

(No Model.)

2 Sheets—Sheet 1.

H. S. MAXIM.

APPARATUS FOR INDICATING THE FLOW OF FLUIDS.

No. 522,995.

Patented July 17, 1894.

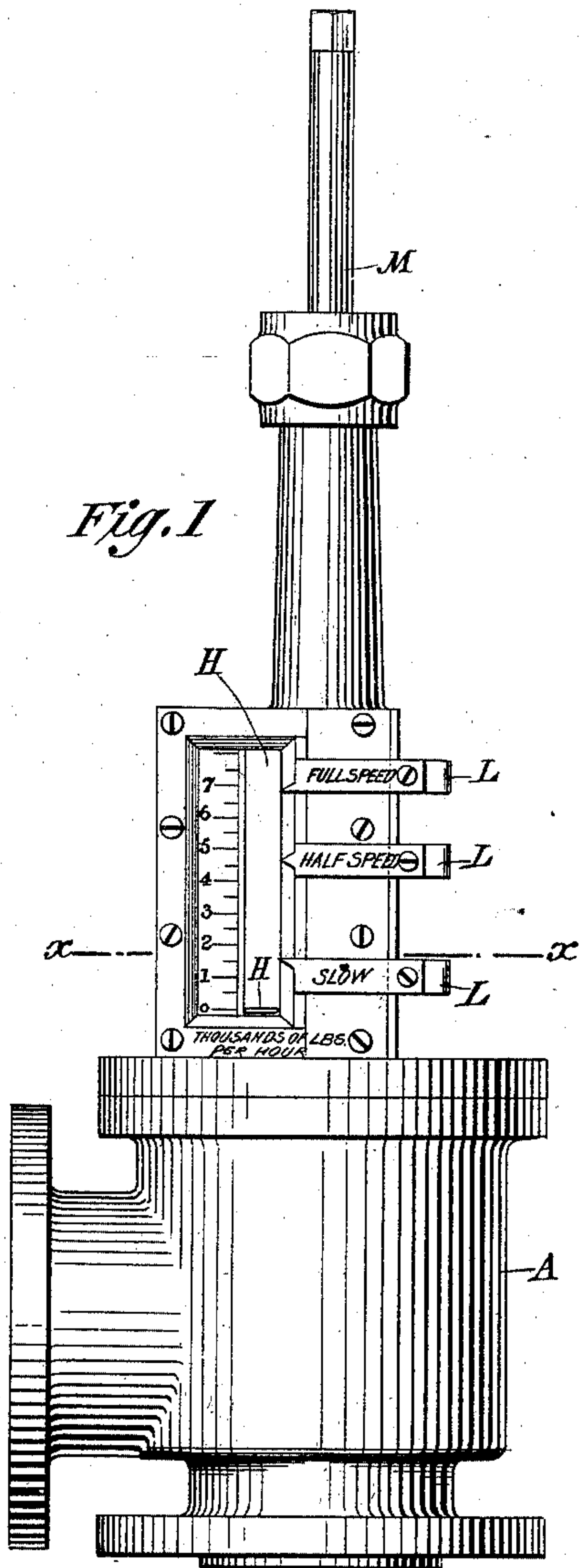


Fig. 1

