

F. H. RICE.
ALARM FOR AUTOMATIC FIRE EXTINGUISHERS.

APPLICATION FILED JULY 30, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

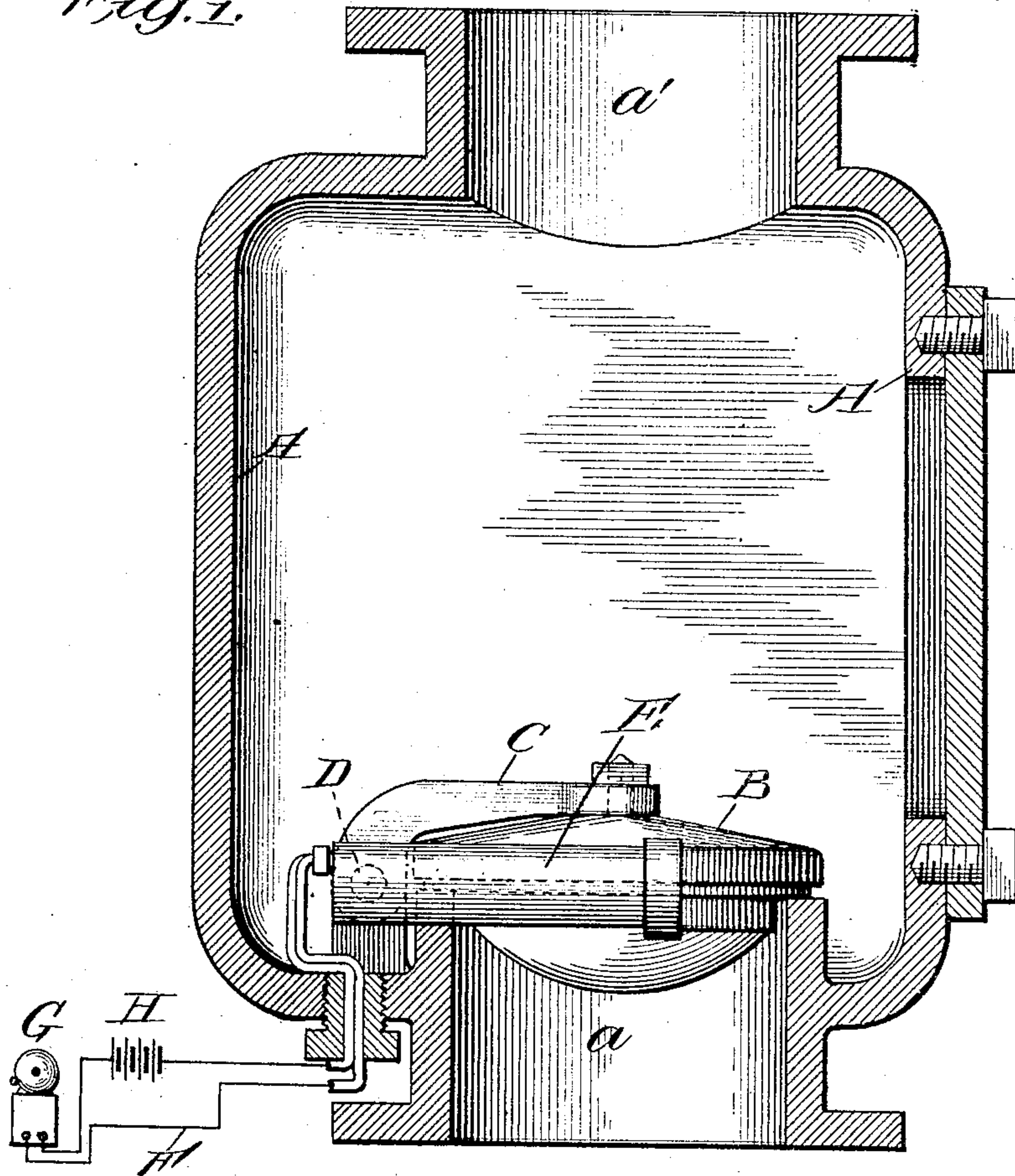
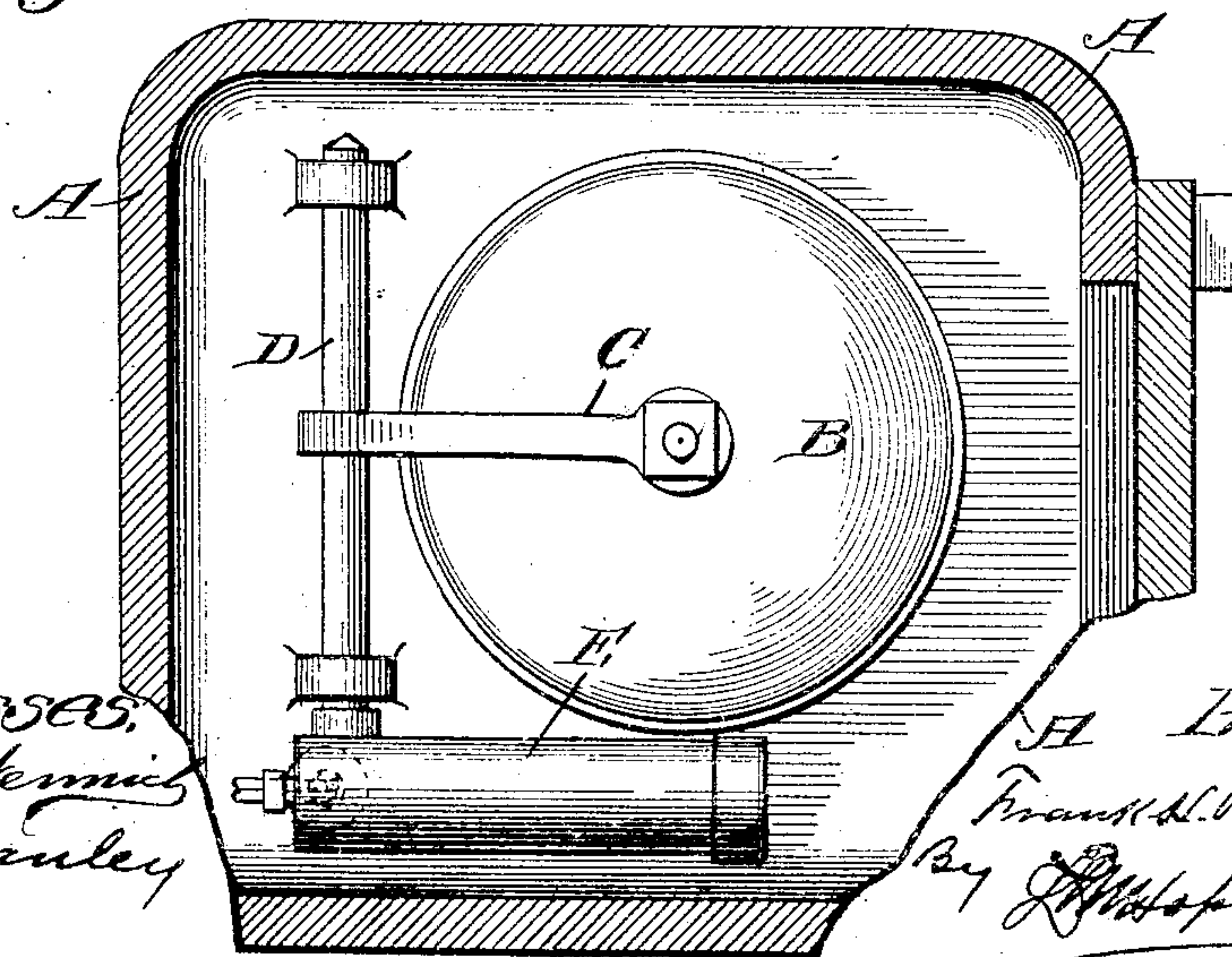


