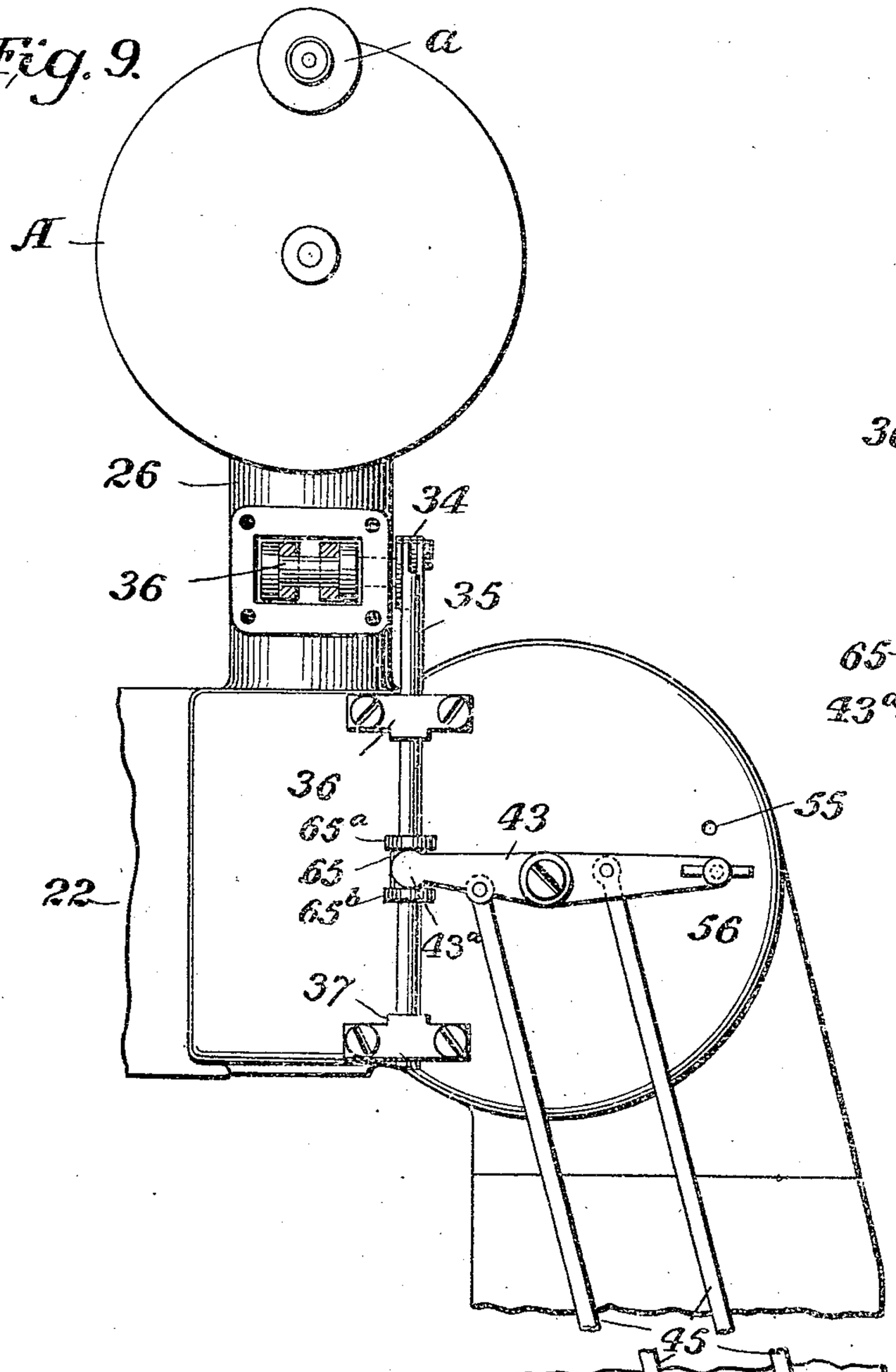
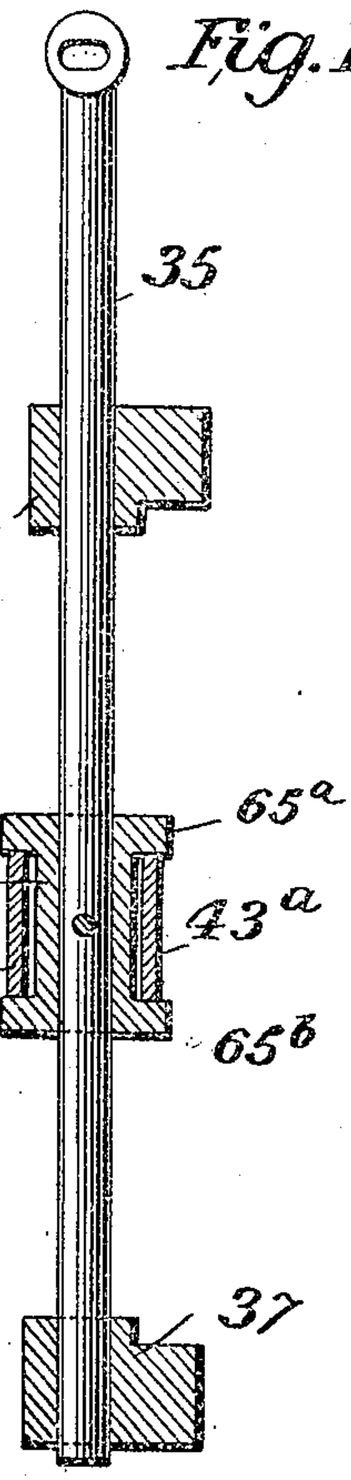