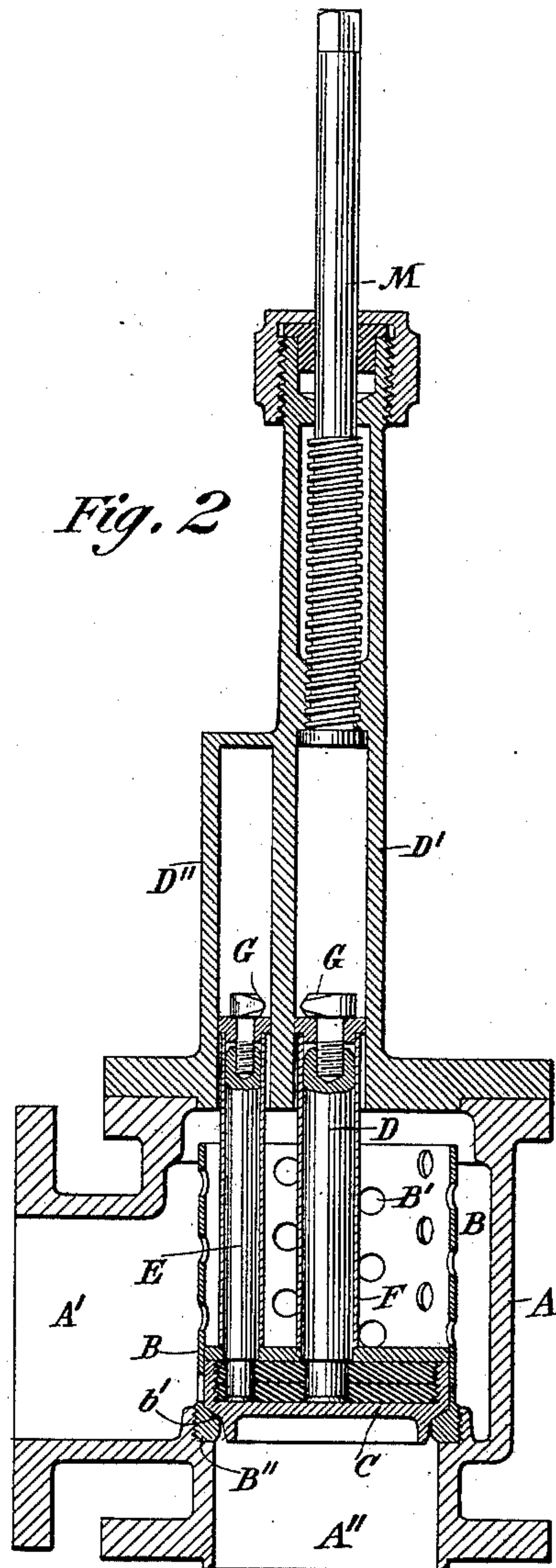


Fig. 2

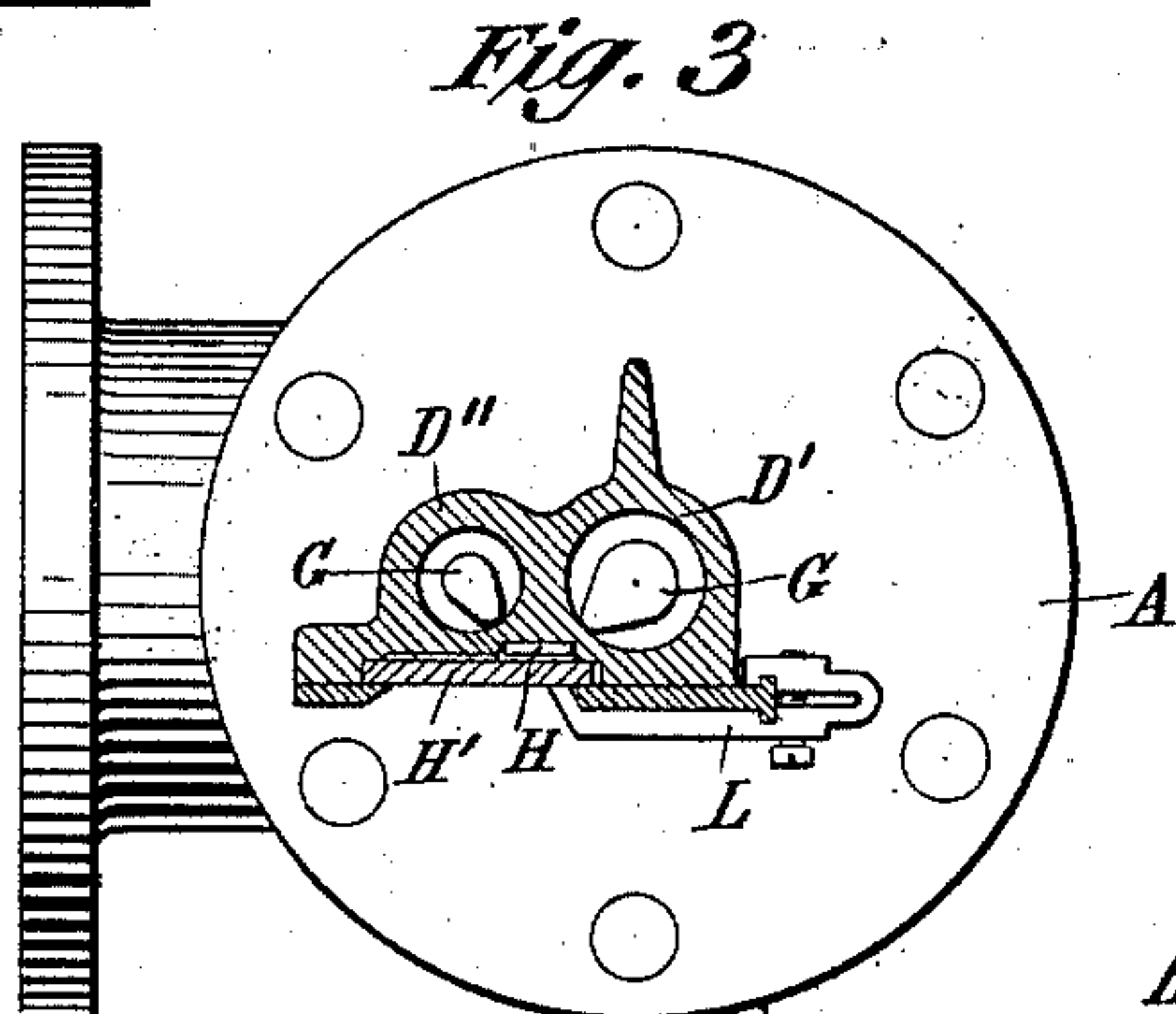


Fig. 3

Witnesses  
Raphael Netter  
James M. Catlow

Inventor  
Hiram S. Maxim  
By His Attorneys  
Duncan & Page.

(No Model.)