Fig. 2.



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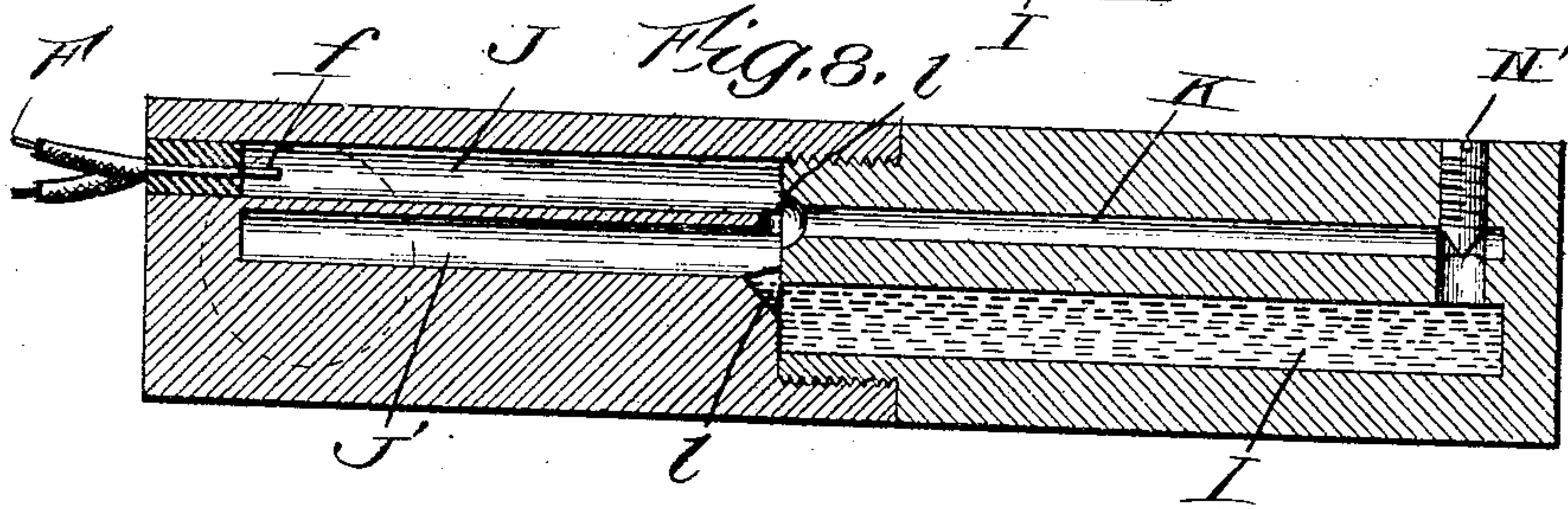
