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PATENTED MAR. 6, 1906.

F. M. LEAVITT.
STARTING VALVE FOR AUTOMOBILE TORPEDOES.

APPLICATION FILED MAY 3, 1904.

2 SHEETS—SHEET 1.

FIG. 1.

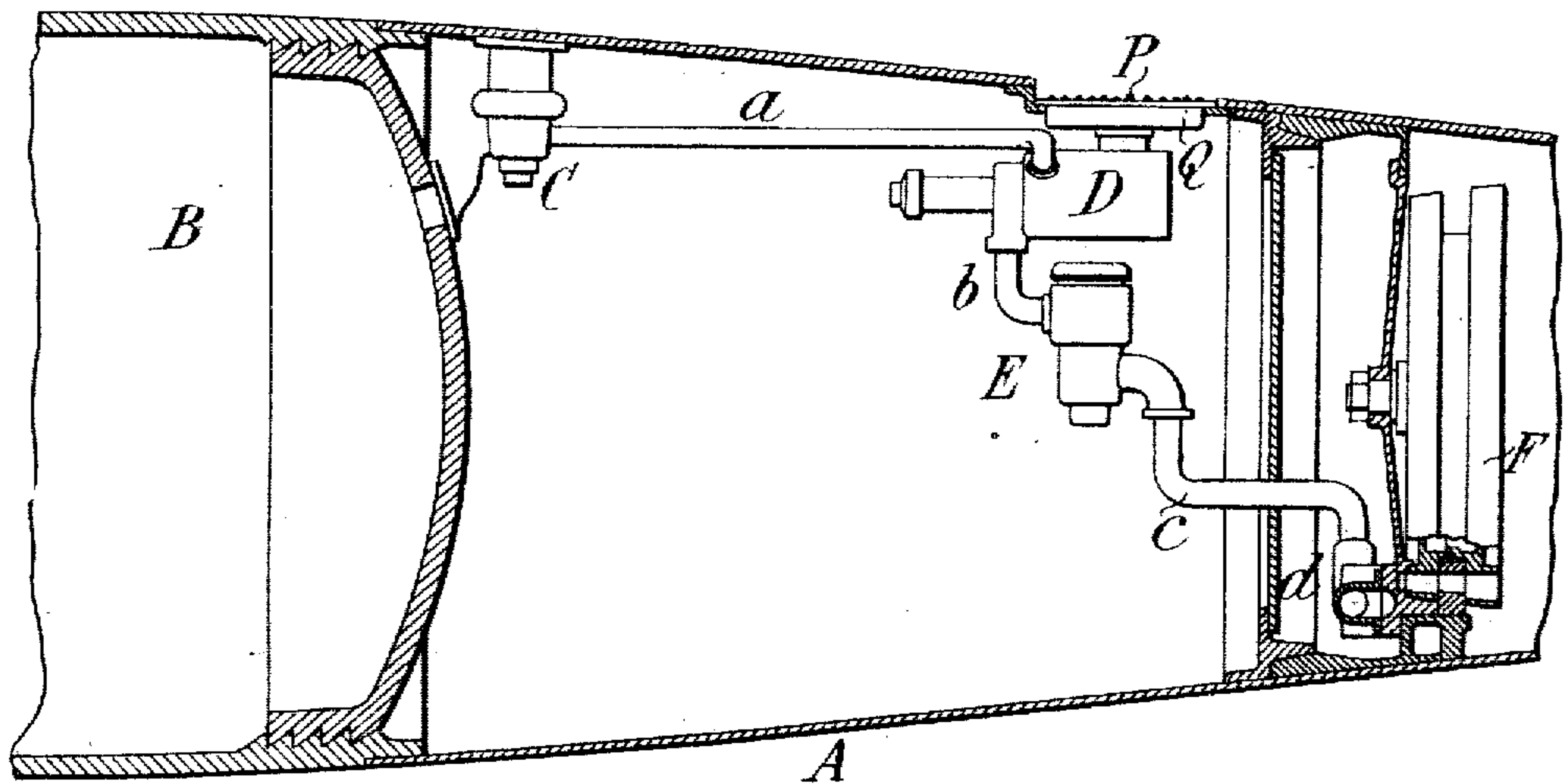


FIG. 6.