2 Sheets—Sheet 2.

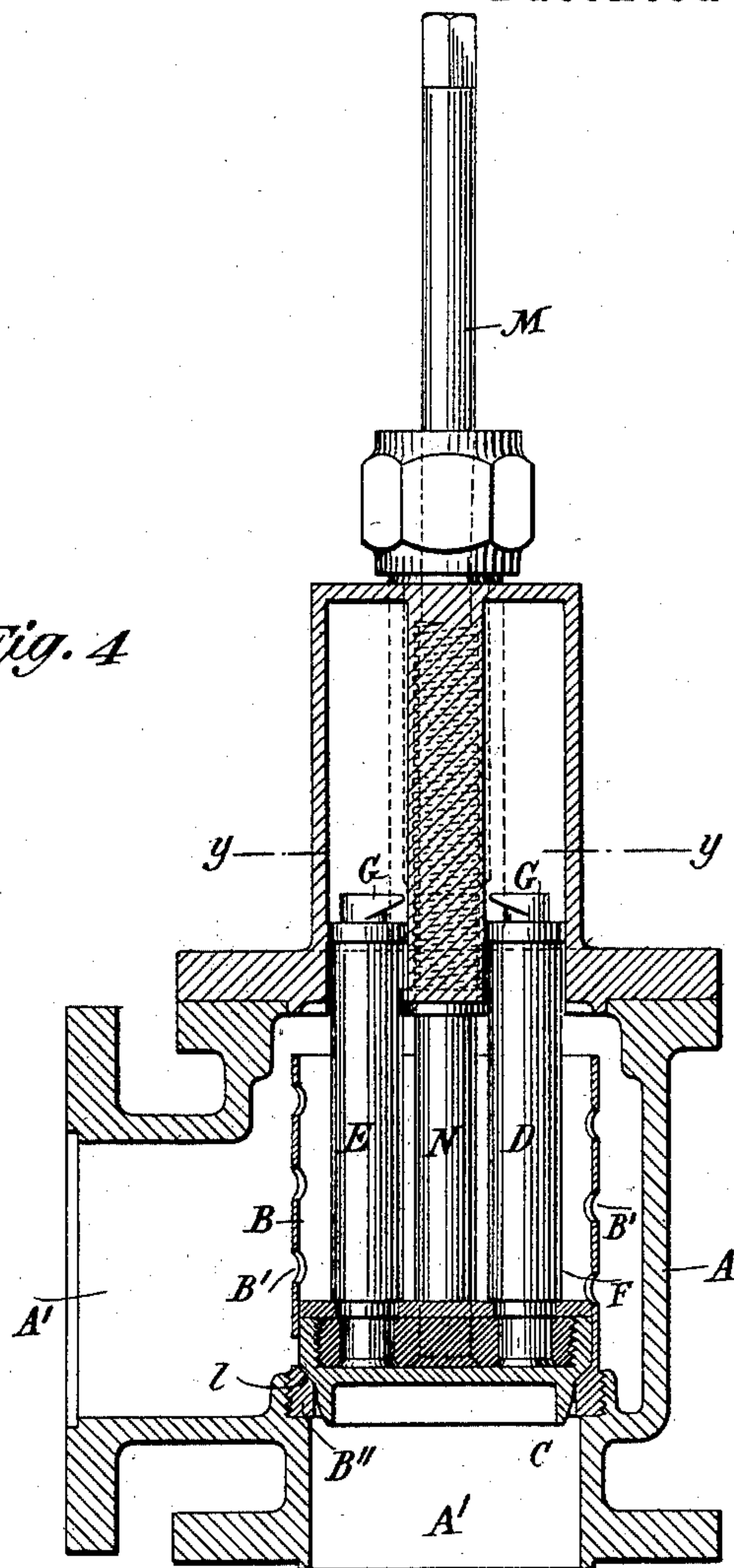
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