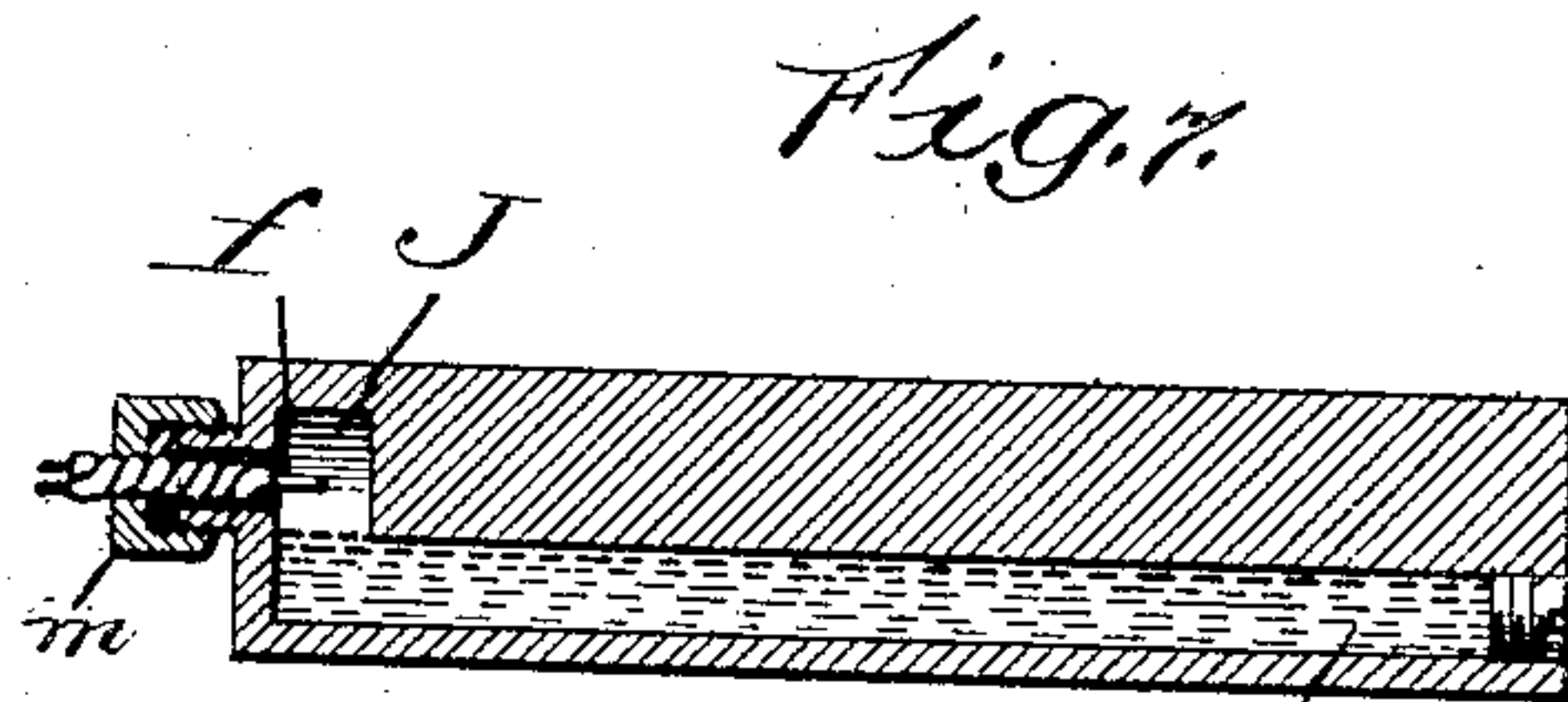
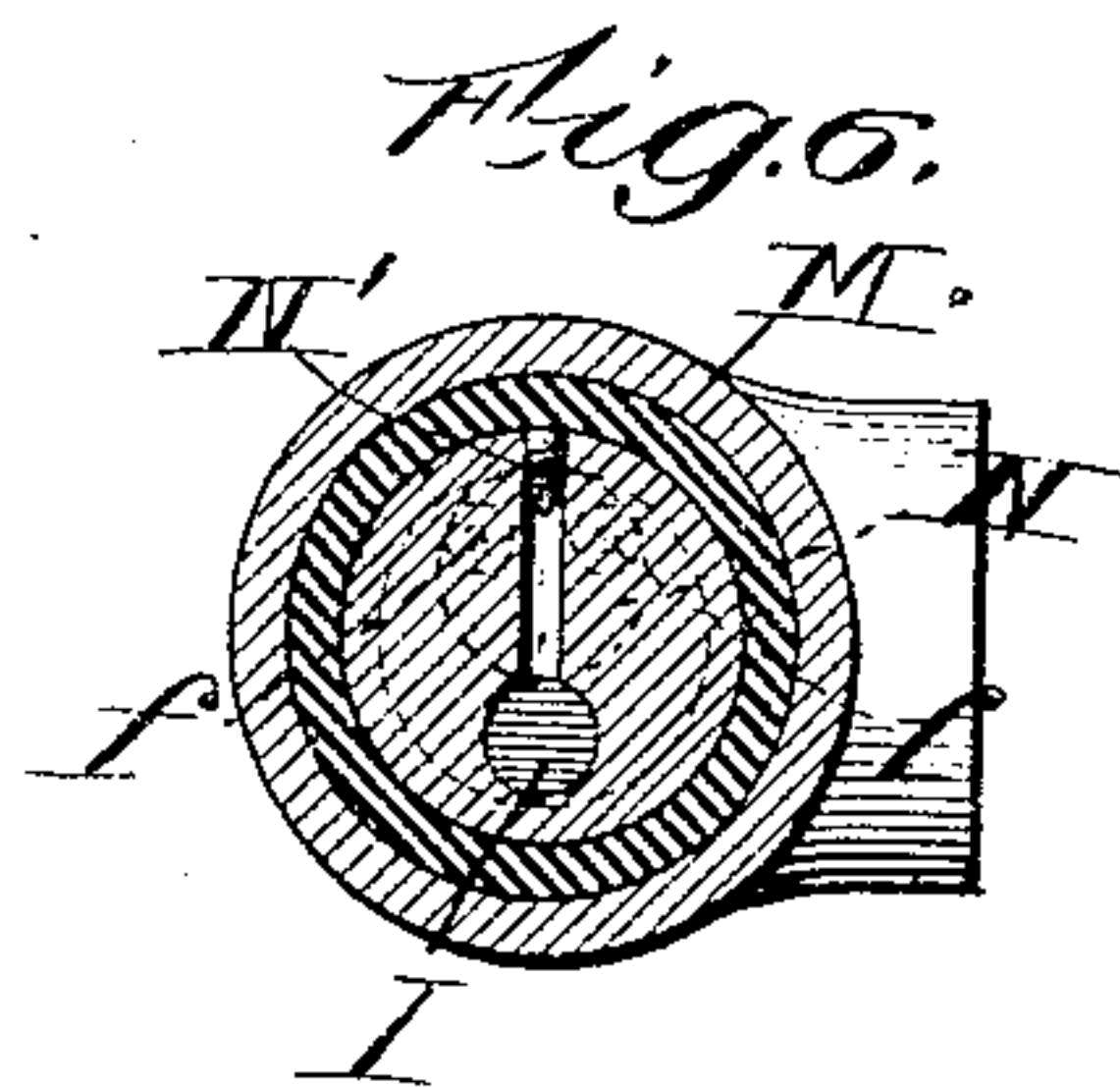
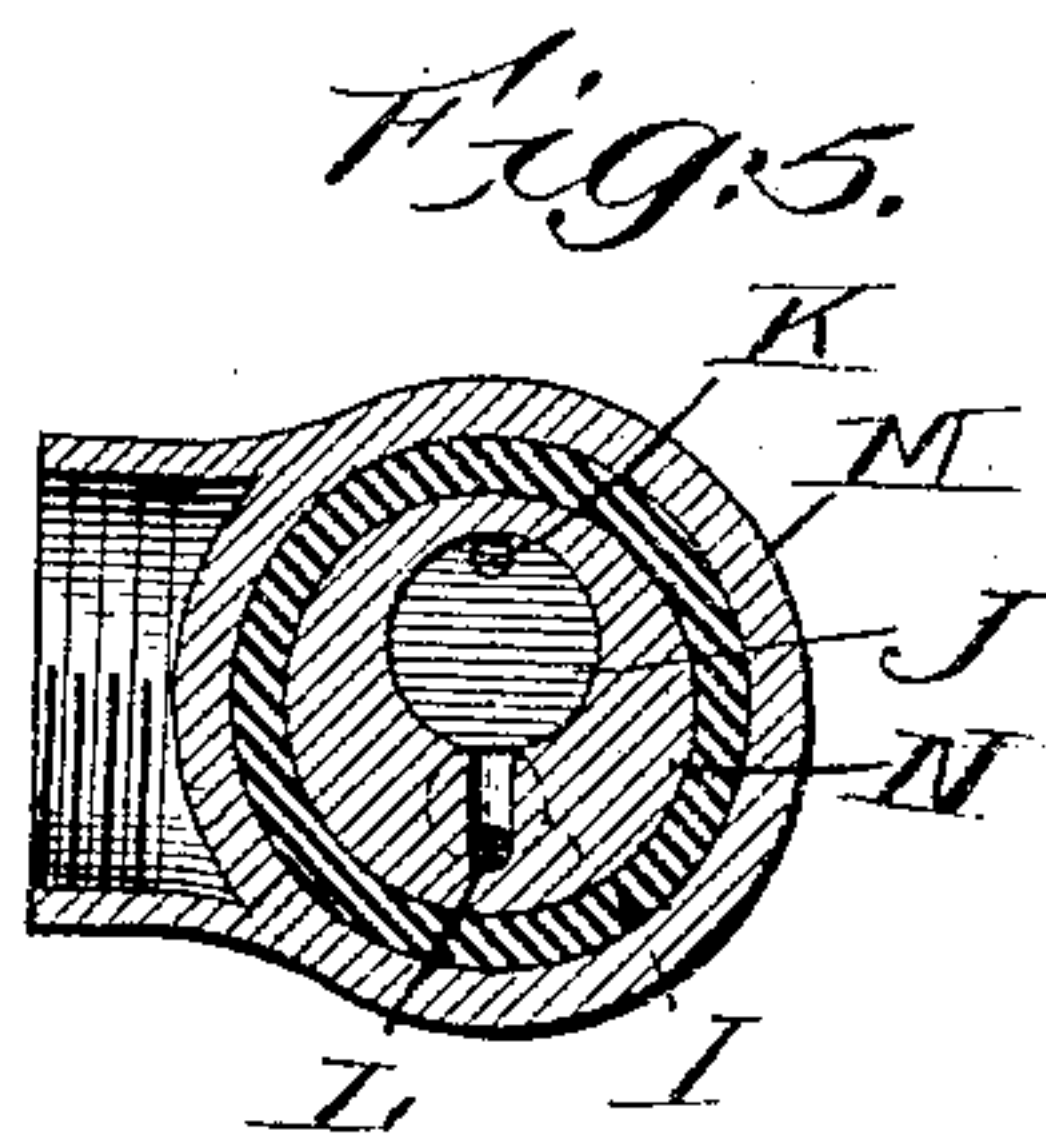
