No. 785,669. PATENTED MAR. 21, 1905.

M. D. HANLON.

RAILWAY SIGNAL.

APPLICATION FILED JULY 9, 1904.

3 SHEETS—SHEET 1.

Fig: 1.

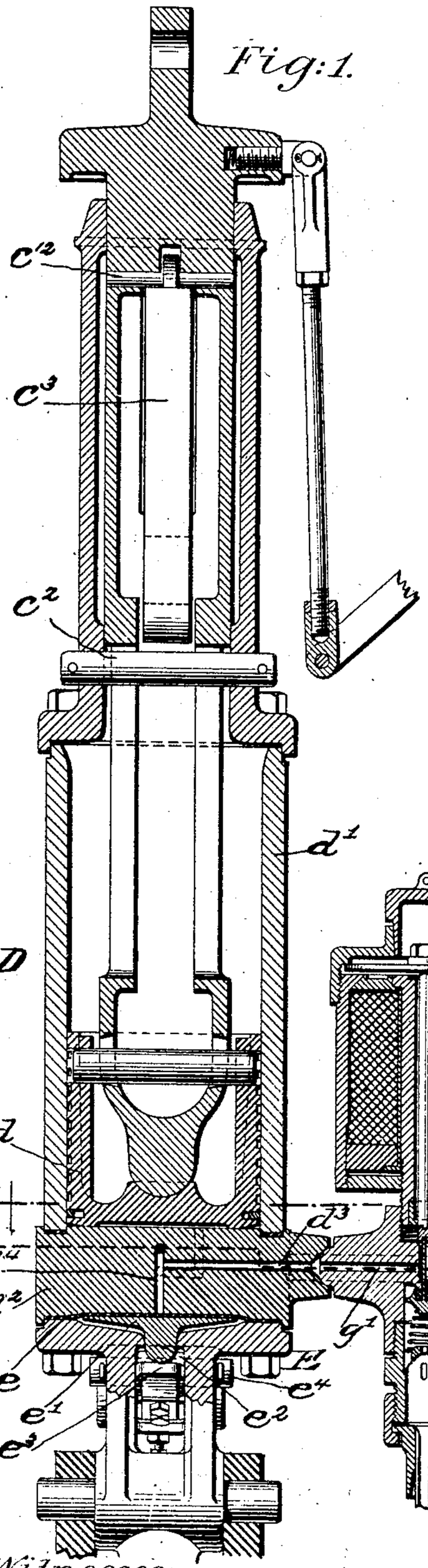
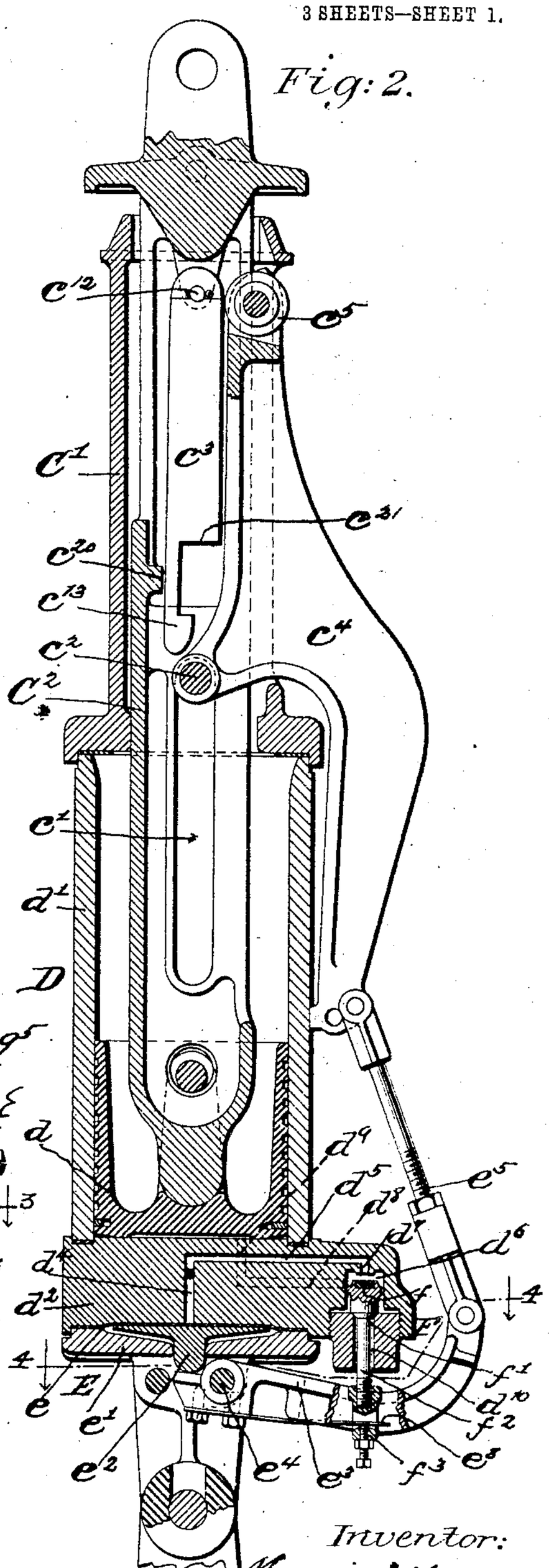