FIG. 7.

FIG. 5.

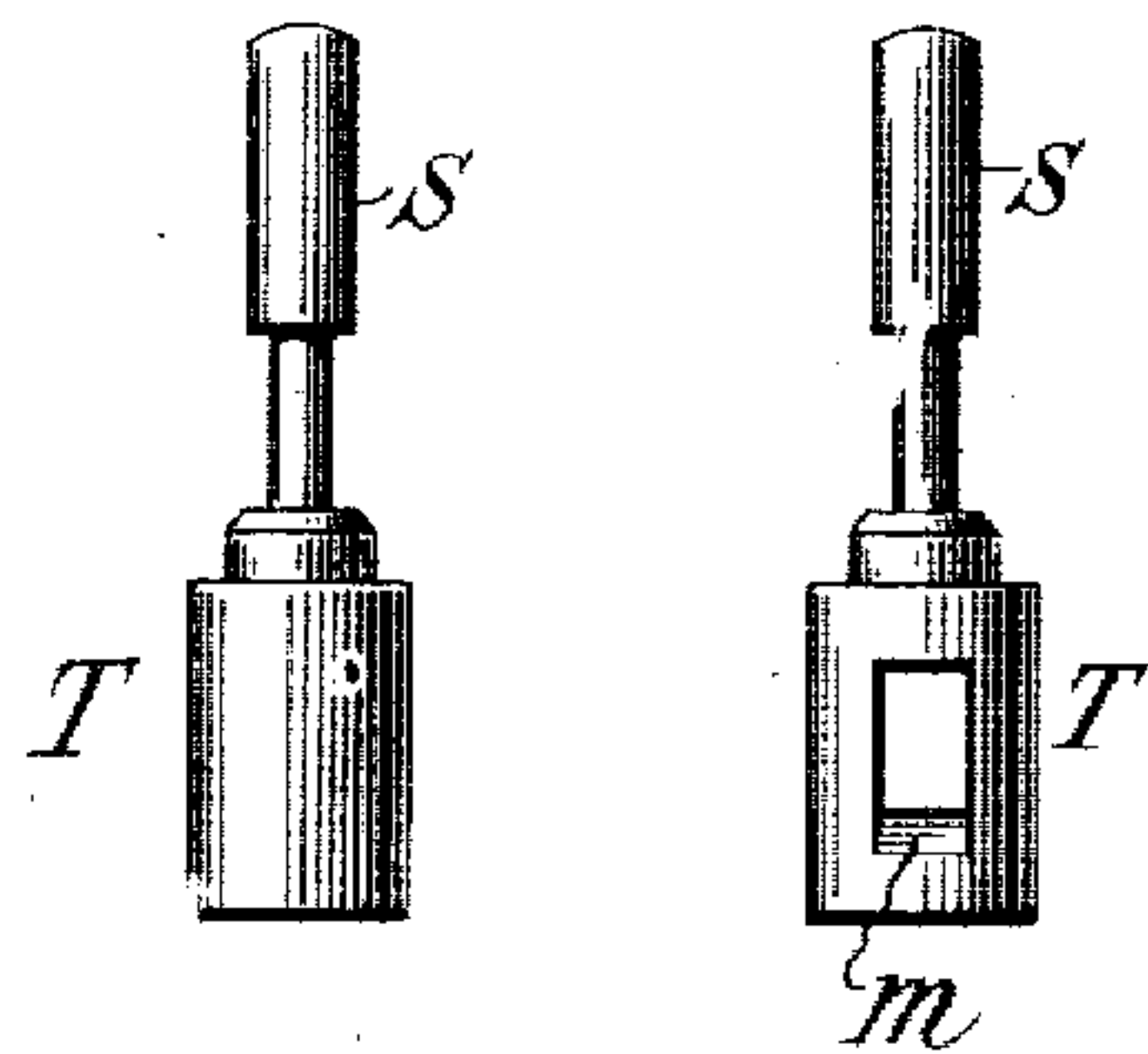
