J. P. COLEMAN.

RAILWAY SIGNAL.

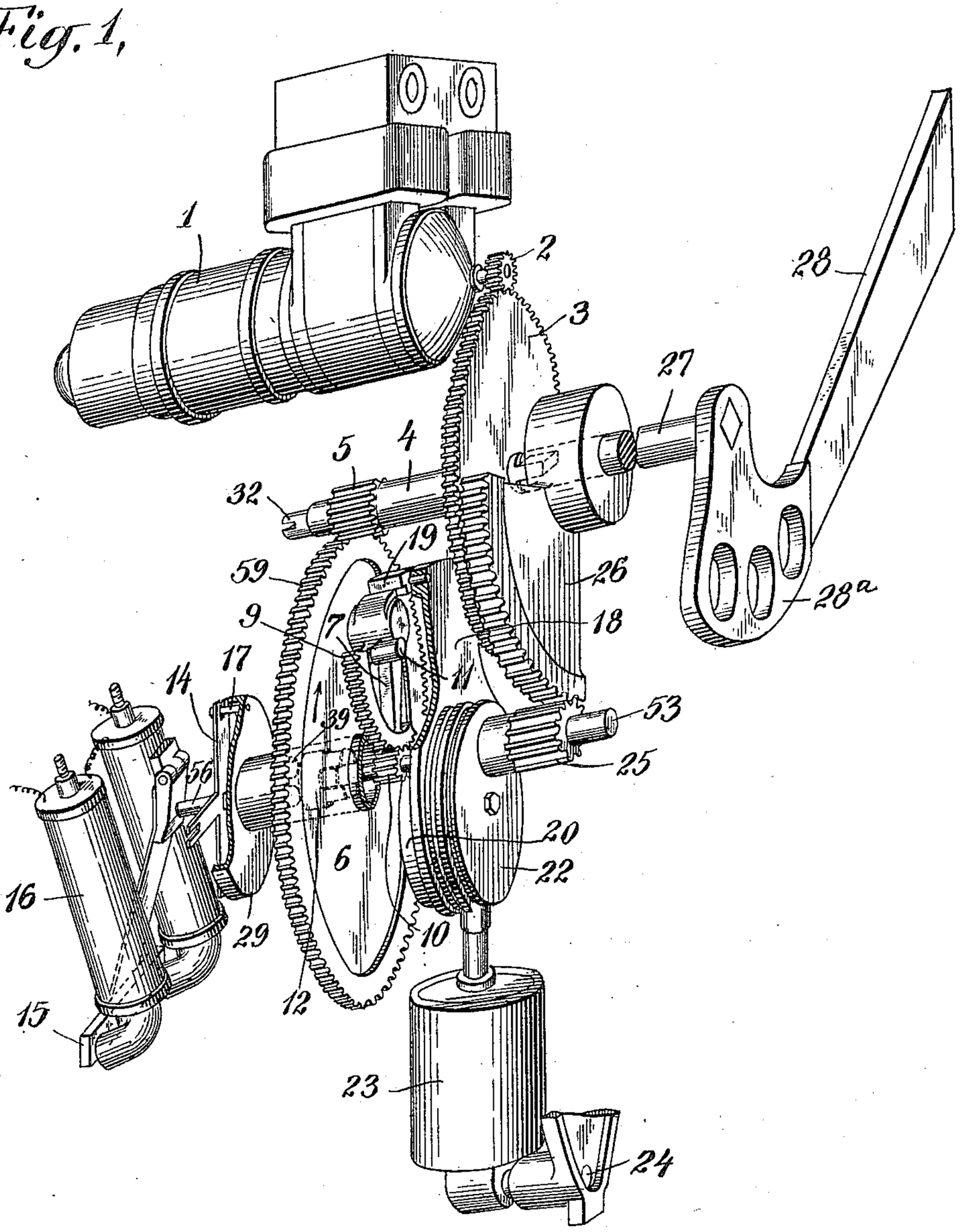
APPLICATION FILED MAY 2, 1910.

994,125.

Patented June 6, 1911.

5 SHEETS—SHEET 1.

Fig. 1,



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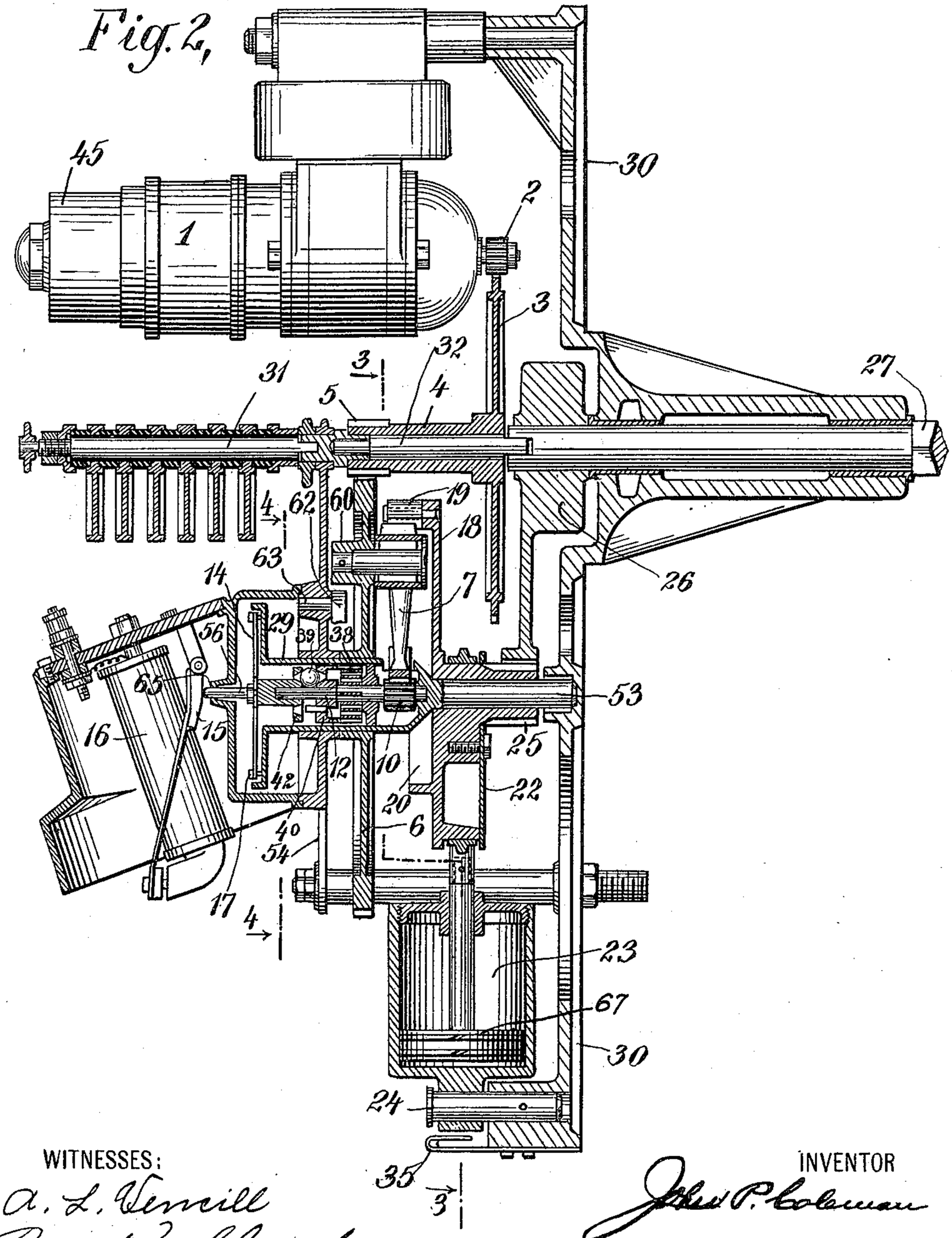
5 SHEETS—SHEET 2.