Fig. 10.



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UNITED STATES PATENT OFFICE.

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TRAINING AND ELEVATING MECHANISM FOR GUNS.

958,515. Specification of Letters Patent. Patented May 17, 1910.

Application filed January 6, 1909. Serial No. 471,009.

To all whom it may concern:

Be it known that we, JOHN F. MEIGS and HERMAN G. JAKOBSSON, a citizen of the United States and a subject of the King of Sweden, respectively, residing at South Bethlehem, Northampton county, State of Pennsylvania, have invented certain new and useful Improvements in Training and Elevating Mechanism for Guns, of which the following is a specification.

The present invention consists in a variable speed mechanism whereby either the training or elevating mechanism of a gun, or both, may be operated at different speeds as compared with the speed of the hand wheels, to suit the requirements of different conditions. For instance, the gunner may follow a rapidly moving object or target, either in elevation or azimuth, without a correspondingly rapid movement of the hand wheels, by throwing into operation high speed gears or he may follow a slowly moving object without materially changing the speed of his hand gear by throwing into operation other gears suitably proportioned, or in pointing the gun at an object or target in case the gun is mounted upon a ship which is rolling, the gunner may throw high speed gears into operation during that period of the roll when the movement of the ship is greatest, and may throw into operation low speed gears when there is least movement of the ship.

The invention further consists in means for throwing the different sets of gears into and out of operation without discontinuance of the movement of the hand wheels or cranks.

The invention will be described in connection with the accompanying drawing, in which,

Figure 1 is a side view of a portion of a gun and its carriage embodying the present invention; Fig. 2 is an enlarged side view of the hand wheel standard and the devices for shifting from one set of gears to another by hand or foot power; Fig. 3 is an elevation of the same partly in section on the line 3 of Fig. 2; Fig. 4 is a sectional view illustrating the operation of the springs which are used in shifting the clutch; Fig. 5 is a sectional view through the clutch; Fig. 6 is a plan view of the clutch and the lower gear with which it coöperates; Fig. 7 is a plan illustrating one form of treadle which can be used for shifting the clutch; Fig. 8 is a detail of the handle shown in Fig. 2 for shifting the clutch; Fig. 9 is a side view partly in section of the hand wheel standard, illustrating another form of the devices for shifting from one set of gears to another; Fig. 10 is a sectional view illustrating some of the intermediate parts for shifting the clutch when using the treadle.

Referring to Fig. 1 of the drawing, 20 indicates the gun tube, which is hung on trunnions 21 supported upon a suitable carriage or base 22. It will be understood that the gun is provided with gearing suitable for moving it about its vertical and horizontal axes for training and elevating, it being unnecessary to illustrate such gearing in detail for the purposes of the present application.