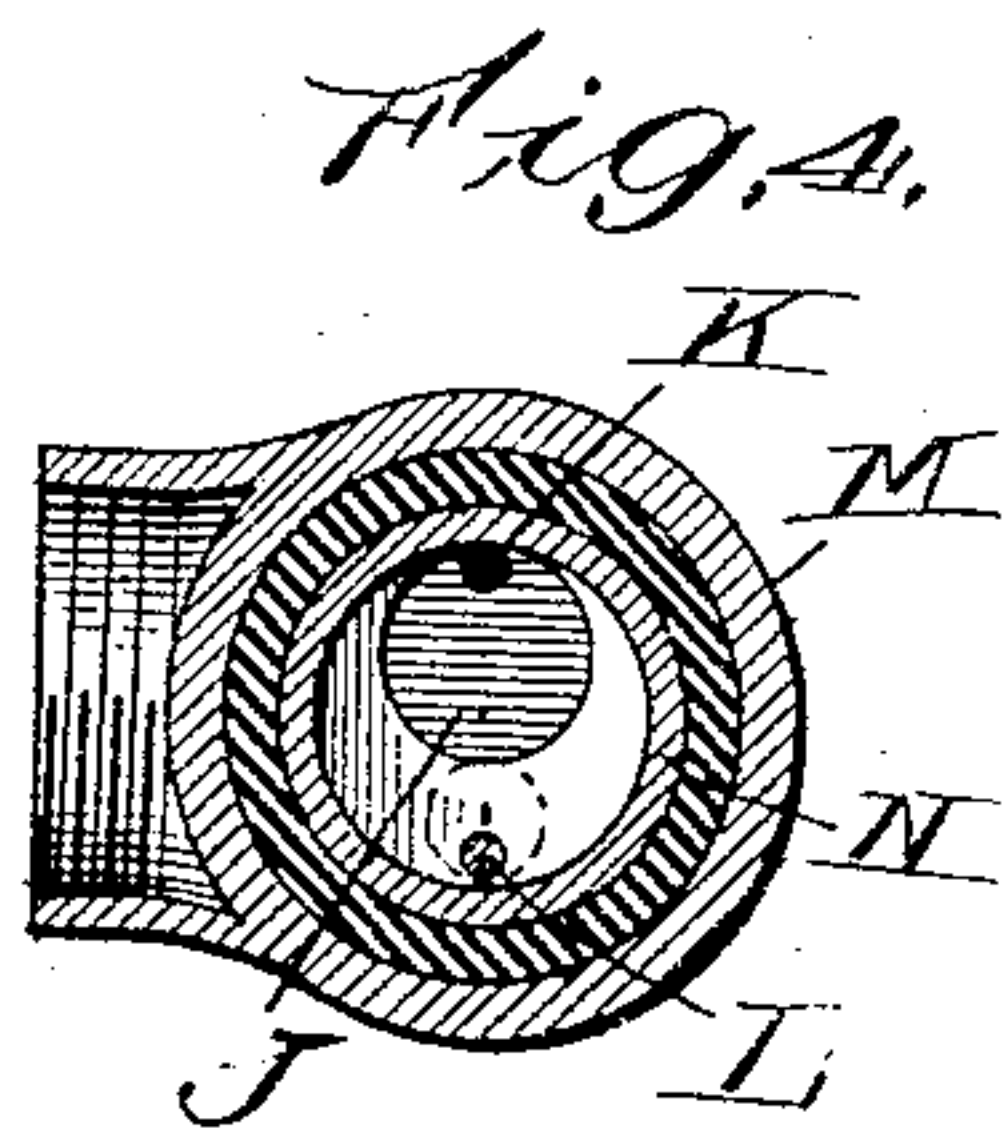
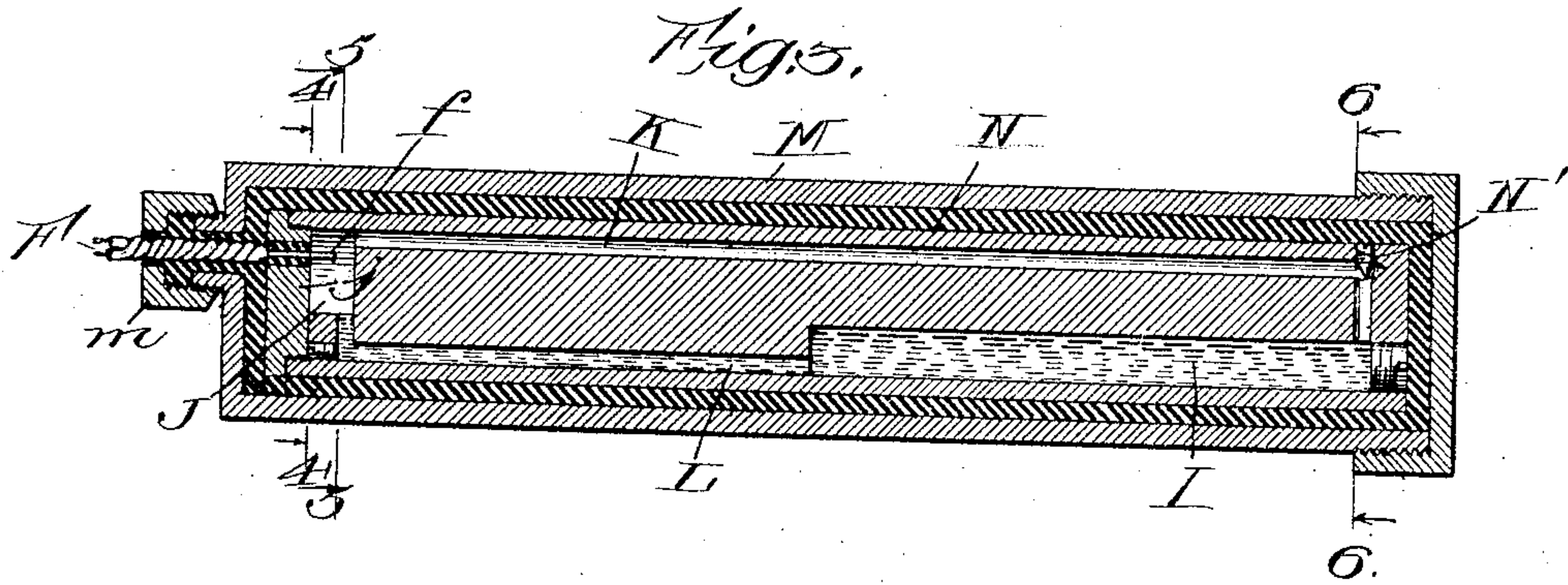
Inventor:
Frank H. Rice
By *[Signature]*
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ALARM FOR AUTOMATIC FIRE EXTINGUISHERS.