Fig. 2.



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5 SHEETS—SHEET 3.

Fig. 5,

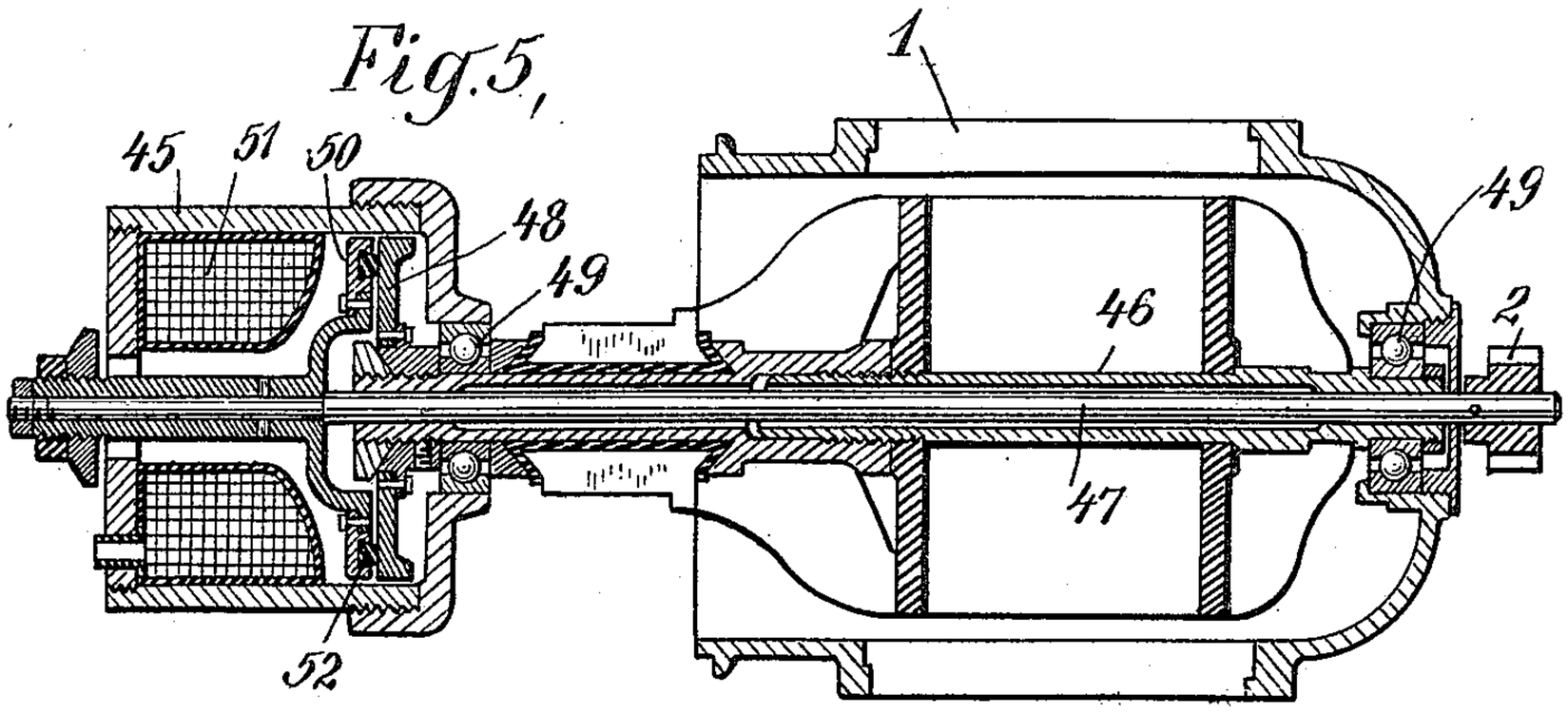


Fig. 3,

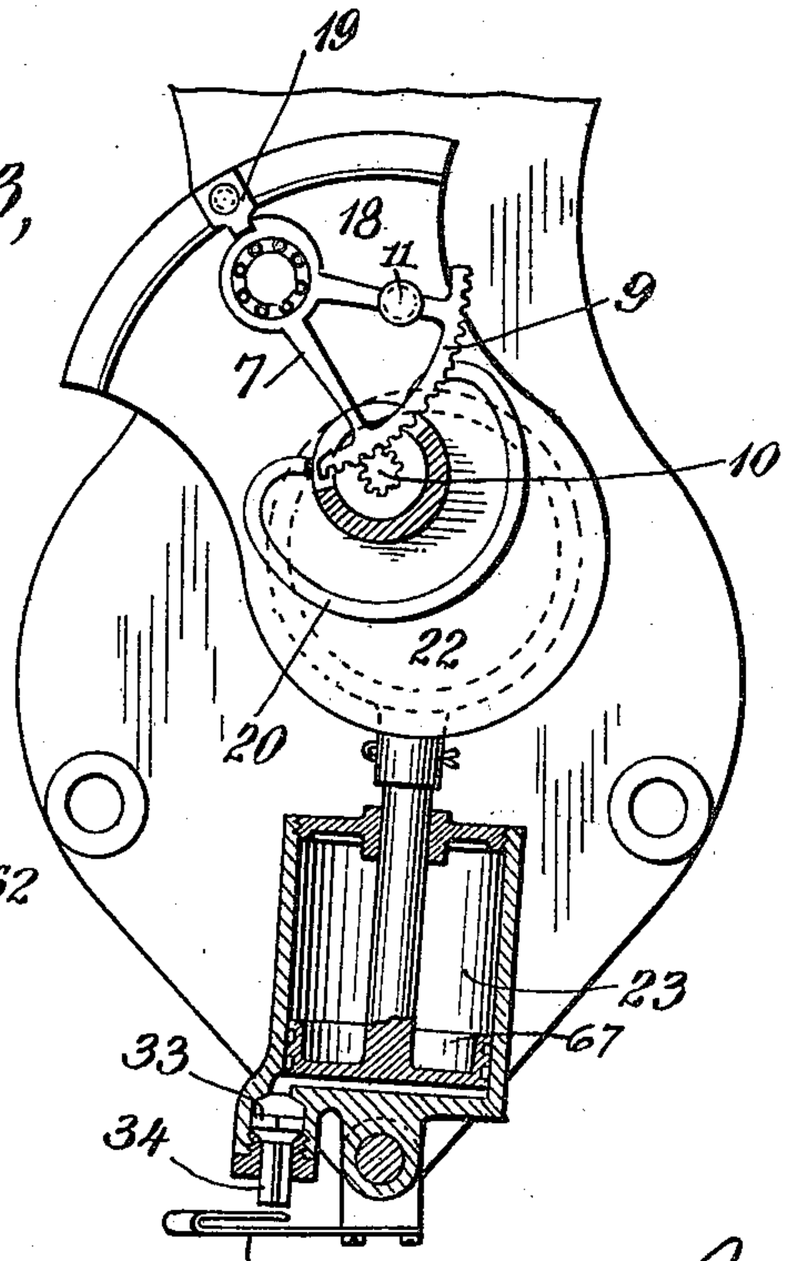
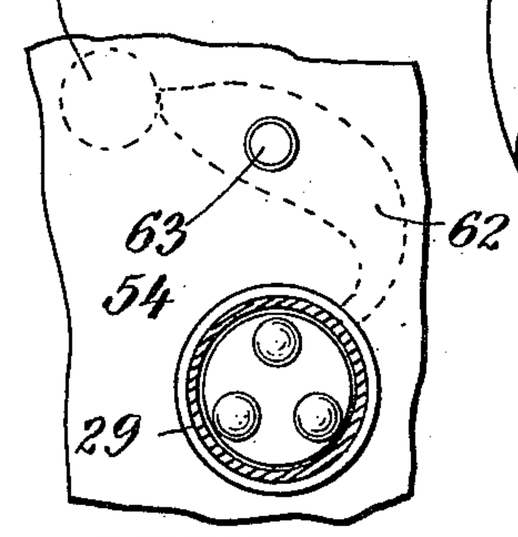


Fig. 4,



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5 SHEETS—SHEET 4.