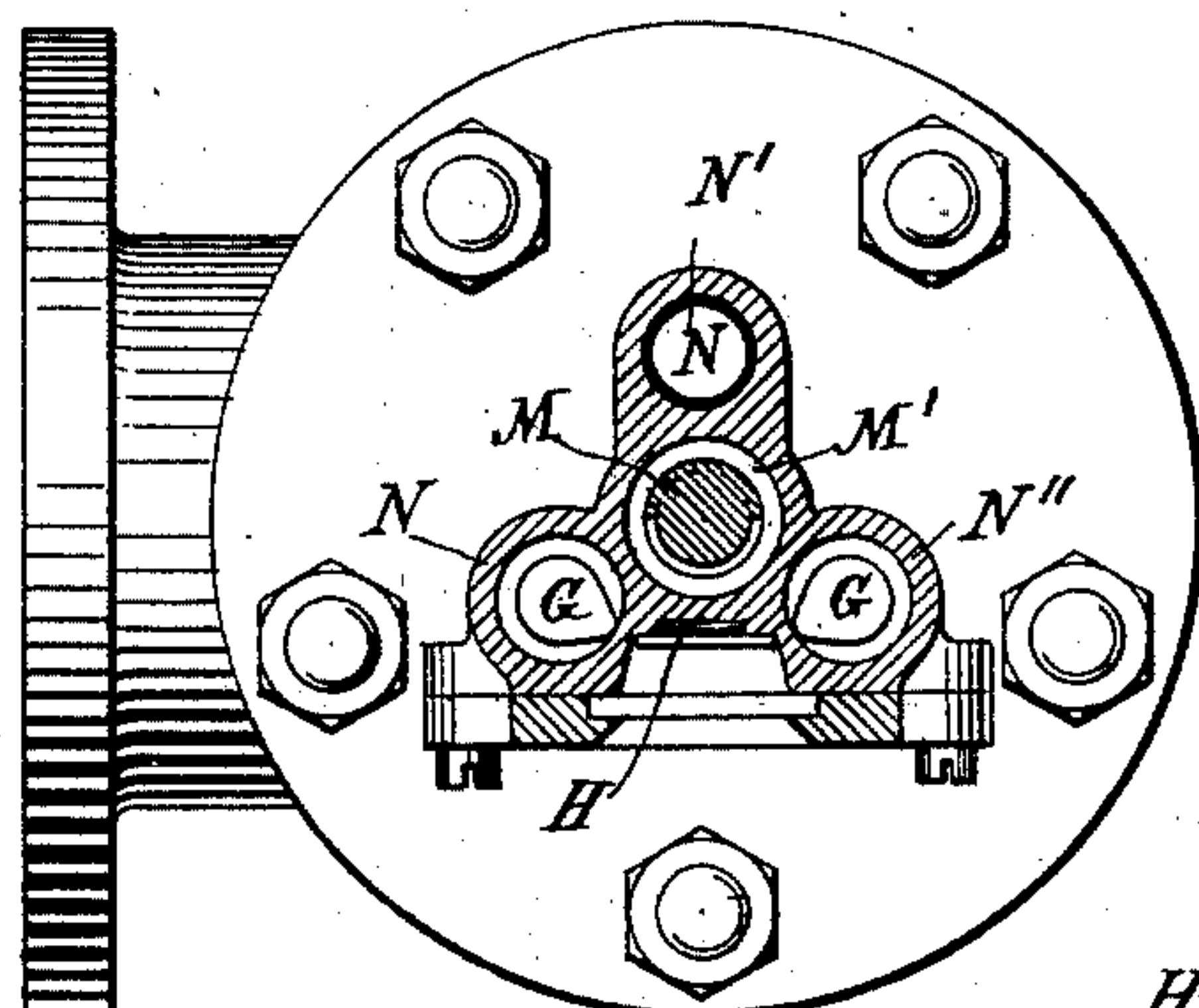
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*Fig. 4*