Referring to Figs. 2 and 3, 23 indicates a shaft which is driven by hand wheel mechanism to be hereinafter described and which in turn is connected with the training and elevating mechanism to drive the latter. The upper end of the shaft 23 has a bearing 24 in a bracket 25 which is mounted on a standard 26 through which the shaft passes. A horizontal shaft 27 is also mounted in bearings in the bracket 25 and rigidly connected with this horizontal shaft are two hand wheels or cranks A, B, provided respectively with rotatable handles *a*, *b*. Rigidly connected with the crank disk A are two bevel gears *c*, *d*, which intermesh respectively with two gears *c'*, *d'*, adapted to rotate freely about the axis of the shaft 23. As will be apparent from inspection of Fig. 3 the crank handles *a*, *b*, move in opposite directions simultaneously with respect to the operator; that is, when the handle *a* is being moved toward the operator the handle *b* is moved away from him and vice versa. The effect of this is that the operator is able to exert more power on the apparatus than with a single handle, while at the same time he can keep his body steadier and use the sighting devices much more effectively than when the body is swayed by the use of a single handle. By the use of two handles the operator can also hold his body steadier while operating the pedals to change the gears, thus facilitating his work in sighting the gun.

Either of the gears, c', d', may be rigidly connected with the shaft 23, at will, by means of a clutch device of any suitable character. The preferred form of such device, as shown comprises a sleeve 28 surrounding the shaft 23 and free to slide vertically thereon, but compelled to turn with said shaft by means of a suitable spline. On the upper end of the sleeve 28 is a toothed wheel or flange 29 (Figs. 5 and 6) which is adapted to interlock with complementary teeth formed in recesses in the upper and lower sides respectively of the gears c', d'. When the sleeve 28 is in its lowest position it interlocks the gear c' with the shaft 23 and the shaft is driven by the gear c at the higher of the two rates of speed provided by the means illustrated, and when the sleeve 28 is interlocked with the gear d', the shaft 23 is driven by the similar gear d, at a lower rate of speed as compared with the speed of the crank disks.

Referring to Figs. 5 and 6, 60 indicates a ring or idler which is mounted between and co-axial with the gears c', d'. This idler is so constructed that the clutch gear 29 can pass through it and it is as thick as, and slightly thicker than, the clutch disk so that in shifting from one of the gears c', d', to the other the clutch disk will pass an intermediate position in which it is disconnected from both, this for a purpose to be presently described. As shown, the idler is a plain ring seated in an annular recess in the gear c' and held therein by the gear d', the parts being loosely adjusted so that there is practically no friction between the ring and the gears.

The sleeve 29 may be adjusted into engagement with either of the gears c', d', by various means. As shown in Fig. 3 a collar 30 on the lower end of the sleeve is provided with trunnions 31 which are engaged by arms 32 on a rock shaft 33. On the outer end of the shaft 33 is an arm 34 to which a vertically arranged rod 35 is pivotally connected. The rod 35 slides in fixed bearings 36, 37, as shown in Figs. 3 and 4. About midway between the bearings 36, 37, a collar or enlargement 38 is securely connected to the rod 35 and above and below the collar 38 are disks or cups 39, 40, which are free to slide upon the rod 35. Between the disk 39 and the bearing 36 is a coiled spring 41 and a similar spring 42 is arranged between the disk 40 and the bearing 37.

Referring to Figs. 2 and 3, 43 indicates a lever, one arm of which is forked, the two branches 43^a of the fork being arranged on opposite sides of the fixed collar 38 and between the disks 39 and 40. As shown in these figures the lever 43 is connected with a treadle 44 by two rods 45 arranged respectively on opposite sides of the fulcrum of the lever and the treadle, so that every movement of the treadle will be communicated positively to the lever. The treadle may be operated in any suitable manner. As shown, it is provided with a foot piece 46 by means of which, when the foot piece is pressed down, the forked end of the lever 43 will be moved upward. To move the treadle and the lever 43 positively in the opposite direction, we provide a cross-lever 47 having a foot piece 48, as shown particularly in Figs. 2, 3 and 7. The foot piece 48 is mounted on one end of the cross-lever 47 and the other end thereof is loosely interlocked or pivotally connected with the treadle 44. By depressing the foot piece 48 the foot piece 46 is thrown up and the movement of the treadle reversed, which moves the forked arm of the lever 43 downwardly.