Fig. 6,

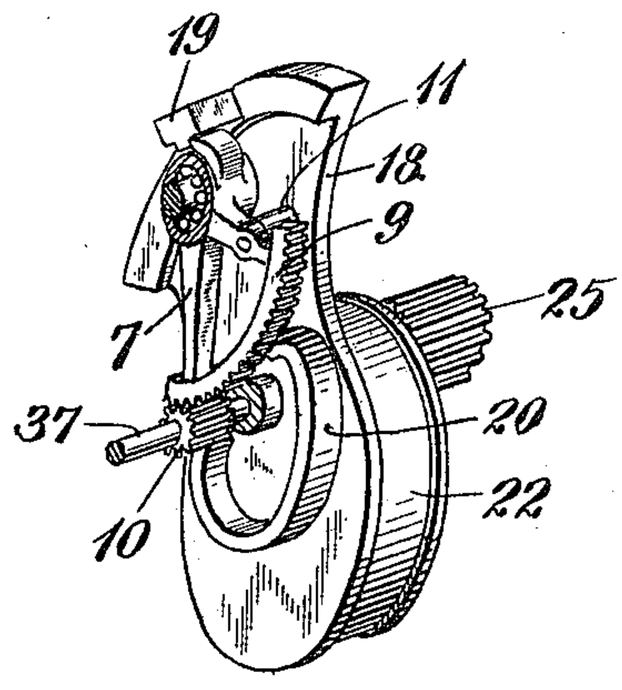
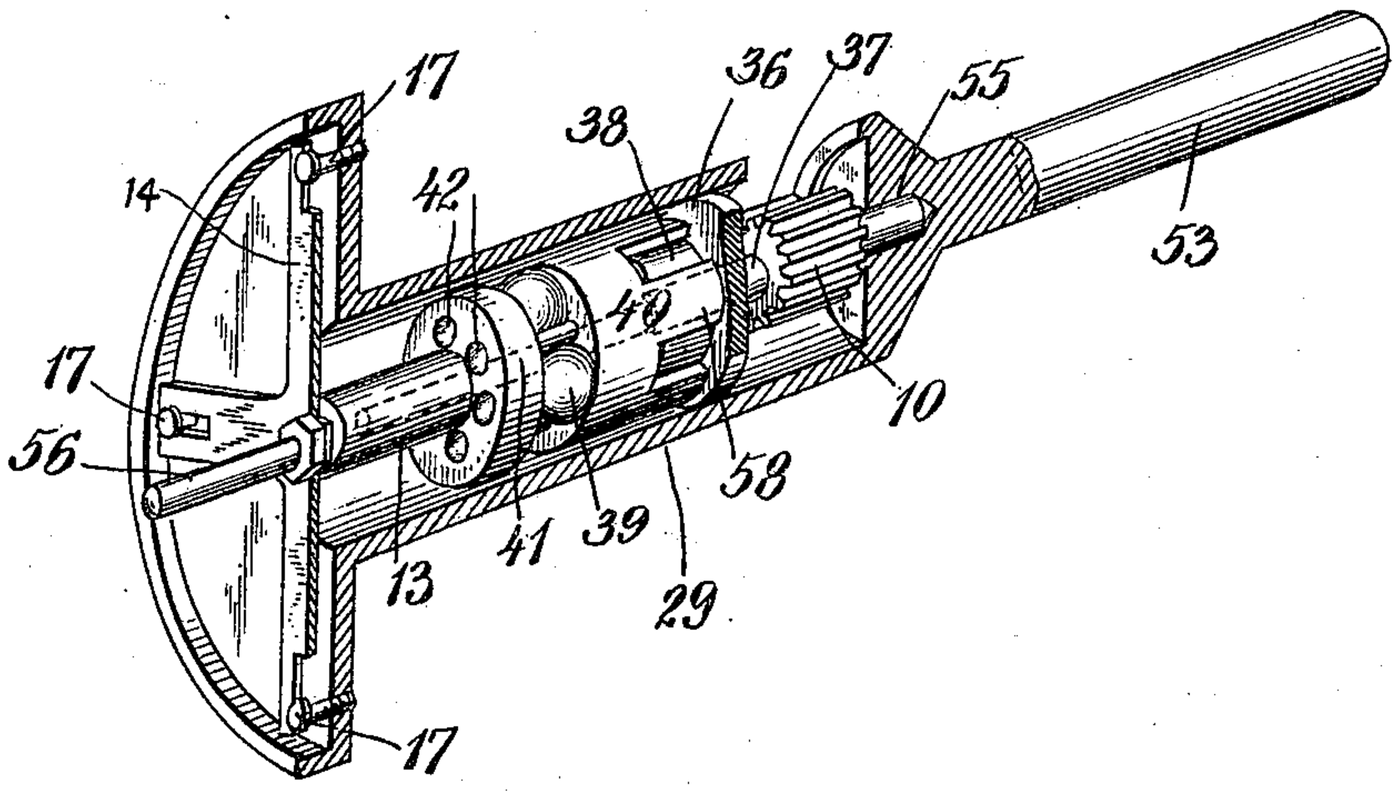


