C. W. TOWNSEND.

ELECTRIC PUMP GOVERNOR.

APPLICATION FILED JUNE 18, 1906.

965,609.

Patented July 26, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

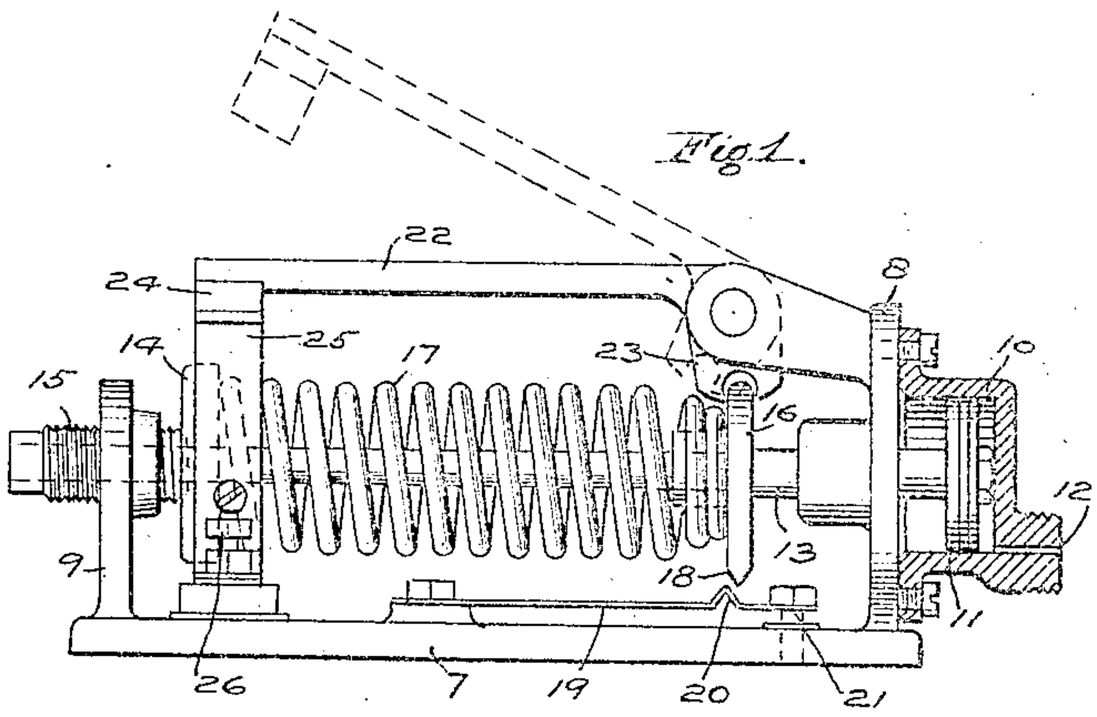


Fig. 2.