Fig: 2.



Witnesses:
John A. Rennie.
Robt. F. Johnson

Inventor:
Marquis D. Hanlon
By Geo. E. Crosse.
his Attorney.

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3 SHEETS—SHEET 2.

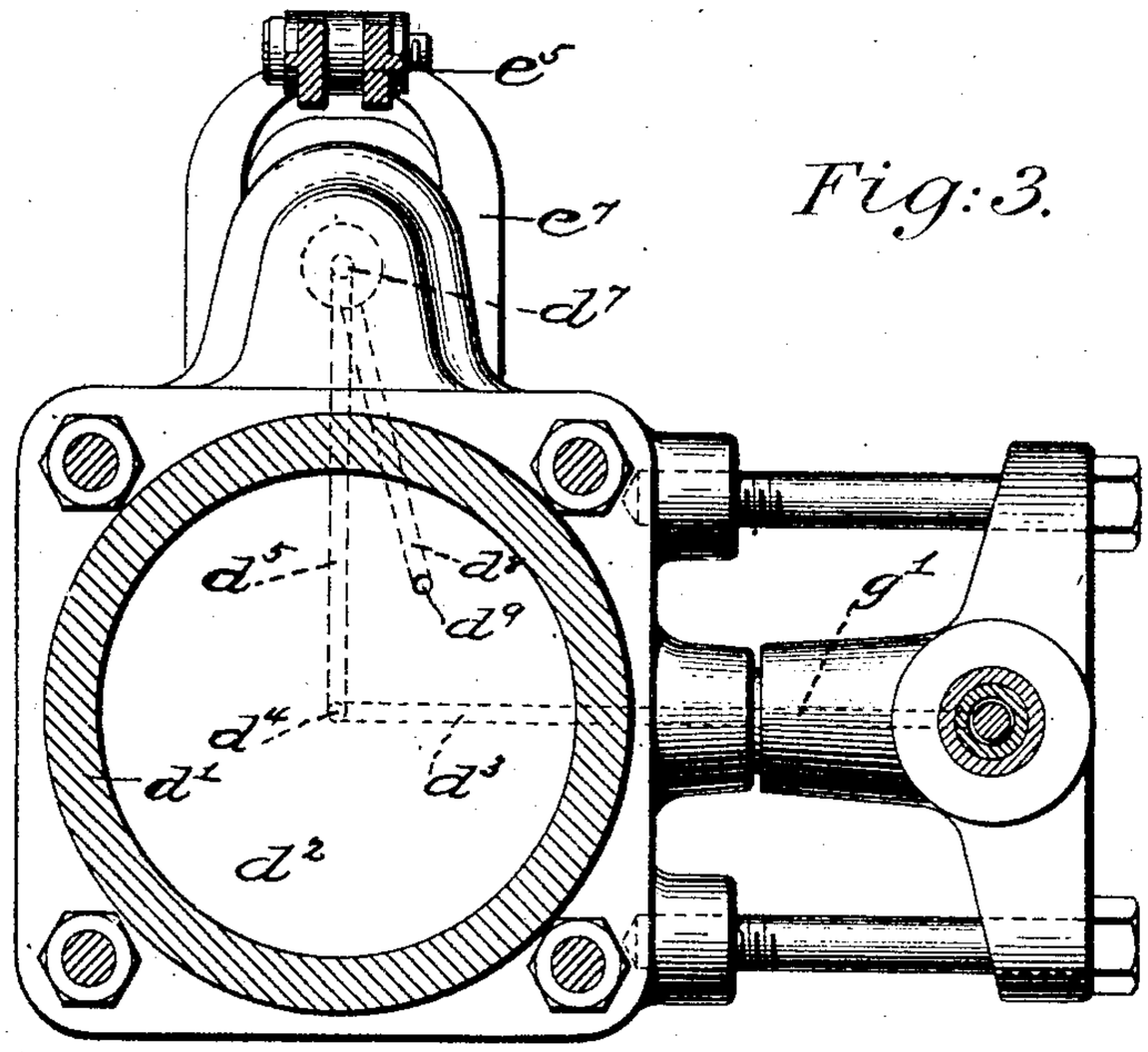


Fig: 3.

Fig: 4.

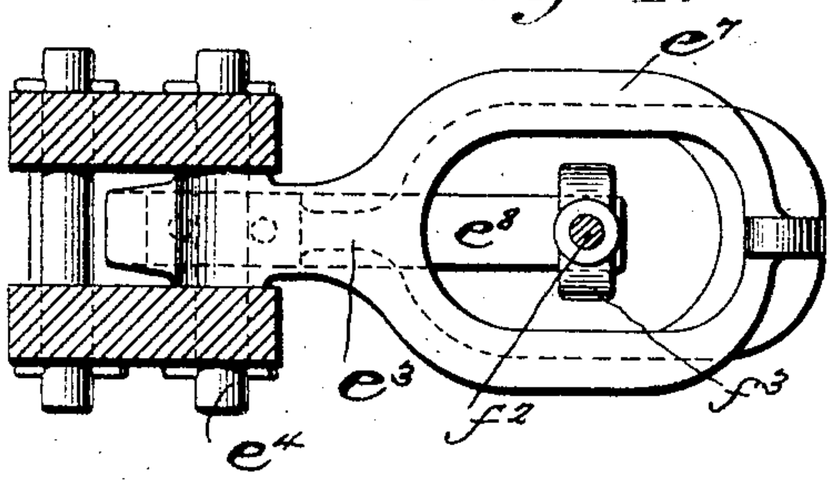
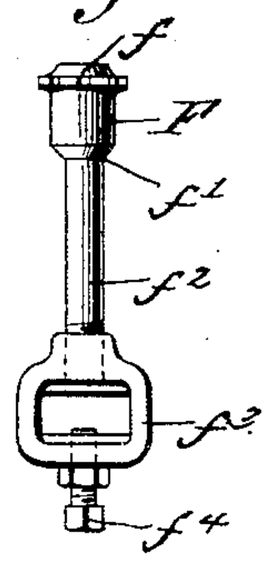


Fig: 5.



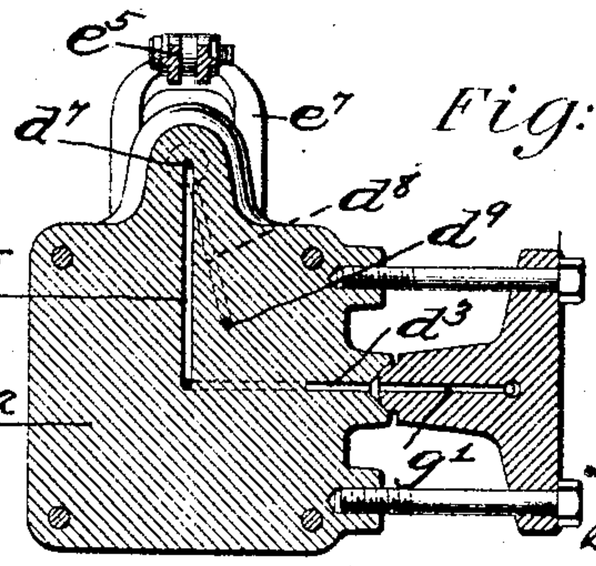


Fig: 6.