Fig. 7,



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5 SHEETS—SHEET 5

Fig. 11,

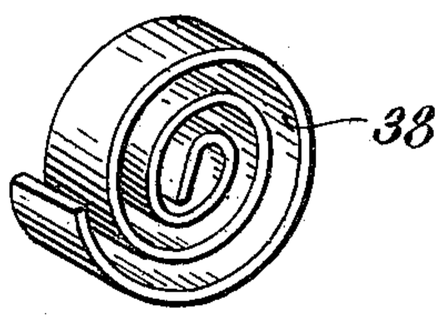


Fig. 8,

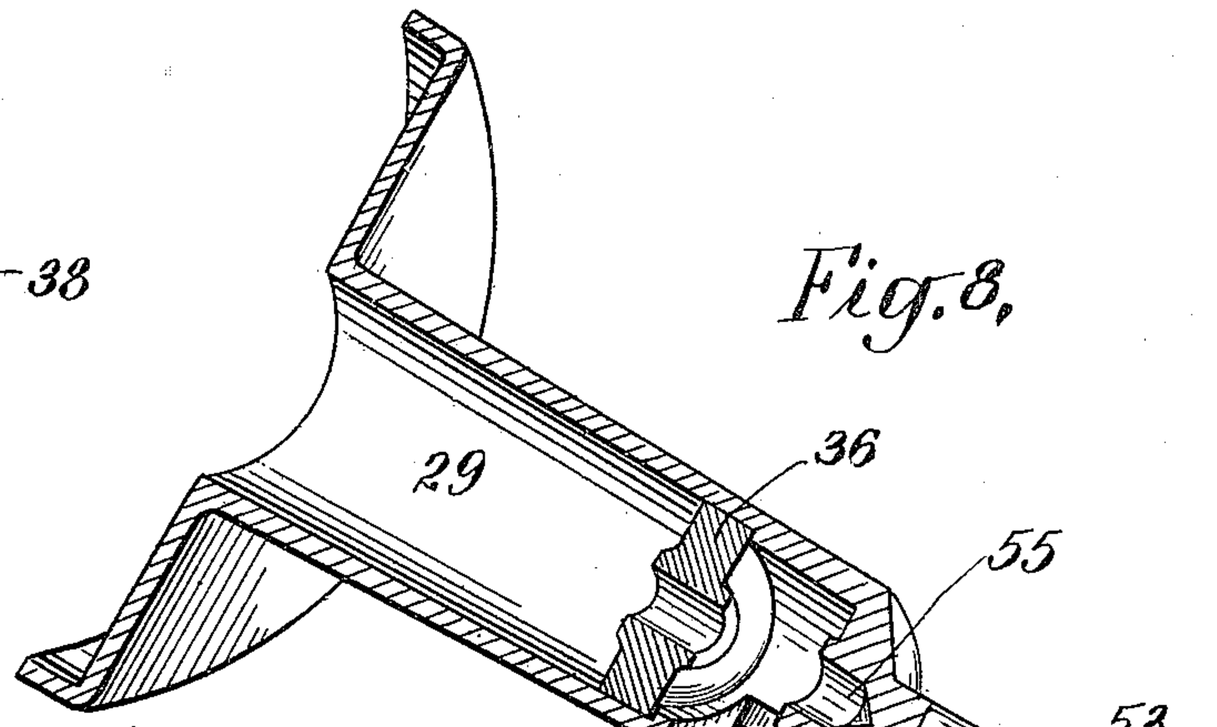


Fig. 10,

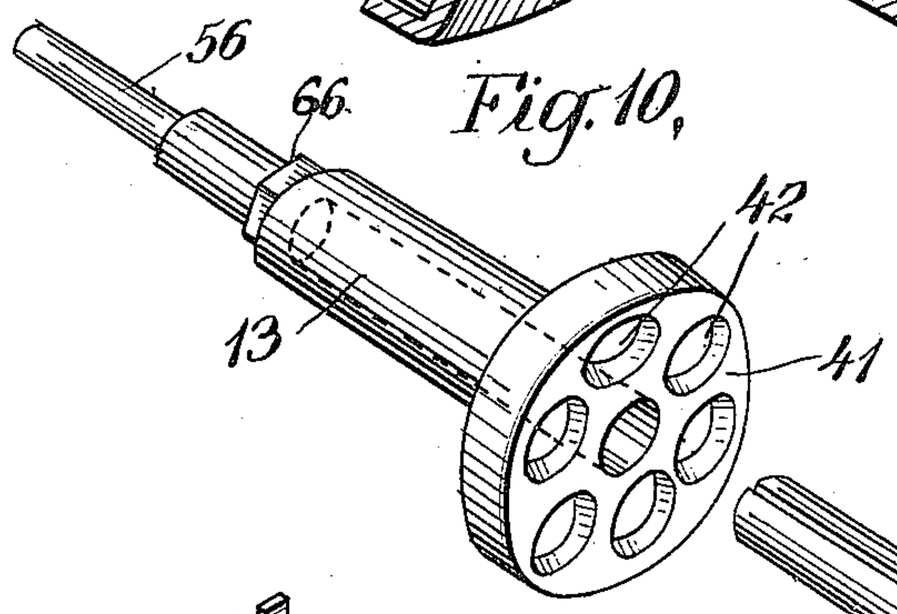


Fig. 9,