The operation of the devices above described is as follows: The clutch 29 being in its lower position, as shown in Figs. 3 and 5, the shaft 23 will be driven by the gears c, c', at the higher of the two speeds provided by the mechanism shown in the drawing. If, now, it be desired to operate the training or elevating mechanism at a slower speed while maintaining substantially the same speed of movement of the crank disks, the foot piece 48 is pressed down, raising the foot piece 46 and forcing down the fork arm 43^a of the lever 43. This moves the disk 40 downwardly compressing the spring 42 and releasing the disk 39, which is under pressure of the spring 41. The spring 41 therefore tends to move the collar 38 and the rod 35 downwardly and yieldingly presses the clutch disk 29 upward until it is stopped by the clutch teeth of the gear d'. The continued movement of the crank disks presently brings the clutch teeth of the gear d' into register with the spaces between the teeth of the clutch 29 and the spring 41 then acts further to throw the clutch disk into engagement with the gear d', which connects said gear with the shaft 23 and permits of driving the training or elevating mechanism at a lower speed while maintaining substantially the same speed of movement of the crank disks.

It will be evident that with the mechanism above described the change from one speed to another can be effected without taking either hand from the cranks or stopping their movement and without disturbing the gunner or causing him to lose sight of the object upon which he is training the gun. If the idler 60 were not interposed between the gears c', d', the clutch teeth might cause some stoppage in the turning of the crank disks in passing from one gear to the other and thus annoy or disconcert the gunner and for this reason the idler 60, or some equivalent thereof, is highly important. Instead of the idler a suitable space intervening between the clutch teeth of the gears will be

sufficient, but the idler as shown closes the space between the gears and renders the same dust proof. It will be seen that in the forms above described we do not positively shift the clutch but simply place a spring under tension to move it when it comes into register with the gear to which it is directed. In this manner no interlocking of the gears by means of the clutch is possible and the clutch moves quickly into mesh with the gear toward which it is directed at the first opportunity.

In some instances it may be preferable to shift the clutch by hand and for this reason we may provide a handle for shifting the lever 43. As shown in Figs. 2 and 8, a handle 56 is mounted directly on the end of the lever 43. The handle is provided with a pin 51 on the inner end of which is a head 52. Surrounding the pin is a spring 53 which bears on the head and tends to move it inward. A rounded projection 54 on the head 52 engages recesses 55 on a fixed part of the carriage to hold the lever 43 yieldingly in either of its operative positions. To shift the clutch the handle 56 is pulled out to release the detent 54 and then shifted until the detent registers with the other recess 55. This puts one or other of the springs 41, 42, under tension to shift the clutch and the clutch disk will thereafter be shifted when its teeth register with the gear toward which it is impelled by the spring. By arranging the springs to move the clutch we are enabled to shift the lever 43 either by foot or hand power instantly without waiting for the gears to turn so that the clutch may move to the desired position. When foot power is used the hands need not be removed from the crank handles and when hand power is used, it is only necessary to remove one hand for an instant to shift the lever 43.

In Figs. 9 and 10 we have shown a form of clutch shifting mechanism which is positively operated, preferably by foot power, and which we have found to work satisfactorily. In this form of the invention the springs for shifting the clutch are omitted and the rod 35 is positively connected with the treadle, which is of the form heretofore described. As shown in Fig. 10 a collar 65 is fixed to the rod 35 between the guides 36 and 37, said collar having flanges 65^a, 65^b. The fork 43^a of the lever 43 engages these flanges and moves the rod 35 positively up and down as the lever 43 is rocked. By pressing on one or other of the foot pieces 46, 48 of the treadle, pressure up or down is communicated to the rod 35 tending to shift the clutch 29 and the clutch shifts immediately when it comes into register with the recesses in the gear c' or d' toward which it is being moved. This form of the mechanism is found to work satisfactorily and has some advantages in simplicity and economy over the forms of the clutch shifting mechanism heretofore described, in which the springs are used.