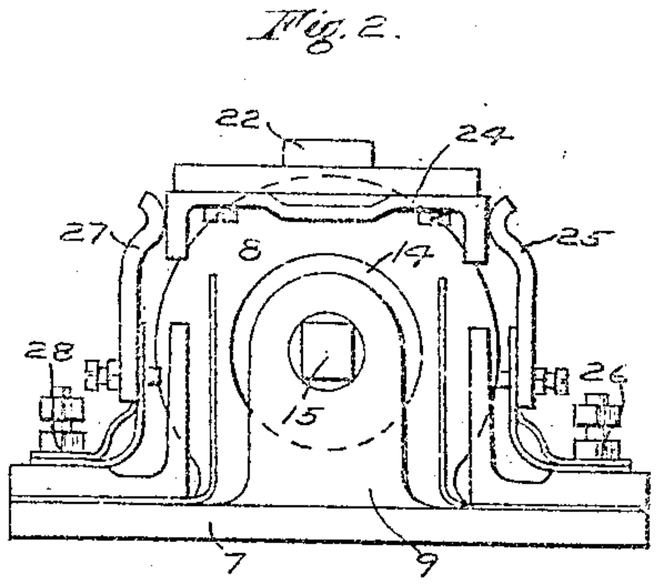
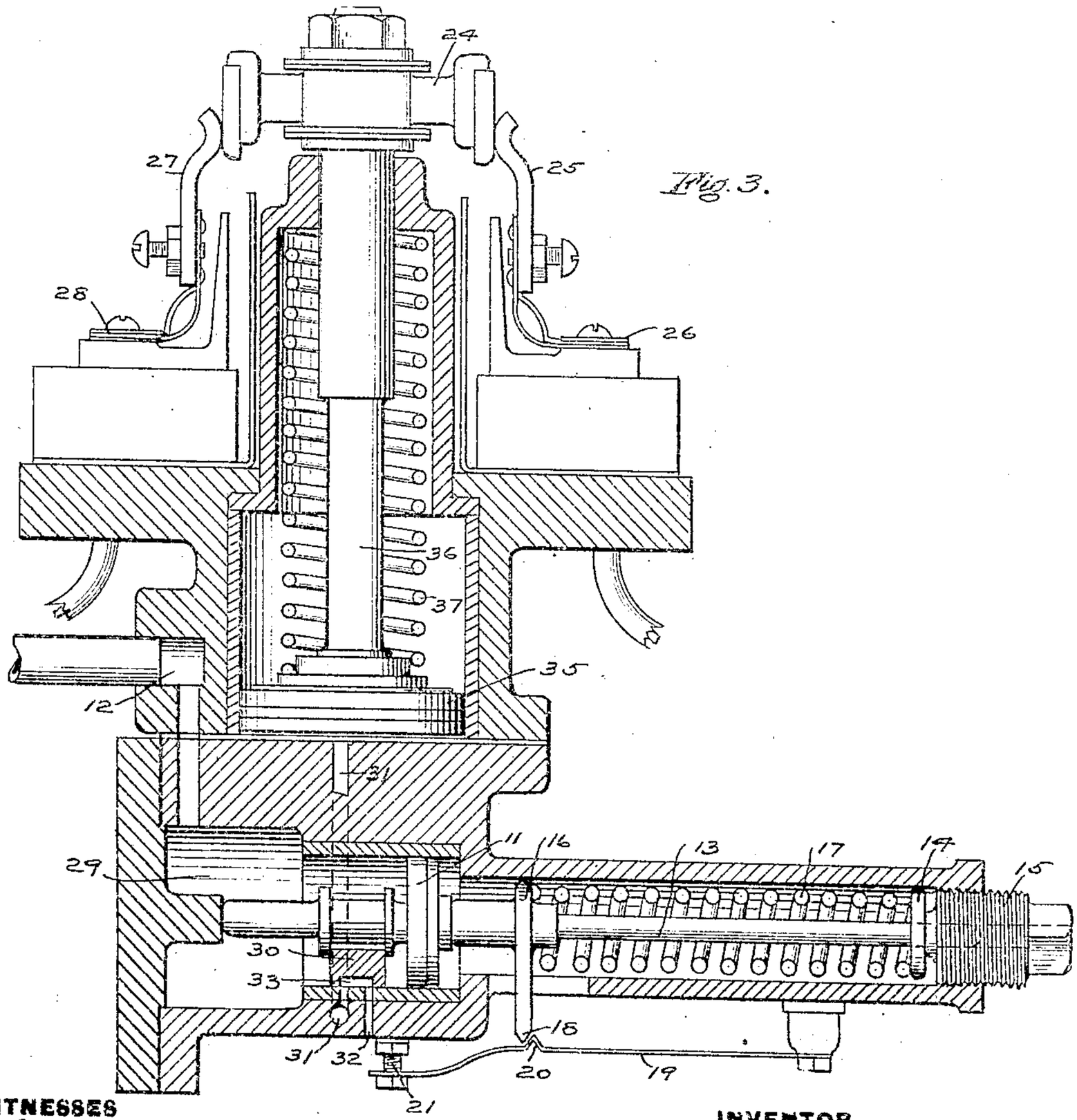


Fig. 3.



WITNESSES

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2 SHEETS—SHEET 2.