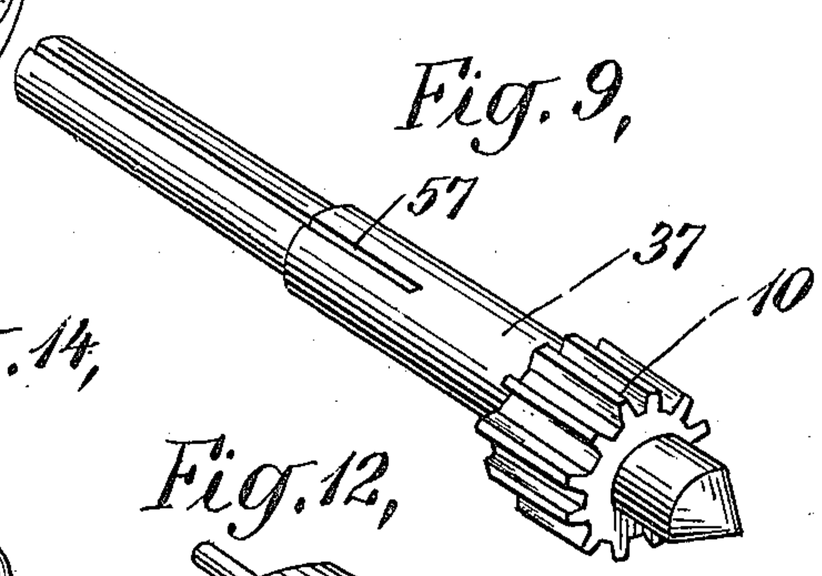


Fig. 15,

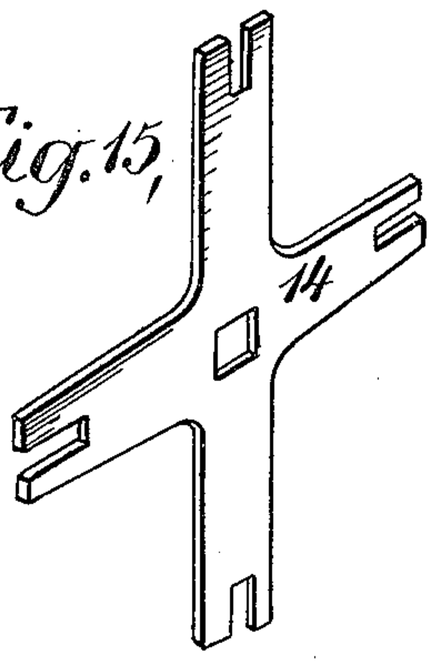


Fig. 14,

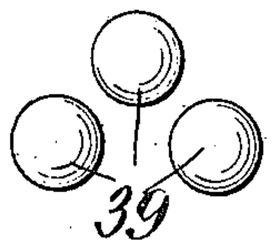


Fig. 12,

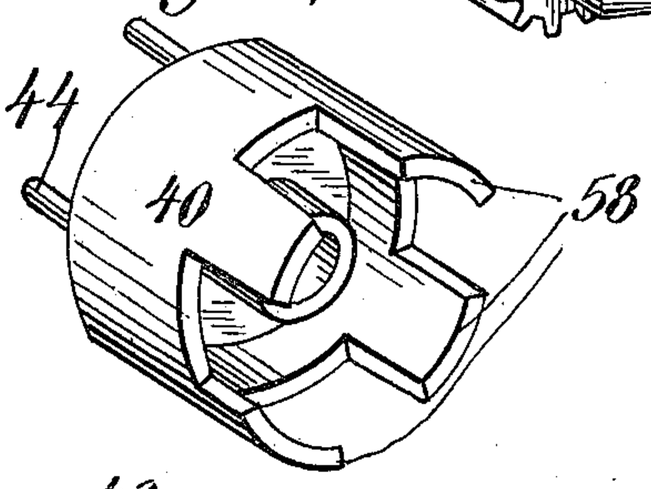
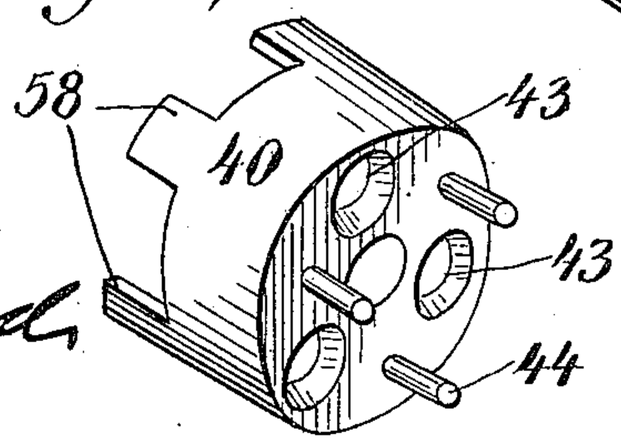