*Fig. 5*



Witnesses  
Raphael Netter  
James H. Leathur

Inventor  
Hiram S. Maxim  
By his Attorneys  
Duncan & Page.



# UNITED STATES PATENT OFFICE.

HIRAM STEVENS MAXIM, OF BEXLEY, ENGLAND.

## APPARATUS FOR INDICATING THE FLOW OF FLUIDS.

SPECIFICATION forming part of Letters Patent No. 522,995, dated July 17, 1894.

Application filed July 18, 1893. Serial No. 480,828. (No model.) Patented in England July 6, 1892, No. 12,508.

*To all whom it may concern:*

Be it known that I, HIRAM STEVENS MAXIM, a citizen of the United States, residing at Baldwin's Park, Bexley, in the county of Kent, England, have invented a certain new and useful Improvement in Apparatus for Indicating the Flow of Fluids, (for which I have obtained a patent in Great Britain, No. 12,508, dated July 6, 1892,) of which the following is a specification.

The improvement, subject of my present application is designed for use more especially as an indicating feed-water check-valve, and in the following specification it will be illustrated and described in connection with a device of this kind.

My said invention is especially applicable to the feed-water check-valves of steam boilers, and particularly to the boilers of torpedo and similar boats in which the evaporation is usually extremely rapid, and where it is very desirable to determine whether water is entering the boiler or not with more readiness and certainty than the ways and means heretofore resorted to permit of.

It is my object to provide a means by which the engineer or boiler attendant may ascertain at a glance whether water is or is not entering the boiler, and, if it be, at what rate or in what amount.

In carrying out my invention I provide a suitable chamber or casing which is to be interposed between the boiler and the feed-water supply. Within this casing is arranged a tube containing a piston or disk movable axially within the same. All the water which enters the boiler must pass through the tube or some portion of the same and in so doing raise the piston or disk to a greater or less extent dependent upon its amount or rate of flow. The passage through the tube for the water may be secured by making slots or perforations therein, or in any other way providing for an opening through the same which increases in extent in proportion to the elevation of the piston. The said piston is provided with a stem which extends up into a closed tube or casing which is of non-magnetic metal and the stem a magnetized steel rod or bar, or bars, which cause a small follower on the outside of the tube to rise and fall with the pole or poles of the magnets.

In the drawings hereto annexed: Figure 1 is a side elevation of an indicating check-valve embodying my improvements. Fig. 2 is a vertical central section of the same. Fig. 3 is a horizontal section on line  $x-x$  of Fig. 1. Fig. 4 is a vertical section of a modification of the invention. Fig. 5 is a horizontal section of the same on line  $y-y$ .

A is the casing or section of tubing that contains the apparatus.