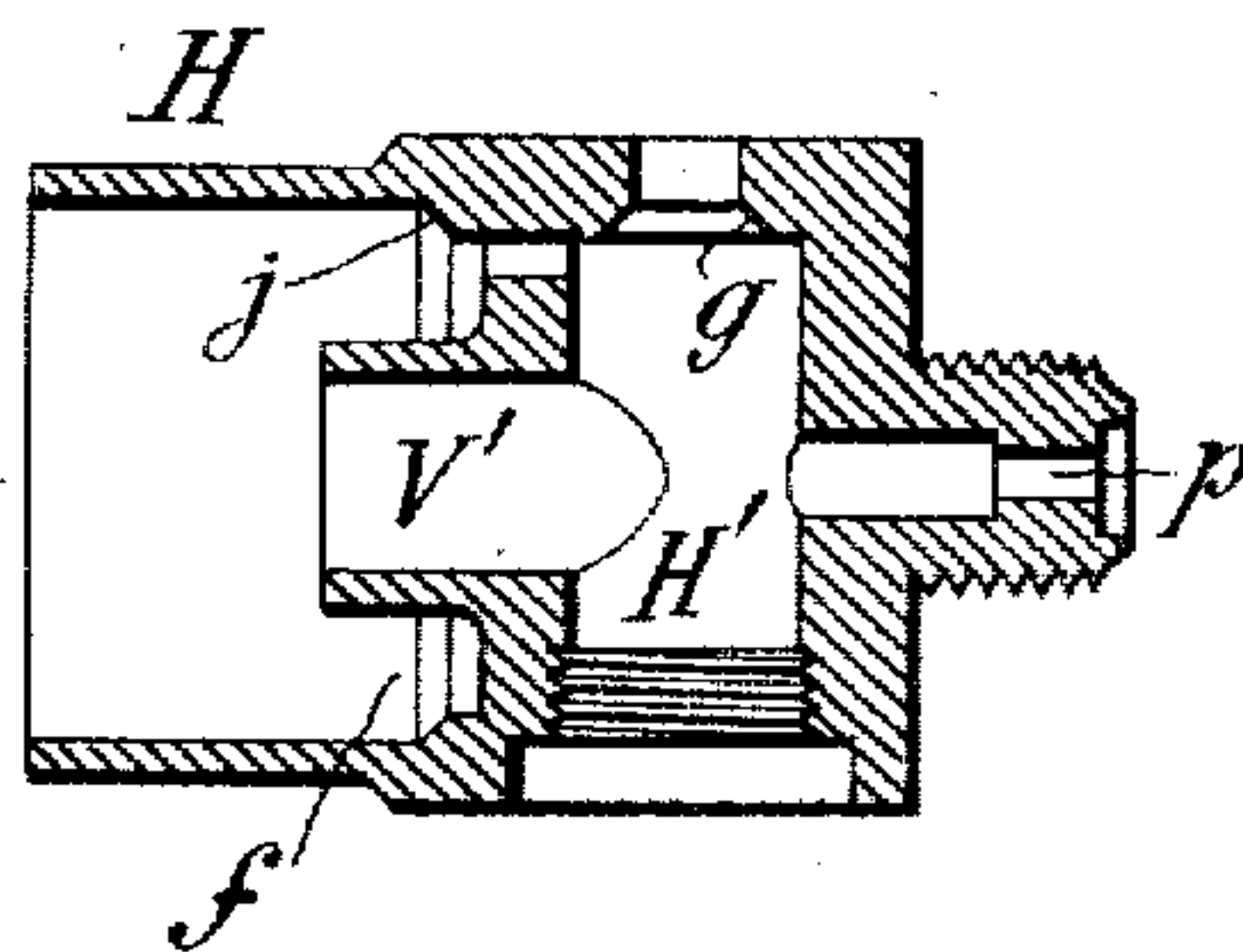