Witnesses:
John A. Bennie.
Robt. S. Johnson

Inventor:
Marquis D. Hanlon
By Geo. E. Greene
his Attorney.

No. 785,669.

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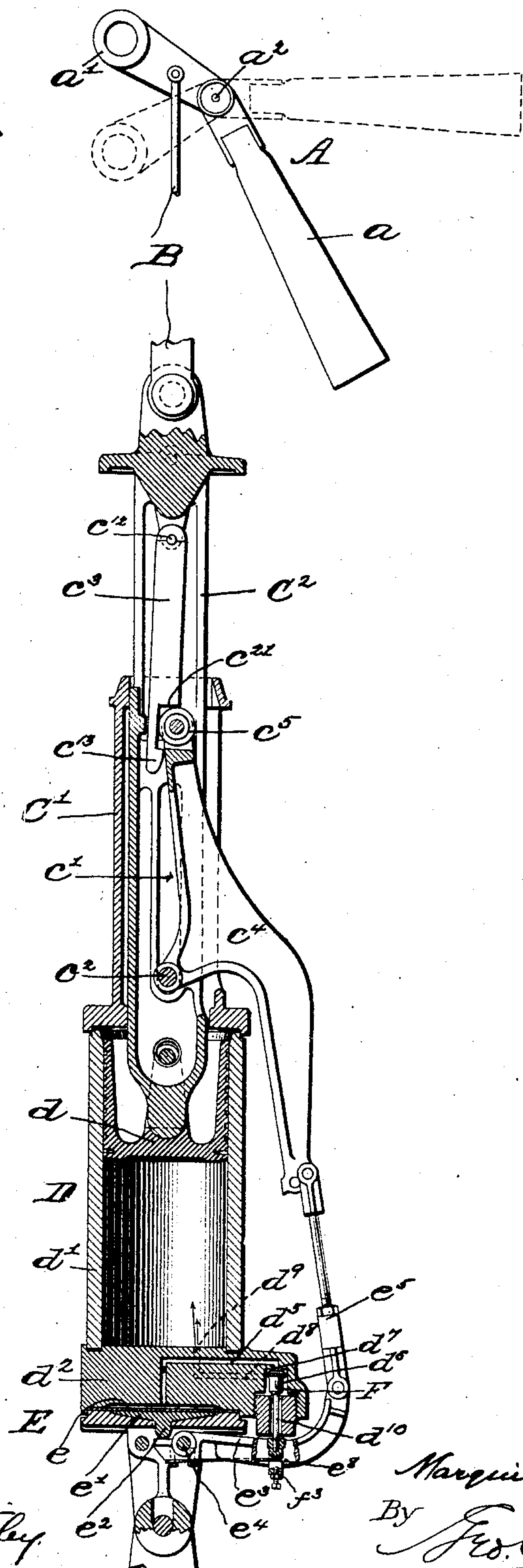
3 SHEETS—SHEET 3.

Fig: 7.



Witnesses:
Robt. Johnson
Stockell M. Whiteley

Inventor:
Marquis D. Hanlon
By Fred. E. Cruse
his Attorney.

No. 785,669. Patented March 21, 1905.

UNITED STATES PATENT OFFICE.

MARQUIS D. HANLON, OF WILKINSBURG, PENNSYLVANIA.

RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 785,669, dated March 21, 1905.

Application filed July 9, 1904. Serial No. 215,878.

To all whom it may concern:

Be it known that I, MARQUIS D. HANLON, a citizen of the United States, residing at Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Railway-Signals, of which the following is a specification.

My invention relates to railway-signals, and particularly to that class of railway-signals in which the motive power therefor is in the form of fluid-pressure.

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

In the accompanying drawings, Figure 1 is a vertical sectional view of a portion of a railway-signal embodying my invention and showing more particularly the operating mechanism thereof. The several parts of the operating mechanism are in the positions they occupy when the signal device of the railway-signal is in a position indicating "danger." Fig. 2 is a view similar to Fig. 1, but taken in a plane at right angles to the plane of section of Fig. 1. Fig. 3 is a transverse sectional view taken on the line 3 3 of Fig. 1. Fig. 4 is a transverse sectional view taken on the line 4 4 of Fig. 2. Fig. 5 is a detail view. Fig. 6 is a detail horizontal sectional view taken on the line 6 6 of Fig. 1, showing an arrangement of ports and passages for the supply of fluid-pressure to different fluid-pressure apparatus comprised in the operating mechanism. Fig. 7 is a view similar to Figs. 1 and 2, drawn to a smaller scale, but showing the several parts in the positions they occupy when the signal device is in a position indicating "clear" or "safety."