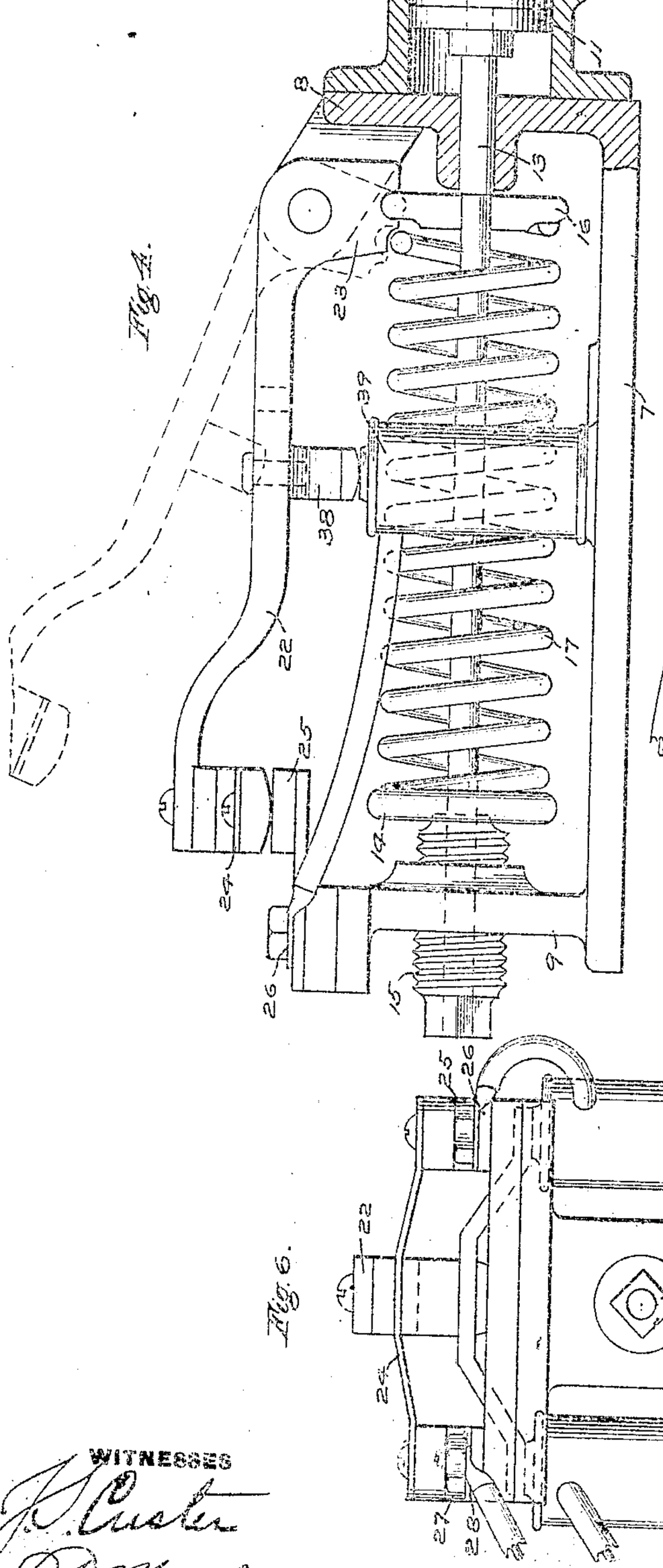

Fig. 4.