FIG. 8.

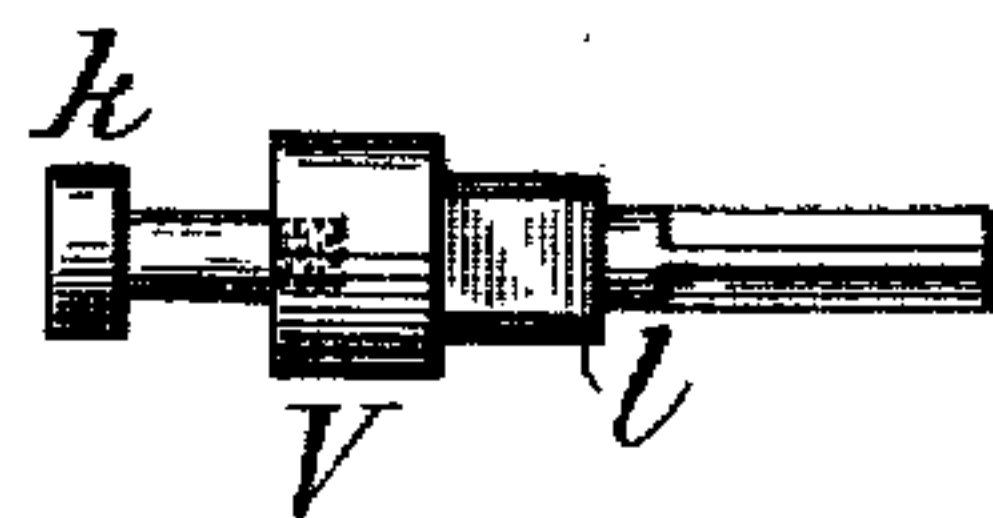
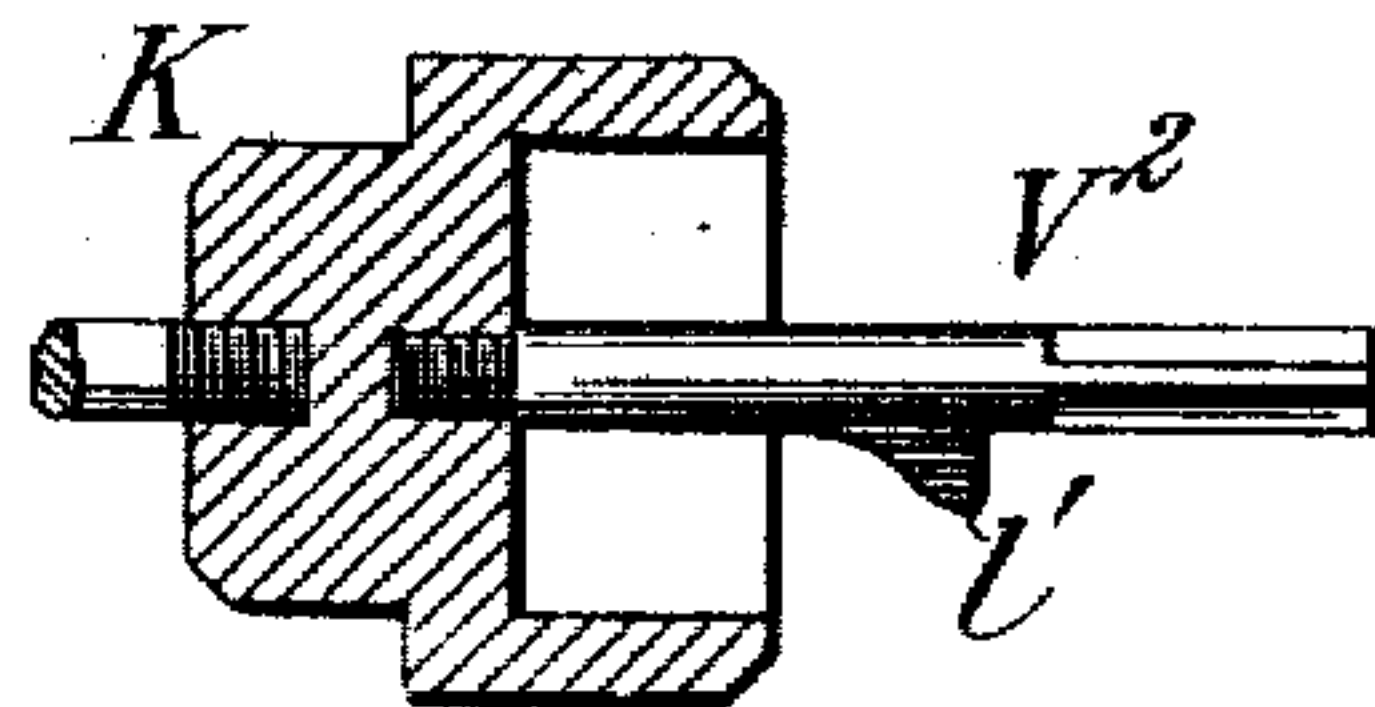