APPLICATION FILED JULY 30, 1904.

2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

FRANK H. RICE, OF CHICAGO, ILLINOIS, ASSIGNOR TO AUTOMATIC FIRE PROTECTION COMPANY, A CORPORATION OF MAINE.

ALARM FOR AUTOMATIC FIRE-EXTINGUISHERS.

No. 840,375.

Specification of Letters Patent.

Patented Jan. 1, 1907.

Application filed July 30, 1904. Serial No. 218,935.

To all whom it may concern:

Be it known that I, FRANK H. RICE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Alarms for Automatic Fire-Extinguishers, of which the following is a specification.

The present invention relates to a device for use in connection with wet-pipe systems for giving an alarm upon the opening of the system by the firing of one or more sprinkler-heads; and its object is to provide an improved device of this class, and more particularly one that will prevent the giving of a false alarm upon the momentary unseating of the main water-valve under the influence of water-hammer. A device which causes an alarm to be given instantly upon every disturbance of the valve under these momentary impulses is for obvious reasons objectionable, while at the same time it is of the utmost importance that an alarm be given as quickly as practicable upon every sustained unseating of the valve. The valve itself may and ordinarily will respond to and be unseated a greater or less distance by every disturbance of the static condition, which results in a preponderance of pressure against its under or inlet side; but in order to prevent merely momentary disturbances from causing a "false" alarm and, on the other hand, cause or permit an alarm to be given upon a sustained unseating of the valve, as aforesaid, I interpose between the valve and the alarm mechanism a device or mechanism which may appropriately be called "time mechanism." This time mechanism is of such construction that immediately upon the unseating of the valve it (the time mechanism) will commence an operation which if continued for a predetermined length of time will condition the alarm mechanism to operate, such continued operation being conditional upon the valve's remaining unseated, while, on the other hand, if the valve reseats itself before the expiration of the aforesaid predetermined length of time the operation of the time mechanism will not only cease, but in addition to this the time mechanism will be reset or restored to its normal condition—i. e., the condition which existed before the disturbance of the valve took place.

In some localities there is no water-ham-

mer, or practically none, while in others it varies in frequency, duration, and force. It is of course desirable that an alarm be given as soon as practicable after the firing of a head, and hence to meet these varying conditions and have a sufficient margin of safety against false alarms, and, on the other hand, cause an alarm to be given as soon as practicable after that margin is passed, so that one and the same device may be used in any locality, the time mechanism may be provided with means for adjusting it, or, in other words, for regulating the length of time it must run before conditioning the alarm mechanism to operate.

It is well understood by those skilled in the art that in a wet-pipe system the only function of the so-called "valve" is the causing of an alarm to be given upon the establishing of a current or flow of water through the system upon the opening of a sprinkler-head, and hence I desire to have it understood that the term "valve" as used in this specification is intended to comprehend any movable device that is exposed to or influenced by pressure in the system and is adapted to respond to variations in the status thereof for the purpose stated.

In its broadest aspect the invention is not limited to alarm mechanism of any particular construction; but I prefer to use mechanism having an electrical circuit, including a make and break under the control of the time mechanism, so that an alarm will be given upon the making or breaking of the circuit, accordingly as the system is operated on an open or closed circuit.

An hour-glass is within the scope of the term "time mechanism" as used in this specification, and the mechanism which I prefer to use is the equivalent of an hour-glass, although it has a body of liquid in place of the body of sand customarily used in an hour-glass.

In the accompanying drawings, which are made a part of this specification, Figures 1 and 2 are respectively a vertical and a horizontal section of the main water-valve of a wet-pipe automatic fire-extinguishing system and an alarm device embodying the invention associated therewith. Fig. 3 is an enlarged longitudinal section of the time mechanism thereof. Figs. 4, 5, and 6 are transverse sections thereof on the lines 4 4,

5 5, and '6 6, Fig. 3, looking in the direction of the arrows, respectively. Figs. 7 and 8 are views similar to Fig. 3, showing modifications.

A represents the main water-valve casing having an inlet *a*, leading from a source of water-supply, and an outlet *a'*, leading to the system of distributing-pipes.

B is the main water-valve proper, located over the inlet *a* and directly in the waterway in customary manner, so as to be exposed to the water and lifted thereby upon any disturbance of the static condition thereof, which results in a preponderance of pressure on the under or inlet side. It may be lifted either as a result of the opening of one or more sprinkler-heads or as a result of water-hammer. When lifted as a result of the opening of any number of heads from one up, it is desirable that an alarm be given, and, on the other hand, when lifted as a result of water-hammer it is desirable that no alarm be given. When lifted as a result of the opening of one or more heads, it will be sustained in elevated position by the water flowing past it; but when lifted as a result of water-hammer it reseats itself immediately upon the cessation of the impulse. It is this difference that is made use of for giving an alarm in one instance and preventing it in the other, and these results are preferably accomplished by the mechanism hereinafter described, albeit I desire to have it understood that excepting when otherwise specifically stated the invention is not limited to details of construction.