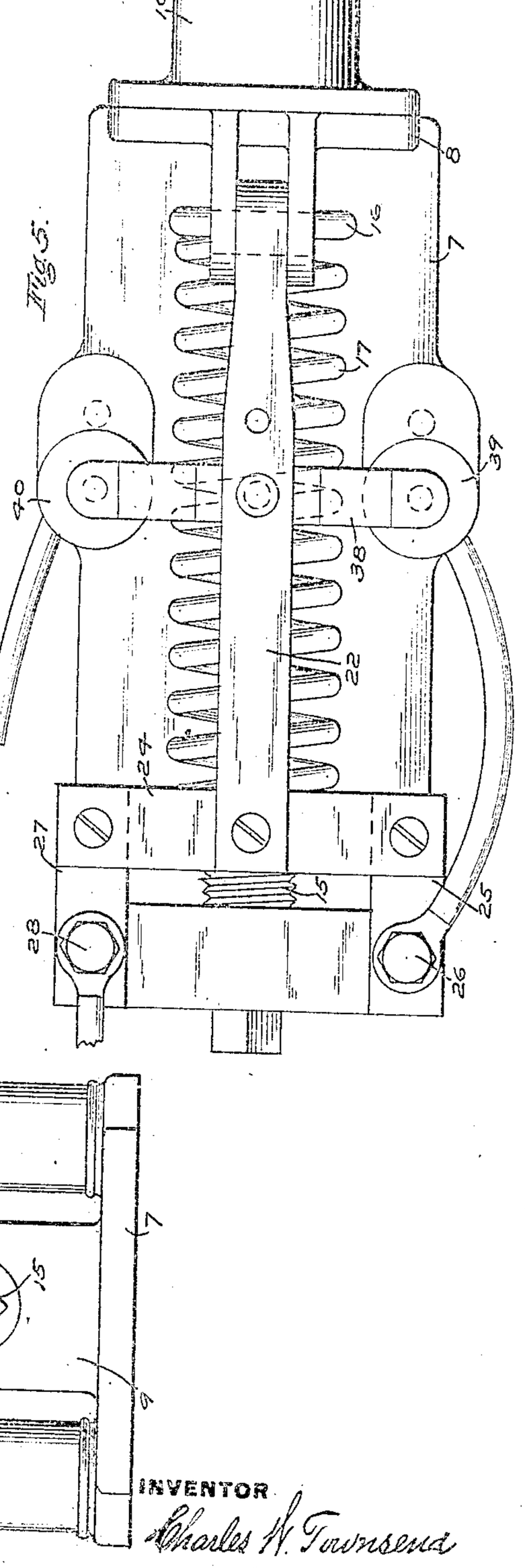

Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

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ELECTRIC PUMP-GOVERNOR.

965,609. Specification of Letters Patent. **Patented July 26, 1910.**

Application filed June 18, 1906. Serial No. 322,194

To all whom it may concern:

Be it known that I, CHARLES W. TOWNSEND, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Electric Pump-Governors, of which the following is a specification.

This invention relates to electric pump governors, and is particularly adapted to be used for governing electric motor driven air compressors, such as employed in air brake systems on electric cars, for storing up compressed air in a reservoir, and operating to open and close the electric circuit to stop and start the motor according to the degree of air pressure produced by the compressor.

The principal object of my invention is to simplify the construction of governors of this type, to greatly lessen the cost of manufacture and at the same time produce a governor which shall be durable and thoroughly reliable in its operation.

With this object in view, my present form of apparatus is composed of few parts, connected together in a simple and compact design, which may be readily adjusted to operate under any desired service conditions, all as hereinafter more fully described and set forth in the claims.

In the accompanying drawings, Figure 1 is a side elevation of one form of my improvement, the pressure cylinder being indicated in section; Fig. 2 an end view of the same; Fig. 3 a sectional view of a modified form of my invention; Fig. 4 a side view showing still another modification; and Figs. 5 and 6 a plan and end view respectively of the modified construction shown in Fig. 4.

As shown in Figs. 1 and 2, my improved device comprises a base portion 7, having at or near one end a flange 8, on which may be mounted a pressure cylinder 10 having movable abutment or piston 11, and an admission port 12 for communicating with the pump or reservoir of fluid under pressure. The piston rod 11 which extends out through the flange or head 8, has a collar 16 fixed thereon, and another collar 14 mounted for longitudinal movement and adapted to be adjusted by a screw 15 mounted in the upright flange 9 for varying the tension of the coiled spring 17 located between said collars.

The switch mechanism for opening and closing the electric circuit may comprise a bell-crank lever, supported in any convenient manner, such as pivoted upon a bracket secured to the cylinder head 8, and having a long arm 22 carrying a contact bar 24 for engaging the stationary contact fingers 25 and 27 connected respectively to the binding posts 26 and 28 of the electric circuit. The short arm 23 of the bell-crank lever is operated by the movement of the piston rod and is preferably provided with a recess engaging the fixed collar 16 on said rod. By means of this construction the switch for controlling the circuit is opened and closed by the movement of the piston, which is subject to the opposing forces of the fluid-pressure from the pump or reservoir on one side, and of the adjustable spring upon the other.