Fig. 13,



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RAILWAY-SIGNAL.

994,125. Specification of Letters Patent. **Patented June 6, 1911.**

Application filed May 2, 1910. Serial No. 558,984.

To all whom it may concern:

Be it known that I, JOHN P. COLEMAN, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Railway-Signals, of which the following is a specification.

My invention relates to railway signal mechanisms, and particularly to railway signal mechanisms comprising a counterweighted semaphore capable of a plurality of positions of indication, and an electric motor for moving the counterweighted semaphore against the action of its counterweight.

I will describe a railway signal mechanism embodying my invention, and then point out the novel features thereof in claims.

In the accompanying drawings, Figure 1 is a perspective view partly in section showing the several parts or devices comprised in a railway signal mechanism and embodying my invention. Fig. 2 is a sectional side view of the railway signal mechanism shown in Fig. 1. Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2 looking in the direction of the arrows. Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2 looking in the direction of the arrows. Fig. 5 is a sectional view of the electric motor shown in Figs. 1 and 2. Fig. 6 is a perspective view showing in detail a portion of the apparatus shown in Figs. 1 and 2. Fig. 7 is a perspective view showing a form of electrically controlled clutch device used for operatively connecting and disconnecting the counterweighted semaphore with the motor. Figs. 8, 9, 10, 11, 12, 13, 14 and 15 are perspective views showing in detail parts of the clutch device shown in Fig. 7.

Similar reference characters refer to similar parts throughout the several views.

A feature of my invention is a novel form of clutch device or "slot mechanism" comprised in the signal mechanism which permits of a reverse movement of the semaphore blade under the action of its counterweight without producing a reverse rotation of the motor armature. Still another feature, and an important one, is the combination with a semaphore signal capable of three positions of indication of a single air dash pot which acts as a buffer in the movement of the semaphore from "safety" to "danger" or from "safety" to "caution" or from "caution" to "danger."

Referring to the drawings, the counterweighted semaphore comprises a blade 28 and a counterweight 28^a, which counterweight also serves as a spectacle to hold colored glass or lenses. The semaphore is suitably fixed on a shaft 27, and when free to move, always assumes a horizontal position under the influence of its counterweight 28^a and blade 28. In the drawings, I have shown the semaphore blade as being moved from its horizontal position upwardly to its other two positions of indication, but it may be made to move from its horizontal position downwardlv to its other two positions of indication equally as well. These arrangements are understood by those skilled in the art and involve merely mechanical changes between the operating mechanism and the semaphore which need not be described herein.

1 designates an electric motor by means of which the blade 28 is moved to its inclined and vertical positions. In this invention, the blade is held in its inclined and vertical positions by means of an electrically controlled clutch device 12, hereinafter to be described.

23 is an air dash pot which acts as a buffer to the return movements of the semaphore 28 toward its horizontal position.

2 designates a pinion which is operatively connected with the armature of the motor 1 in a manner hereinafter to be described, and which drives a gear 3 secured to a sleeve 4. Also secured to the sleeve 4 is a pinion 5 which drives a gear 6. The sleeve 4 is mounted to rotate freely on a shaft 32 which is connected with the semaphore shaft 27 by tongue and groove connection, and which is connected with a circuit controlling device 31 in a similar manner. Pivotally secured to the face of the gear 6 is a lever or dog 7 provided with gear teeth 9. These teeth 9 mesh with a pinion 10 journaled within a hollow shaft 29 of the gear 6, as shown more clearly in Figs. 6 and 7.

26 designates a quadrant gear fixed on the shaft 27. This quadrant 26 is driven by a pinion 25 secured to a disk 18. This disk 18 is free to rotate on an extension 53 of the hollow shaft 29. The ratio between the radii of the quadrant gear 26 and the pinion

25 is such that the pinion 25, and therefore the disk 18, make substantially a complete revolution for each movement of the semaphore between horizontal and inclined, and between inclined and vertical positions. Secured to the face of this disk 18 is a pin or stud 19 arranged to lie in the path of a projecting face of the dog 7, as shown in Figs. 3 and 5. Thus, when the dog and the stud come into contact, the tendency is to rotate the dog on its pivot out of contact with the stud. This rotation of the dog is prevented under predetermined conditions by means of a clutch device 12 which I will now describe.

Referring to Figs. 7 to 15, inclusive, as well as to Fig. 2, 29 designates the hollow shaft to which is secured the motor-driven gear 6, and within which is journaled a pinion shaft 37 carrying the pinion 10 which meshes with the gear teeth on the dog 7. This hollow shaft 29 has a projecting spindle 53 by means of which it is journaled at one end in the frame 30 as shown in Fig. 2, while its other bearing consists of another portion 54 of the framework of the mechanism. One end of the pinion shaft 37 is journaled in a recess 55 in the hollow shaft 29, and its other bearing consists of a ring 36 slipped in on the opposite side of the pinion 10 (see Fig. 8). Figs. 12 and 13 are front and rear views respectively of a collar or drum 40 which fits loosely upon the shaft 37 and is operatively secured thereto by a spring 38 as hereinafter described. In this drum are drilled countersunk holes 43 having their centers equidistant from the center of the drum. Into these countersunk holes are placed balls, herein shown as being three in number, which project into corresponding countersunk holes 42 in a similar collar or drum 41 which is also loosely journaled on the shaft 37. Three pins 44 secured to the drum 40 serve to keep the balls in their proper relative positions. A tubular extension 13 of the latter drum 41 is carried out to the end of the spindle of the shaft 37 which serves as its bearing, where it has a squared portion 66 over which fits a flexible torsion member or diaphram 14. A still further extension 56 of this drum is journaled in the framework at 65, as shown in Fig. 2. This diaphram 14 is secured to an expanded portion of the hollow shaft 29 by pins or rivets 17, and it thus prevents any rotary movement of the drum 41 with relation to the gear 6, yet it permits of a limited amount of end movement of the drum 41 along the shaft 37 supporting it, without material resistance.