The valve B is carried by an arm C, projecting from a shaft D, that is mounted to turn freely in suitable bearings, and to this shaft is secured the time mechanism E, the construction of which is fully shown in Figs. 3, 4, 5, and 6. Disregarding for the time being its details of construction this device comprises a support or foundation of some suitable construction and a shifting body carried thereby and adapted to shift its position by gravity when the support is shifted, whereby it makes and breaks an electrical circuit. Preferably the support consists of a shell having within it a chamber, and the shifting body consists of a quantity of mercury partly filling the chamber and adapted to flow from place therein as the inclination of the shell is changed. Into this chamber project the terminals *f* of an electrical circuit F, which includes an alarm device G and a battery H or other source of electrical energy. The chamber preferably comprises what is, in effect, two chambers I and J and restricted ducts K and L, connecting the chambers I and J at top and bottom, respectively. All of these features are preferably formed by boring or coring holes in a block of glass, porcelain, hard rubber, iron, or other non-amalgamating material of the proper size and shape, the ends of the drill or core holes be-

ing closed wherever necessary by suitable plugs. The plug *j*, which closes the chamber J, is provided with an opening through which the two sides of the circuit are led, so as to be insulated from each other, the opening being closed air and water tight. The terminals may be spaced apart so that a single random drop or small body of mercury will not connect them.

The chamber I constitutes a reservoir for containing the mercury, which preferably fills it and the duct L up to the level of the bottom of the contact-chamber J, so that when the device is in normal position (horizontal) the mercury will not stand in the contact-chamber J, although there would be no objection to its doing so other than the possibility of its splashing up and closing the circuit under severe water-hammer. When the valve unseats, the support will be tipped and the mercury-reservoir will be carried to a higher level relatively to the contact-chamber J, and the mercury will flow into the latter, the necessary vent taking place through the duct K, and if the flow be allowed to continue the terminals *f* will eventually be submerged and the circuit thereby closed. Regardless of the length of time required for this action to take place I believe this to be a new means for controlling the circuit of an electrical alarm used in combination with the valve of an automatic fire-extinguisher of either the wet-pipe or the dry-pipe type.

As before stated, there are localities in which there is no water-hammer, and where this condition exists it is desirable to give the alarm at the earliest possible moment after the unseating of the valve. I have therefore shown in Fig. 7 a modification in which the chamber is shaped to permit the mercury to have a perfect freedom of movement, the restricted ducts K and L being dispensed with, but where water-hammer exists this simple form of the device is undesirable because it acts too quickly, and hence in order to prevent water-hammer from causing fire-alarms the shifting of the necessary quantity of mercury to cause an alarm is retarded. This may be done by restricting the duct L, through which the mercury flows or the vent-duct K, or both, or by properly proportioning and disposing the parts.

In constructing or adjusting the device to close the circuit in any given length of time regard must be had not only to the capacity of the passage through which the mercury flows, but also to the quantity of mercury that must flow or shift in order to submerge the terminals. These are matters of detail that can readily be met by those skilled in the art. A valve or other device N' may be placed in any of the ducts or passages so as to put the adjusting of the device to meet any given condition within the power of the person installing it after it leaves the

factory. In any event the mercury-passages must be of such capacity and so related that if given the necessary time the mercury will close the circuit even when the valve is lifted only the short distance that is incident to the opening of a single head. This will be only a fraction of an inch at the outer edge of the valve, and since it is important that an alarm be given upon the opening of even a single head it follows that this minimum range of valve movement is the limit within which the device must operate.

Of course the rapidity of the flow will depend somewhat upon the extent of the difference in the relative levels of the opposite extremities of the mercury-chamber; but this will simply tend to hasten the giving of an alarm when the valve is completely opened. Should a large number of heads open at about the same time, the valve would open quickly and the normally vertical side of the chamber J would as quickly become its bottom side, and in this condition a small body of mercury would close the circuit. The retarding action of the time mechanism would be thereby rendered inactive, and this is as it should be, since the retarding action is desirable only in preventing false alarms, and not in delaying the giving of an alarm when a proper occasion for it arises.

The shell above described is preferably inclosed in a metallic jacket M, and a body N of ozocerite or other suitable substance is run into the space between them, so as to insulate them and form an absolutely watertight joint at all points. The jacket has a hollow spud through which the wires are led, and this spud is closed by a cap m, having an opening for the passage of the wires.

In its broadest aspect the invention is not limited to the means above described for retarding the rise of the level of the mercury in the contact-chamber, as I believe any means for doing this to be within the scope of my invention.

In Fig. 8 I have shown at J' an enlargement of the passage through which the mercury flows back and forth between the portions I and J. This enlargement is in the nature of an overflow-chamber, which must be filled with mercury before any of it can enter the so-called "contact-chamber" J, the contracted duct through which the mercury enters and leaves the overflow-chamber J' being made by cutting grooves or notches l of the required size in the face or faces of one or both of the two blocks of which this form of the device is constructed. This overflow-chamber will prevent any possibility of the mercury's splashing up and closing the circuit in case the valve should be suddenly thrown wide open.

It will be observed that the entire make-and-break device is contained in a liquid-tight chamber, and this permits of its being

located wholly within the waterway. The advantage of this is that the necessity for a moving part passing out through a packed opening or stuffing-box is entirely avoided.