A' is the outlet to the boiler, and A'' the inlet from the feed-water pipe. Suitable valves may be provided for use in addition to the instrument itself, when so desired, but I prefer to construct the device in such manner as to render this unnecessary.

Within the casing or tube A a cylindrical tube B is secured to or over the inlet so that all the water which passes into the casing must enter the said tube, from which the only exit will be afforded by raising a piston or plunger C and exposing more or less of a number of perforations or slots B' which are made in the tube.

In the construction shown the tube B is screwed into the casing at its lower end, which fits into a recess B'' provided in the casing to receive it. At the lower end of the tube there is a seat  $b'$  for piston or disk C which when resting on the seat prevents the return of water into the supply or feed-pipe, and thereby constituting a check-valve. The said piston or disk fits closely but easily within the tube B, in which it is adapted to slide in the direction of the axis thereof. The water delivered into the tube B by the supply-pipe passes out through the perforations or slots B' after raising the disk or piston C from its seat through the required distance to uncover a sufficient number of the said perforations or slots.

A rod D is secured to the disk C and extends through a hole in the top or cover of the casing A into a tube D'. This tube is of gun metal or similar non-magnetic metal and the rod D of magnetized steel. I also employ a second rod E which extends up into a tube D'', and both rods are set in an iron or steel disk so that they constitute the two limbs or poles of a horse-shoe magnet.

To protect the magnet against rust and corrosion, the piston or disk and the two limbs



are incased in brass or like metal F, and the rods are provided with the usual concentrating pole pieces G.

Outside the tubes D' D'' is provided a channel or groove parallel with the line of travel of the poles. In this channel is a small iron or steel roller H and a glass cover H' is secured in front of said groove. The follower H is attracted by the poles of the magnetic rods through the gun-metal casing and moves up and down with them, so that its position will always indicate the position of the piston and the flow of water corresponding thereto. At one side of the groove a scale may be marked off in units which represent the thousands of pounds of pressure per hour for which a given flow of water will be necessary, and by means of such scale the flow may be easily regulated.

It is preferable to use three adjustable pointers or markers L, which may be placed at any position by the engineer, one being placed at full speed, one at half speed, and one at slow. The assistant or stoker who has charge of the feed water can then be ordered to keep the indicating roller directly opposite any one of the adjustable pointers.

When it is desired to provide a means for locking the valve down on its seat, a screw stem M may be passed through the top of the tube D', and, when necessary, is turned down to bear upon the end of the rod D.

A modification of the device is shown in Figs. 4 and 5, in which a stem N is used and which is non-magnetic or not designed to serve as a magnet, while two additional stems D, E forming the limbs of a magnet are employed as in the former device. The stem N extends into a tube N', while the stems D, E extend into the tubes N''. The screw-stem M is arranged to pass through a hole M' and to bear upon the valve or piston C directly. This permits the instrument to be considerably shortened, as may often be necessary

when the space afforded under the deck of a torpedo boat or elsewhere is limited.

It is evident from the nature of the construction and mode of operation of the perforated cylinder and piston that the same result, viz: the increased opening of a passage for the water proportionate to the elevation of the indicating stem may be secured in various other ways than that specifically described.

What I claim as my invention is—

1. An indicating check-valve comprising in combination a perforated cylindrical tube having a valve seat at its end, a valve movable axially therein, one or more magnetic stems carried by the valve and extending into a tube or chamber above the valve and a magnetic follower arranged to be moved along the exterior of the chamber by the attraction of the poles of the magnetic stem and thereby to indicate the position of the same and the corresponding elevation of the valve as set forth.

2. An indicating check-valve comprising in combination a casing, a perforated tube within the same having a valve seat at its end, a valve movable axially within the tube, one or more magnetized stems carried by the valve and extending into chambers above the valve, a magnetic follower arranged to be moved along the exterior of the chamber by the attraction of the poles of the magnetic stems, a screw stem in a chamber above the valve and entering the casing and a stem or projection on the valve which may be a magnetized stem or one of the same, in line with the screw stem as set forth.

In testimony whereof I have hereto set my hand this 5th day of July, 1893.

HIRAM STEVENS MAXIM.

Witnesses:

C. A. SEARLE,  
JOHN G. SHIELDS.