It will be seen from the foregoing description that if an end thrust is exerted on the shaft 13 in the direction of the balls, any rotation of the shaft 13 and its drum 41 will be transmitted through the medium of the balls to the drum 40 and thence to the pinion 10. As a means of obtaining this end thrust, I employ an electromagnet 16 having an armature suspended by a lever 15 which is pivoted just above the shaft center. This lever 15 hangs vertically and in contact with the extended spindle 56 of the drum member 41 so as to be free to move outward with that member when the magnet is deënergized, or to prevent outward movement of the drum 41 when the magnet is energized.

The action of this clutch device in the movement of the semaphore by the motor is as follows: During the rotation of the gear 6 by the motor, the engagement of one clutch drum 40 by the other drum 41 is effected by means of the balls 39, the magnet 16 being energized for this purpose. The inner end of the pivoted dog 7, which meshes with the pinion 10, is constantly tending to rotate that pinion and consequently the drum 40 on its shaft, due to the pressure of the stud 19 on the outer end of this dog. This rotative effort is transmitted through the balls to the other drum 41, but this latter drum, being positively held against rotation by the diaphragm 14, locks the drum 40 and pinion 10 against rotation relative to the gear 6, thus maintaining, through the dog 7 pivoted on the gear 6, this latter gear and the disk 18 in operative relation. The semaphore 28 will, therefore, be driven to its inclined or vertical position, and will be maintained in such position as long as the magnet 16 remains energized. When, however, the magnet is deënergized, the rotative effort of the dog 7 on the pinion 10 will cause the drum 41 to move outward, thus freeing the means by which one clutch drum operatively engages the other. The stud 19 will then cause the dog 7 to rotate on its pivot and free itself from the stud, whereupon the semaphore 28 is free to move toward its horizontal position by the action of the counterweight 28^a and the blade 28. This rotation of the disk 18 brings a cam 20 formed on the face of the disk into contact with a pin 11 on the dog 7, restoring that member to its position for engagement with the stud 19 when the latter again arrives in position to engage it. This cam 20 and its action on the dog 7 are clearly shown in Figs. 3 and 6. This last described movement of the dog to restore it to its engaging position would cause a rotation of the pinion 10 and the clutch drum 40 at a time when such a movement of the drum is unnecessary. To avoid this needless operation of the clutch drum, I mount the drum loosely upon the shaft 37 and interpose a coil spring 38 between them, which is so formed as to constitute, in effect, a ratchet. This spring 38 is secured at its inner end to the shaft by means of a slot 57 cut in the shaft. Its outer end engages one or another of several

tongues 58, formed on the drum 40, when driven by the shaft in one direction, but drags over these tongues without engagement when driven in the opposite direction. In this manner not only do I avoid the undesirable rotation of the clutch drum 40, but I also obtain a resilient medium between it and the pinion 10, thereby relieving excessive shocks to the clutch members under abnormally severe conditions of operation of one disk by the other, such as might obtain if the stud 19 were brought violently into contact with the dog 7 owing to the failure of operation of the buffing device 23 hereinafter described.

Referring to Figs. 1 and 2, it will be observed that when the motor has moved the semaphore to one of its positions and the power has been cut off from the motor, the weight of the semaphore will tend to react against the motor and might drive the motor with the gearing backwards. To avoid this I pivot a pawl 62 to the portion 54 of the frame (see Fig. 4) by a pin 63 and adapt it to lie in the path of a boss 60 on the gear 6. As the gear 6 revolves the boss raises the pawl 62 and passes it, but as the gear 6 comes to rest the boss 60 is behind the pawl 62, and any backward motion of the gear 6 is prevented. As is hereinbefore explained, the gear 6 makes substantially one revolution for each movement of the semaphore between its horizontal and inclined, and inclined and vertical positions, hence only one pawl 62 and one boss 60 are required to hold the mechanism in both the inclined and vertical positions.

Inasmuch as the armature of a small motor rotating at high speed possesses considerable momentum, when the motor circuit is interrupted, this momentum will continue to rotate the armature and gearing, and may carry the semaphore beyond the proper positions. While this may be compensated for to some extent by interrupting the motor circuit some time before the semaphore reaches a desired position, this method is not wholly satisfactory, especially when the electro-motive force impressed on the motor is variable and when the load represented by the semaphore varies on account of wind, snow, and similar causes. To obviate this trouble, I employ a clutch in the motor, as illustrated in Fig. 5. The armature shaft 46 is journaled in ball bearings at points 49, and is hollow to accommodate a pinion shaft 47 to which is secured the pinion 2. This pinion shaft is free to rotate inside the armature shaft and has secured to it at one end a soft iron plate 50. Secured to the armature shaft 46 is a corresponding soft iron plate 48, separated from the first mentioned plate by means of a gasket 52 of non-magnetic material. A winding 51 is placed inside of a soft iron clutch shell 45. This winding is energized at the same time as the motor, and the two plates 48 and 50 are therefore held together by magnetic attraction and the pinion shaft is caused to rotate with the armature. When, however, the motor circuit is broken, the armature is permitted to revolve freely without driving the pinion. By this means the momentum of the armature is instantly freed to expend itself idly when the motor circuit is broken, and the gearing is brought to practically instantaneous rest.