I do not claim, broadly, as my invention a device of the class described having time mechanism, having a shifting body, and means through which the valve lifts said body to a position from which it may fall by gravity and condition the alarm mechanism to operate; nor do I claim the means for retarding the movement of said body. Further, I lay no claim to the combination of a chamber or chambered support containing a shiftable fluid body with or without means for retarding the shifting of said body and means controlled by the pressure in the system for shifting said body and causing it to condition the alarm mechanism to operate; nor do I claim more specifically such a combination wherein the means controlled by pressure in the system may shift said body in one direction to cause it to condition the alarm mechanism to operate and in the opposite direction to reestablish said body in its normal condition; nor do I claim the combination, with a receptacle containing fluid under pressure and a signal device, of a chamber, a shiftable body of electrically-conductive material therein arranged to be conditioned for shifting movement by variation of pressure in the receptacle, and a circuit whereby the operation of the signal device is controlled, including contact parts in the chamber controlled by the shiftable body whereby proper shifting of the shiftable body conditions the signal device for operation.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a device of the class described, the combination with a valve and an alarm mechanism, of a movable support, a body carried thereby and adapted to shift from place to place thereon, by gravity, and means through which the valve shifts the support and conditions said body to shift, and thereby condition the time mechanism to operate, substantially as described.

2. In a device of the class described, the combination with a valve and an alarm mechanism, of a movable support, a body carried thereby and adapted to shift thereon, means for retarding the movement of said body, and means through which the valve shifts the support and conditions said body to shift, and thereby condition the alarm mechanism to operate, substantially as described.

3. In a device of the class described, the combination with a valve and an alarm mechanism, of a movable support having a chamber, a fluid body contained in said chamber and adapted to shift therein, and thereby condition the alarm mechanism to

operate, and means through which the valve shifts the support, and thereby conditions the fluid body to shift, substantially as described.

5 4. In a device of the class described, the combination with a valve and an alarm mechanism, of a movable support having a chamber, a fluid body contained in said chamber and adapted to shift therein, and
10 thereby condition the alarm mechanism to operate, means for retarding the shifting movement of said body, and means through which the valve shifts the support and thereby conditions said body to shift, substan-
15 tially as described.

5. In a device of the class described, the combination with a valve and an alarm mechanism, of a movable support having a chamber comprising enlarged portions and a
20 contracted duct connecting them, a fluid body contained in said chamber and adapted to shift from either of said enlarged portions to the other, and means through which the valve shifts the support and thereby causes
25 said body to shift and condition the alarm mechanism to operate, substantially as described.

6. In a device of the class described, the combination with a valve and an alarm
30 mechanism, of a movable support having a chamber comprising enlarged portions, a contracted duct connecting the bottoms of said enlarged portions, a fluid body contained in said chamber and adapted to shift from
35 either of said enlarged portions to the other, and means through which the valve shifts the support and thereby causes said body to shift and condition the alarm mechanism to operate, substantially as described.

40 7. In a device of the class described, the combination with a valve and an alarm mechanism, of a movable support having a chamber, a fluid body contained in said chamber and adapted to shift back and
45 forth therein, means for retarding the shifting of said body, and means through which the valve shifts the support back and forth, whereby said body is caused to shift in one direction and condition the alarm mechanism
50 to operate and in the opposite direction and reestablish itself in normal condition, substantially as described.

8. In a device of the class described, the combination of a valve, an electrical alarm
55 mechanism, a water-tight chamber into which the terminals of the alarm-circuit extend, said chamber being located in the waterway, and means controlled by the valve and located in the waterway for controlling
60 the alarm-circuit, substantially as described.

9. In a device of the class described, the combination of a valve, an electrical alarm mechanism, a water-tight chamber into which the terminals of the alarm-circuit ex-
65 tend, said chamber being located in the wa-

terway, means within the chamber for controlling the alarm-circuit and means through which the valve controls the circuit-controlling means, substantially as described.

10. In a device of the class described, the
70 combination of a valve, an electrical alarm mechanism, a movable water-tight chamber into which the terminals of the alarm-circuit extend, said chamber being located in the waterway, a shifting body in said cham-
75 ber for controlling the alarm-circuit, and means through which the valve moves the chamber, substantially as described.

11. In a device of the class described, the combination of a valve, an electrical alarm
80 mechanism, a movable water-tight chamber located in the waterway and into which the terminals of the alarm-circuit extend, means in said chamber, controlled by the position of the chamber, for controlling the circuit, and
85 means whereby the chamber is moved by the valve, substantially as described.

12. In a device of the class described, the combination of a support having a chamber, a fluid body contained in said chamber and
90 adapted to shift from place to place therein, means for retarding the shifting of the fluid body, means controlled by the pressure in the system for shifting the fluid body in the chamber, and an electrical alarm mechanism having terminals in the chamber adapted
95 to be connected and disconnected as the body shifts, substantially as described.

13. In a device of the class described, the combination of a valve exposed to the pres-
100 sure in the system, a support movable with said valve, and having a chamber, comprising portions connected by a restricted duct, a fluid body contained in said chamber and adapted to flow back and forth through said
105 duct, and an electrical alarm mechanism having terminals in the chamber, substantially as described.

14. In a device of the class described, the combination of a valve exposed to the pres-
110 sure in the system, a support movable with the valve and having a chamber, a body of mercury contained in the chamber and adapted to shift therein, and an electrical alarm mechanism having terminals adapted
115 to be closed by the mercury, substantially as described.

15. In a device of the class described, the combination of a movable support having a chamber comprising a reservoir, a contact-
120 chamber and an overflow-chamber arranged between the reservoir and contact-chamber, an electrical alarm mechanism having terminals in the contact-chamber, and means for shifting the movable support, substan-
125 tially as described.

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