In order to effect a quick and sudden movement of the piston and its rod at the times of opening and closing the switch to cut out and cut in the pump, a retarding spring 19 is preferably provided, formed of a strip of flexible metal rigidly secured at one end and having an adjusting nut or screw 21 for adjusting the position of said spring. On the strip spring 19 is formed a hump or projection 20, which is adapted to engage with a V-shaped projection 18 on the collar 16 of the piston rod and thereby exert a certain additional resistance to the movement of said rod at this point of its movement in both directions.

The amount of resistance exerted by the retarding spring varies according to the extent or amount of surface of the hump 20 on the spring which engages the V-shaped projection 18 on the collar, which amount may be adjusted by means of the adjusting screw 21 to any degree desired. This will determine the difference between the cutting in pressure and the cutting out pressure of the governor, as will be readily understood.

When the springs 17 and 19 are adjusted to the desired amounts, and there is little or no pressure in the cylinder, the switch is normally closed, as shown in the drawing, and, as the current is turned on, the pump starts to work compressing air and accumulating pressure in the cylinder 10 of the governor. As this pressure increases to the degree for which the main spring 17 is adjusted, the piston 11 is moved out slightly,

so that the V-shaped projection engages the hump on the retarding spring, and the additional resistance thus offered to the movement of the piston rod holds the same at this point without moving the switch until the pump pressure has increased an additional amount, sufficient to depress the retarding spring and carry the V-shaped projection over the hump 20. As the resistance exerted by the retarding spring then ceases the piston moves out with a quick and positive movement, compressing the main spring 17 and throwing the bell-crank lever to its upper position, thereby opening the switch with a sudden and snap-like action, which prevents injurious arcing at the contact points of the circuit.

After the pump stops the pressure in the cylinder 10 falls and the main spring 17 starts the piston on its return movement, but the V-shaped projection then engages on the other side of the hump 20 of the retarding spring and holds the parts in this position until the pressure in the cylinder acting on piston 11 has fallen to such a degree that the tension of spring 17 is sufficient to overcome both the fluid pressure and the effect of the retarding spring, whereupon the piston, with its rod and collar, move inward with a quick positive action, causing the sudden movement of the bell-crank lever to close the switch and start the pump. It will be noticed that the arm of the bell-crank carrying the switch contact is much longer than the one connected to the piston rod, so that the extent and rapidity of its movement are multiplied to give very quick action.

In the manner above described, the governor continues to operate to cut the pump in and out, and thereby maintain a certain range of fluid pressure in the reservoir.

This form of my device is particularly adapted for use with small potential currents, but for governing motors working under heavier currents I prefer the modified form of my improvement shown in Fig. 3 of the drawings. According to this modification, the movable contact bar 24 of the switch is carried by rod 36 of piston 35 operating against the spring 37 in the cylinder 34, the admission of fluid under pressure to and its release from said cylinder being controlled by a small slide valve 30 operated by the piston 11 and governor mechanism previously described.