It will be evident from the foregoing description that the duty devolving upon the means for arresting the counterweighted semaphore in its movement from the vertical to the 45° position will be severe, if the momentum of the moving parts be not checked just before reaching the 45° position. Similarly, the shock to the entire structure will be severe if a like check to the momentum be not effected just before the semaphore reaches the horizontal or danger position. To this end I employ a novel buffing device illustrated in Figs. 1, 2 and 3 and which I will now describe. The pinion 25 which meshes with the segmental gear 26, has a radius of one-eighth the radius of the segmental gear. Hence for each 45° movement of the segmental gear and the semaphore 28 attached thereto—a full revolution of the pinion is effected. The shaft for the pinion is formed into an eccentric 22 by which is operated a piston 67 of an oscillating cylinder 23. This cylinder is pivoted to the frame by a pin 24. Each revolution of the pinion shaft thus imparts a full forward and backward stroke to the piston, the forward stroke drawing air into the cylinder through a check valve 33, and the backward stroke compressing the air and thus checking the momentum of the moving parts. The top of the cylinder is open to the outside air at all times.

It will be seen that by this means a single dash-pot may be used to give equal retardation to the speed of the movement of the semaphore from the vertical or 45° positions, just before reaching the 45° or horizontal positions respectively. A comparatively small amount of electrical energy in the electromagnet 16 is thus enabled to arrest the moving parts at the 45° position, and all shock is removed from the mechanism on the return of the parts to the horizontal position of the semaphore. While the buffing device as thus far described would serve the purpose of absorbing the momentum of the moving parts on the return of the semaphore by gravity, this might, without further provision, constitute an undesirable "load" on the signal motor during the latter's operation of the semaphore at certain points in its movement, because the compression stroke of the piston would be equally effective whether the crank

be driven backward by the semaphore, as described, or forward by the motor. To meet this possible objection, I take advantage of the oscillating movement of the cylinder, which is in one direction on the compression stroke when the motor is moving the semaphore, and in the reverse direction on the compression stroke while the semaphore is moving by gravity toward its danger position. By virtue of this motion, I arrange the check valve 33 to be forced open during the compression stroke of the piston while the motor is driving the semaphore, but to be unaffected while the semaphore is moving in the reverse direction. The opening of the valve may be effected by means of a valve-stem 34 secured to the valve 33 and projecting outward to engage with a stationary piece 35, secured to the framework 30, when the cylinder is rocked to the proper side.

It will be noted from the foregoing description that a signal mechanism embodying my invention permits the use of a low-power motor which drives the semaphore through gears of relatively high ratio—that is, a relatively large number of revolutions of the motor are required to effect a small movement of the semaphore. But by the use of a clutch device such as I have described, the high-speed gears and the motor are disengaged during the return of the semaphore by gravity toward the caution and danger positions. Also by the use of a buffing device such as I have described, a simple and effective means is provided for absorbing the momentum of the moving parts during their return to their caution and danger positions.

Having thus described my invention, what I claim is:

1. In combination, a railway signal, a motor, two concentric and independent rotatable members operatively connected respectively with the signal and with the motor, a stud carried by one of said members, a dog mounted on the other member to have movement relatively thereto, the said relative movement being into and out of position for engagement with the stud, a stationary electromagnet, and mechanism interposed between the electromagnet and the dog for holding the dog in position for engagement with the stud whereby the signal and the motor may be operatively connected.

2. In combination, a railway signal, a motor, two concentric and independent rotatable members operatively connected respectively with the signal and with the motor, a stud carried by one of said members, a dog mounted on the other member to have movement relatively thereto, the said relative movement being into and out of position for engagement with the stud, a stationary electromagnet, and mechanism interposed between the electromagnet and the dog for holding the dog in position for engagement with the stud and for permitting the dog to move out of such position according to whether or not the electromagnet is energized, whereby the signal and the motor may be operatively connected or disconnected.

3. In combination, a railway signal, a motor, two concentric and independent rotatable members operatively connected respectively with the signal and with the motor, a stud carried by one of said members, a dog mounted on the other member to have movement relatively thereto, the said relative movement being into and out of position for engagement with the stud, a clutch device for holding the dog in position for engagement with the stud whereby the signal and the motor may be operatively connected, and a stationary electromagnet for the control of the clutch device.

4. In combination, a railway signal, a motor, two concentric and independent rotatable members operatively connected respectively with the signal and with the motor, a stud carried by one of said members, a dog mounted on the other member to have movement relatively thereto, the said relative movement being into and out of position for engagement with the stud, an element coacting with the dog, and means including a stationary electromagnet for rigidly connecting the said element with the member carrying the dog whereby the dog is held in position for engagement with the stud.

5. In combination, a railway signal, a motor, two concentric and independent rotatable members operatively connected respectively with the signal and with the motor, a stud carried by one of said members, a dog mounted on the other member to have movement relatively thereto, the said relative movement being into and out of position for engagement with the stud, an element rotating with the member carrying the dog, a second element coacting with the dog, and means including a stationary electromagnet for rigidly connecting the two said elements whereby the dog is held in position for engagement with the stud.

6. In combination, a railway signal, a motor, two concentric and independent rotating members operatively connected respectively with the signal and with the motor, a stud carried by one of said members, a dog pivotally mounted on the other member and adapted for rotation into and out of position for engagement with the said stud, a stationary electromagnet, and mechanism interposed between the electromagnet and the dog for holding the dog in position for engagement with the stud whereby the signal and the motor may be operatively connected.

7. In combination, a railway signal, a mo-

tor, two concentric and independent rotatable members operatively connected respectively with the signal and with the motor, a stud carried by one of said members, a dog mounted on the other member to have movement relatively thereto, the said relative movement being into and out of position for engagement with the stud, a stationary electromagnet, mechanism interposed between the electromagnet and the dog for holding the dog in position for engagement with the stud whereby the signal and the motor may be operatively connected, and a buffing device operatively connected with the signal for cushioning the movement of the signal as the stud approaches the dog.

In testimony whereof, I have signed my name to this specification in the presence of two subscribed witnesses.

JOHN P. COLEMAN.

Witnesses:
L. FREDERIC HOWARD,
H. A. WALLACE.