Similar letters of reference designate corresponding parts in all of the figures.

I will premise that wherever I herein use the term "signal" I mean to include any visual-signal device which by its color or by its position relatively to its support gives indications of the service conditions of the railroad-track or section of railroad-track which it governs. Also wherever I use the term "fluid-pressure" I mean a liquid or gas under pressure. I preferably employ a gas. Any gas may be employed—for example, air or carbonic-acid gas—and under any pressure which is sufficient or more than sufficient to operate the apparatus employed for moving the signal device. If the pressure of the gas is above that required for the operation of the apparatus employed in the railway-signal, reducing-valves may be employed in their proper places. An auxiliary reservoir may also be employed between the reducing-valve and the fluid-pressure apparatus.

A (see Fig. 7) designates a visual signal, here shown as being a semaphore and comprising, as usual, a blade a and a counterweight a'. The counterweight a' is adapted when the semaphore is free to move on its pivot a^2 to move the blade a to a horizontal position, which position generally indicates "danger" or "stop" when the railway-signal is placed in service beside a railway. In this invention the blade a is moved from its horizontal position to an inclined position by a fluid-pressure apparatus through the medium of a vertically-arranged rod B, generally termed an "up-and-down" rod. When in an inclined position, the blade indicates "safety" or "caution." The rod B is operatively connected with the semaphore at one end and with the piston of the fluid-pressure apparatus at its other end.

D designates the fluid-pressure apparatus which is employed for moving the signal from one position of indication to another—that is, from a horizontal position to an inclined position. It is here shown as being in the form of a motor comprising a piston d and a cylinder d', within which the piston moves. The motor is mounted on a base d^2, supported on and secured to suitable brackets. The base d^2 is provided with a passage d^3, which is in communication with a controllable source of fluid-pressure supply, a passage d^4, in communication with the passage d^3, and a second fluid-pressure apparatus E, to be hereinafter more particularly described, a passage d^5, in communication with the passage d^3 and with a chamber d^6 through a port d^7, and a passage d^8, leading from the chamber d^6 to a passage d^9, which latter passage opens into the cylinder d' beneath the piston. A double-

acting valve F, to be hereinafter referred to, located in the chamber d^6, upon positive operation in opposite directions opens and closes the passage d^5 and port d^7 to control the supply of fluid-pressure to the cylinder d' and an exhaust passage or port d^{10}, leading from the chamber d^6 to the atmosphere. The valve F is so arranged that when the port d^7 is closed the passage d^{10} is opened, and vice versa. Fluid-pressure for operating the apparatuses D and E may be supplied from any suitable source through a pipe or conduit e^{10}, which is in communication with the passage d^3, and its flow through the passage d^3 is under the control of an electrically-operated valve device G. This valve device may conveniently be substantially of the form and arrangement illustrated and described in United States Letters Patent No. 357,109, issued February 1, 1887, to George Westinghouse, Jr., to which patent reference may be had for details of construction and operation. It is only necessary to here state that the electrically-operated valve device should have the functions of opening the supply of fluid-pressure when the coil g^5, comprised in the device, is energized and of closing or cutting off the supply of fluid-pressure when said coil is deënergized and of opening an exhaust port or passage, through which the used fluid-pressure may escape to the atmosphere. Any electrically-operated valve device having these functions may be employed. The fluid-pressure passes around the valve g, comprised in the valve device G, into a passage g', which is in communication with the passage d^3. The valve g^2, comprised in the valve device G, controls the escape of gas from the passages d^3 and d^4 to the atmosphere through a port g^3. The valves g and g^2 are so arranged that when one is seated the other is unseated or opened, and vice versa.