It will be evident that our invention in its broad aspect may be embodied in many different mechanical forms and hence we desire it understood that we do not limit ourselves to the precise construction and arrangement of parts illustrated and described herein. In the following claims we will use the term "manually operated" in a sense broad enough to cover either the handle or the treadle for shifting the clutch or any other means operated by foot or hand power for this purpose.

What we claim and desire to secure by Letters Patent is,

1. In training and elevating mechanism for guns, the combination of a drive shaft, a crank shaft, a plurality of sets of gears adapted to connect said crank shaft and drive shaft to effect different relative movements thereof, a clutch for rendering any one of said sets of gears operative at will, and manually operated means, including a spring connection for throwing said clutch.

2. In training and elevating mechanism for guns, the combination of a drive shaft, a crank shaft, a plurality of sets of gears adapted to connect said crank shaft and drive shaft to effect different relative movements thereof, a clutch for throwing the different sets of gears into and out of operation, a treadle for moving the clutch, and means for placing said treadle under pressure to move the clutch in either direction, as desired, for the purpose set forth.

3. In training and elevating mechanism for guns, the combination of a drive shaft, a crank shaft, a plurality of sets of gears adapted to connect said crank shaft and drive shaft to effect different relative movements thereof, a clutch for rendering different sets of gears operative at will, springs adapted to throw said clutch in opposite directions, and means for placing either of said springs under tension to move the clutch yieldingly into the desired position, for the purpose set forth.

4. In training and elevating mechanism for guns, the combination of a drive shaft, a crank shaft, a plurality of sets of gears adapted to connect said crank shaft and drive shaft to effect different relative movements thereof, a clutch for rendering either of said sets of gears operative, springs adapted to throw the clutch in either direction desired, a manually operated lever adapted to place either of said springs under tension to shift the clutch, and means for holding said lever in its operative positions.

5. In training and elevating mechanism for guns, the combination with a drive shaft and a crank shaft, of means for communi-

cating to the drive shaft from the crank shaft different speeds relative to the speed of the crank shaft, said means including a clutch, a spring for moving the clutch in one direction, and means for putting said spring under tension to move the clutch.

6. In training and elevating mechanism for guns, the combination with a drive shaft and a crank shaft, of means for communicating to the drive shaft from the crank shaft different speeds relative to the speed of the crank shaft, said means including a clutch, an arm connected to throw the clutch, a rod connected to said arm, a pair of springs mounted on the rod, a fixed abutment, and a movable abutment for each spring, a shoulder on the rod against which said movable abutments are normally pressed by the springs, and means for shifting said movable abutments and compressing the springs, for the purpose set forth.

7. In training and elevating mechanism for guns, the combination with a drive shaft and a crank shaft, of means for communicating to the drive shaft from the crank shaft different speeds relative to the speed of the crank shaft, said means including two sets of speed gears, a clutch for rendering either of said sets of gears operative, and a treadle for shifting the clutch, whereby the operator may shift the clutch without removing his hand from the handle of the crank shaft.

8. In training and elevating mechanism for guns, the combination with a drive shaft and a crank shaft provided with two oppositely disposed handles, of means for communicating to the drive shaft from the crank shaft different speeds relative to the speed of the crank shaft, said means including a clutch, and a treadle for shifting the clutch whereby the operator may change the relative speed of the shafts without removing his hands from the crank shaft handles.

9. In training and elevating mechanism for guns, the combination with a drive shaft and a crank shaft provided with two oppositely disposed handles, of means for communicating to the drive shaft from the crank shaft different speeds relative to the speed of the crank shaft, said means including a clutch, and a treadle having two foot pieces movable in opposite directions whereby the treadle may be positively moved in either direction, for the purpose set forth.

10. In a training and elevating mechanism for guns, the combination of a drive shaft, a crank shaft, two oppositely disposed crank handles on said crank shaft adapted to move simultaneously in opposite directions with respect to the operator, a plurality of sets of gears adapted to connect said crank shaft and drive shaft to effect different relative movement thereof, a clutch for rendering any one of said sets of gears operative at will, and manually operated means for throwing said clutch.

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN F. MEIGS.

HERMAN G. JAKOBSSON.

Witnesses:

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HARVEY L. NIESS.