The operation of this form of my improvement will be readily understood; fluid under pressure from the pump or reservoir being admitted through port 12 to valve chamber 29 acts upon the piston 11 and causes the same to move outward with a quick positive movement, when the pressure rises to a point sufficient to overcome both the regulating spring 17 and the retarding spring 19. as before described. This movement carries the slide valve 30 to such a position as to open wide the supply port 31 to the cylinder 34, whereupon the full reservoir pressure acting on piston 35 throws the same together with the contact bar 24 of the switch to its outer position and thereby opens the circuit with a quick and positive movement. Any suitable or preferred form of blow-out device may also be employed, if desired, for assisting in extinguishing the arcs at the switch contact points. When the pressure acting on the piston 11 has diminished to the predetermined amount, the regulating spring 17 forces the piston back to its former position with quick and sudden movement, as previously described, and thereby returns the slide valve 30 to such position that the cavity 33 opens communication from the port 31 to exhaust port 32 and releases fluid under pressure from cylinder 34 to the atmosphere, so that the spring 37 immediately returns the piston 35 and closes the switch to start the pump. In the place of the retarding spring, as shown in Fig. 1, I may employ other means for temporarily assisting the regulating spring in holding the circuit closed, and in Figs. 4, 5 and 6 have illustrated another modification, in which an electro-magnet is used for this purpose. This construction corresponds substantially with that shown in Figs. 1 and 2, except that in lieu of the retarding spring mechanism an electro-magnet is provided having coils 39 and 40, and a contact piece or armature 38 carried by the arm 22 of the bell-crank lever. The coils of the electro-magnet are located in the motor circuit, as indicated, so that when the governor is cut in with the circuit closed, the coils are energized and the armature attracted thereto with a certain magnetic pull.

When the pressure acting on piston 11 rises to a point sufficient to overcome the tension of the spring combined with the pull of the magnets, the piston moves outward and starts the bell-crank lever toward its open or cut out position. The instant that the circuit is broken, the pulling effect of the magnets ceases, so that the switch arm 22 is carried to its open position, indicated in dotted lines, with a quick and positive movement by the excess of air pressure over that of the spring. As the pressure then diminishes the spring operates to close the switch in the usual way, but the instant that the circuit is again closed the magnets are energized and the switch is then held closed by the combined force of the spring and magnets. This requires a certain increase in pressure before the switch can again be opened, and the range or difference between the cutting in and cutting out pressures is determined by the pull of the magnets, which may be varied by adjusting the position of the magnets and armature with reference to the

pivot of the bell-crank lever and thereby vary the leverage effect.

It will now be seen that by means of my improvements a very simple and compact form of governor is provided, which is composed of few parts and readily adjustable to give any desired range, and operates with a quick and snap-like action to open the circuit and cut out the pump when the maximum degree is reached.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. An electric pump governor comprising a pressure cylinder, piston and rod, a collar fixed on said rod, a coiled spring bearing against said collar, a bell-crank lever having a long arm carrying a contact bar for opening and closing an electric circuit, and a short arm engaging with said fixed collar on the piston rod.

2. An electric pump governor comprising a cylinder, piston and rod, a coiled spring surrounding said rod, a laterally flexible retarding spring, and a projection carried by the rod for engaging said retarding spring.

3. An electric pump governor comprising a cylinder, piston and rod, a coiled spring surrounding said rod, a laterally flexible retarding spring having an adjusting screw, and a projection carried by the rod for engaging said retarding spring.

4. An electric pump governor comprising a cylinder, piston, and rod, an adjustable spring surrounding said rod, a laterally flexible retarding spring having a hump portion, and means operated by the movement of the piston rod for engaging said hump portion.

5. An electric pump governor comprising a cylinder, piston, and rod, an adjustable spring surrounding said rod, a laterally flexible retarding spring having a hump portion with inclined resistance surfaces, and a V-shaped projection carried by the piston rod for engaging said surfaces.

6. An electric pump governor comprising a cylinder, piston and rod, a coiled spring surrounding said rod, a stationary retarding spring, and a projection carried by the rod for engaging said retarding spring.

7. In an electric pump governor, the combination with a piston subject to the fluid pressure, an adjustable regulating spring, a laterally flexible retarding spring, and a projection operated by the movement of the piston for engaging said retarding spring, of a switch operating piston and cylinder, and a valve actuated by the first piston for controlling the supply of fluid to the switch operating cylinder.

8. An electric pump governor comprising a pressure cylinder, piston and rod, a collar fixed on said rod, a coiled spring bearing against said collar, a bell-crank lever having a long arm carrying a contact bar for opening and closing an electric circuit, a short arm engaging with said fixed collar on the piston rod, and a retarding spring adapted to temporarily exert a resistance to the movement of said piston.

In testimony whereof I have hereunto set my hand.

CHARLES W. TOWNSEND.

Witnesses:
W. Glasgow Clark,
S. W. Haynes.