In this invention the fluid-pressure apparatus D is designed to move the signal—in this example the blade a—from one position of indication to another, preferably from the danger position of indication to the safety or clear position of indication, by a single upward stroke of the piston d. After the signal has been moved by the piston d it is locked and held against return movement by suitable locking means operated from the fluid-pressure apparatus E. The fluid-pressure apparatus E as here shown comprises a diaphragm e, located in a chamber formed in part by a portion of the under side of the base d^2 and a cap-plate e', which parts also serve to hold the peripheral edge portion of the diaphragm. The diaphragm is provided with a projection e^2, which bears upon and moves a lever e^3 when fluid-pressure is admitted onto the diaphragm through the passage d^4. The ends of the pin e^4 are mounted in the brackets supporting the base d^2.

The locking means here shown comprises a pawl c^3 and a lever c^4, which is preferably in the form of a bell-crank lever. The pawl c^3 is arranged on a pin c^{12}, which is mounted at its ends in the stem of the piston, which, as shown, is in the form of a cylinder C^2, in such manner as to have a swinging movement. The pawl c^3 is limited in its radial movement in one direction on the pin c^{12} by a projection c^{20}, which may be integral with the piston-stem. The lever c^4 is arranged on a pin c^2, which is mounted in such manner as to have a rocking movement in some fixed part of the railway-signal—for example, a casing C', suitably mounted on the upper end of the cylinder d'. The pin extends through elongated openings c', provided in the piston-stem, in order that the piston and the parts connected therewith may have movement without hindrance by the pin c^2. The lever c^4 is provided with a roller c^5, which when the piston has completed its upward stroke to move the semaphore on its pivot and with it the pawl c^3 moves beneath a shoulder c^{21}, provided on the pawl. (See Fig. 7.) The lever c^4 is rocked by the fluid-pressure apparatus E through the lever e^3 and a rod e^5. The effective position of the locking means is shown in Fig. 7. In this position the rod B, piston d, and pawl c^3 under the influence of the counterweight a' act downwardly to restore the piston d to the bottom of the cylinder d' and the blade a to its horizontal position. Such action, however, is prevented by the lever c^4 and rod c^5 so long as fluid-pressure is acting on the diaphragm e. By reason of the relation of the journal of the roller c^5 to the centers of the pins c^{12} c^2, it lying outside of a line drawn through the centers of the pins c^{12} c^2, the weight a' of the semaphore, rod B, and piston, &c., is transmitted, through the pawl c^3, to the periphery of the roller c^5 and through its journal-pin to the pin c^2 of the lever c^4 and tends to force the lever c^4 outward and the pawl c^3 outward with the roller c^5 and to bring a toe portion c^{13} on the pawl c^3 into engagement with the lever c^4. The pawl c^3, roller c^5, the lever c^4, and its pin c^2 form, in effect, a toggle-joint. When the diaphragm is relieved from pressure, the lever c^4 moves outward on its pivot c^2 and with it the pawl c^3, thus bringing the toe portion c^{13} against the lever c^4. In consequence of this the roller c^5 is moved from under the pawl and, revolving, ceases to support the pawl, which, swinging clear of the lever c^4 and roller c^5, descends with the rod B. The rod B under the influence of the counterweight a' forces the piston to the bottom of the cylinder and moves the blade a to its horizontal position, which indicates "danger." The parts are then in the positions shown in Figs. 1 and 2.

In order to provide for cutting off the supply of fluid-pressure to the cylinder after the lever c^4 has been moved under the pawl c^3, for it is evident that the further supply of fluid-

pressure would be unnecessary and would if supplied the cylinder leak past the piston-packings and still retain the supply of fluid-pressure on the diaphragm, I provide the valve F and operate it positively from the fluid-pressure apparatus E through the lever e^3. The valve is shown as being provided with two valve-faces $f\,f'$, one, f, to open and close the port d^7 and the other, f', to open and close the entrance to the passage d^{10}, which leads to the atmosphere. The valve F is located in the chamber d^6, and the stem f^2 thereof extends through the passage d^{10}. The stem f^2 (see Fig. 5) is provided at its lower end with an adjustable stirrup f^3, which is located in an enlargement e^7 of the lever e^3. (See Fig. 4.) A spring e^8, or there may be a plurality of springs e^8, is secured at one of its ends to the lever e^3, and its other end extends into the stirrup f^2. A screw f^4 is provided in the stirrup and is for the purpose of regulating the tension of the spring e^8. The value of a loose connection between the spring e^8 and the stem of the valve F lies in the fact that some movement of the lever e^3 is permitted without any movement of the valve F.

The operation of the valve F by the fluid-pressure apparatus E is as follows: When the parts of the railway-signal are in the positions shown in Figs. 1 and 2, upon the energization of the coil comprised in the valve device G the valve g^2 will be closed and the valve g opened. Fluid-pressure will then flow through the passages d^3 and d^4 to the diaphragm e and through passages d^5, port d^7, past the valve f, which will be in its open position, (see Fig. 2,) into the chamber d^6 and through the passages d^8 d^9 into the cylinder d' under the piston d, thereby causing the piston to move upward and through the rod B move the semaphore on its pivot. The fluid-pressure acting on the diaphragm e causes the diaphragm to rock the lever e^3 and through the rod e^5 to rock the lever c^4 to bring the roller against the pawl, which resting against a stop c^{20} prevents further movement of the levers c^4 and e^3 by the diaphragm until the shoulder of the pawl has passed beyond the roller c^5, after which the roller c^5 moves under the shoulder of the pawl. When this occurs, the lever e^3 will move the spring e^8 to engage the upper part of the stirrup and positively move the valve F to close the port d^7, and thereby shut off the supply of fluid-pressure to the cylinder and open the exhaust-passage d^{10}, so that the fluid-pressure in the cylinder beneath the piston may exhaust to the atmosphere. When the supply of fluid-pressure is cut off from above the diaphragm, and this is due to a deënergization of the coil comprised in the valve device G, the lever c^4 will move from beneath the pawl, and in doing so it causes the lever e^3 to rock downward. In rocking downward the spring e^8 engages the lower part of the stirrup to positively move the valve F to open the port d^7 and close the passage d^{10}. The valve F is preferably so arranged in the chamber d^6 that it requires positive movement in both directions to satisfactorily perform its functions.

The coil of the valve device is included in a circuit which may be opened or closed in any desired manner—for example, by the armature of a relay the coils of which are included in a track or other circuit.

Having thus described my invention, what I claim is—

1. In a railway-signal, the combination with a signal, of a fluid-pressure apparatus for moving it from one position of indication to another; means for locking the signal in the position to which it has been moved comprising a pawl movable with the signal, a lever for engaging the pawl during the pawl's movement and moving beneath it after an operation of the fluid-pressure apparatus and a second lever operatively connected with the first-mentioned lever; a diaphragm for operating the second lever; a fluid-pressure supply for the fluid-pressure apparatus and the diaphragm; a valve for controlling the supply of fluid-pressure to the fluid-pressure apparatus; and means for moving said valve to cut off the supply of fluid-pressure to the fluid-pressure apparatus which means are operated from the second lever.

2. In a railway-signal, the combination with a signal; of a fluid-pressure apparatus for moving it from one position of indication to another; means for locking the signal in the position to which it has been moved comprising a pawl movable with the signal, a lever for engaging the pawl during the pawl's movement and moving beneath it after an operation of the fluid-pressure apparatus and a second lever operatively connected with the first-mentioned lever; a diaphragm for operating the second lever; a fluid-pressure supply for the fluid-pressure apparatus and the diaphragm; a valve for controlling the supply of fluid-pressure to the fluid-pressure apparatus; and a spring connected with the second lever for moving said valve to cut off the supply of fluid-pressure to the fluid-pressure apparatus.

3. In a railway-signal, the combination with a signal; of a fluid-pressure apparatus for moving it from one position of indication to another; means for locking the signal in the position to which it has been moved comprising a pawl movable with the signal device, a lever for engaging the pawl during the pawl's movement and moving it beneath it after an operation of the fluid-pressure apparatus and a second lever operatively connected with the first-mentioned lever; a diaphragm for operating the second lever; a fluid-pressure supply for the fluid-pressure apparatus and the diaphragm; a valve for controlling the supply of fluid-pressure to the fluid-pressure ap-

paratus; and means, comprising a spring connected with the second lever and a stirrup connected with the valve and in which the end of the spring fits, for moving said valve to cut off the supply of fluid-pressure to the fluid-pressure apparatus.

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

MARQUIS D. HANLON.

Witnesses:
W. L. McDaniel,
George McCormick.