FIG. 9.



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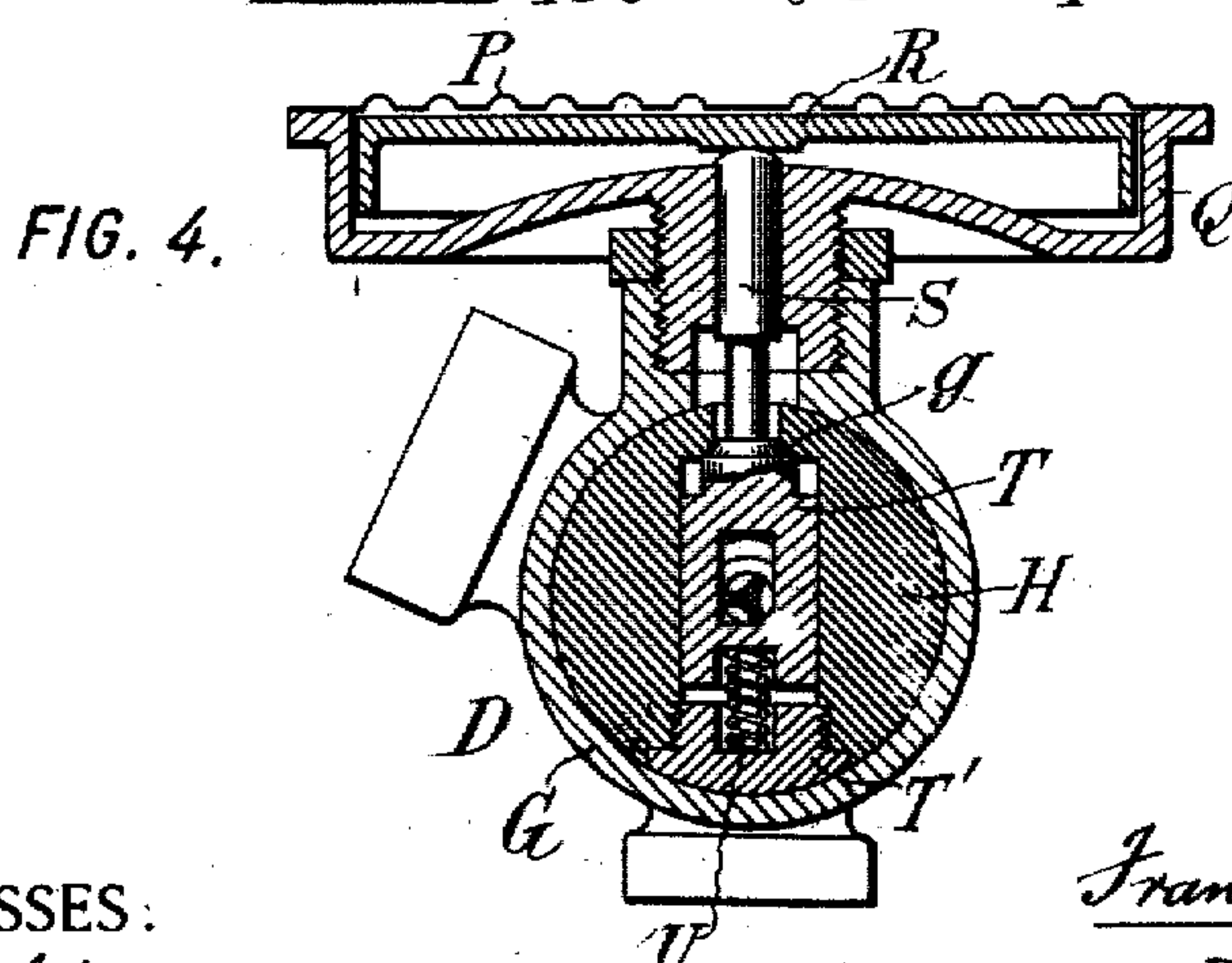
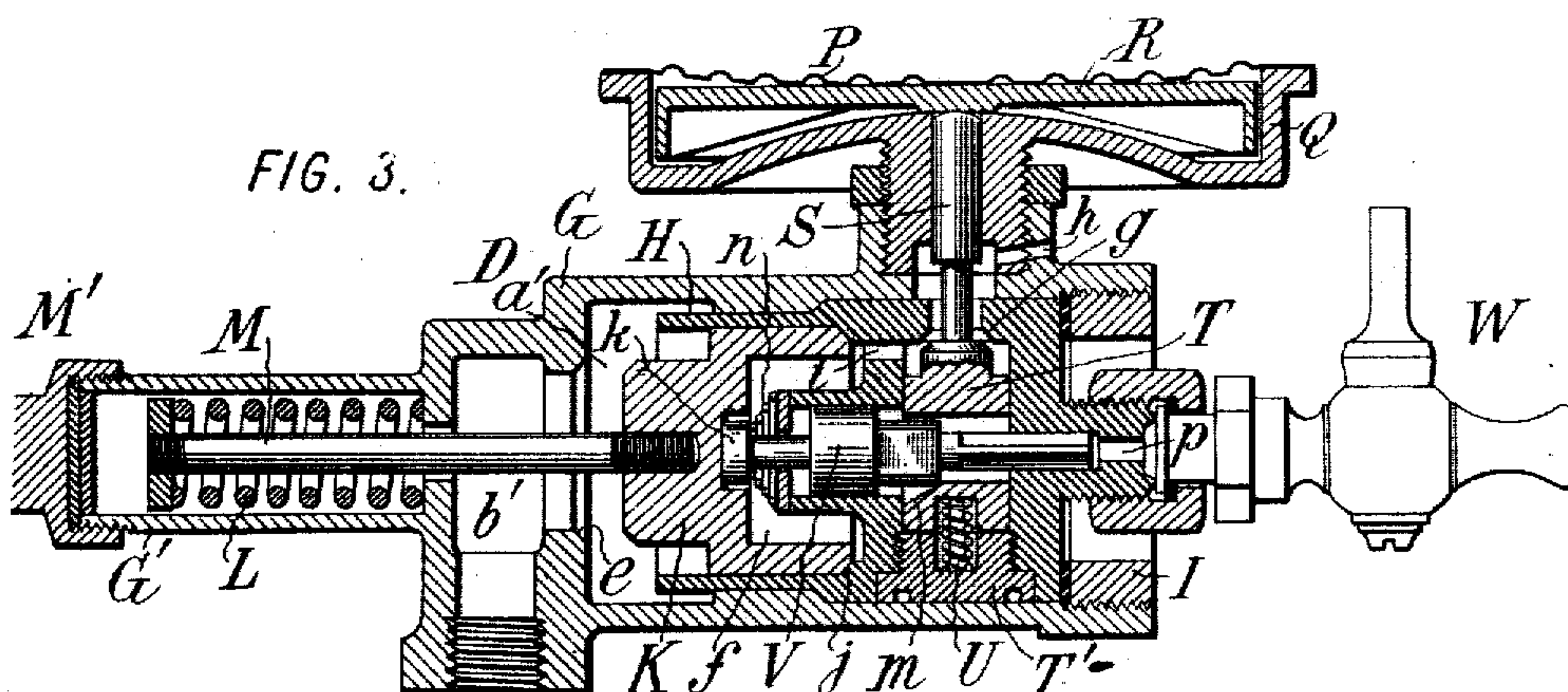
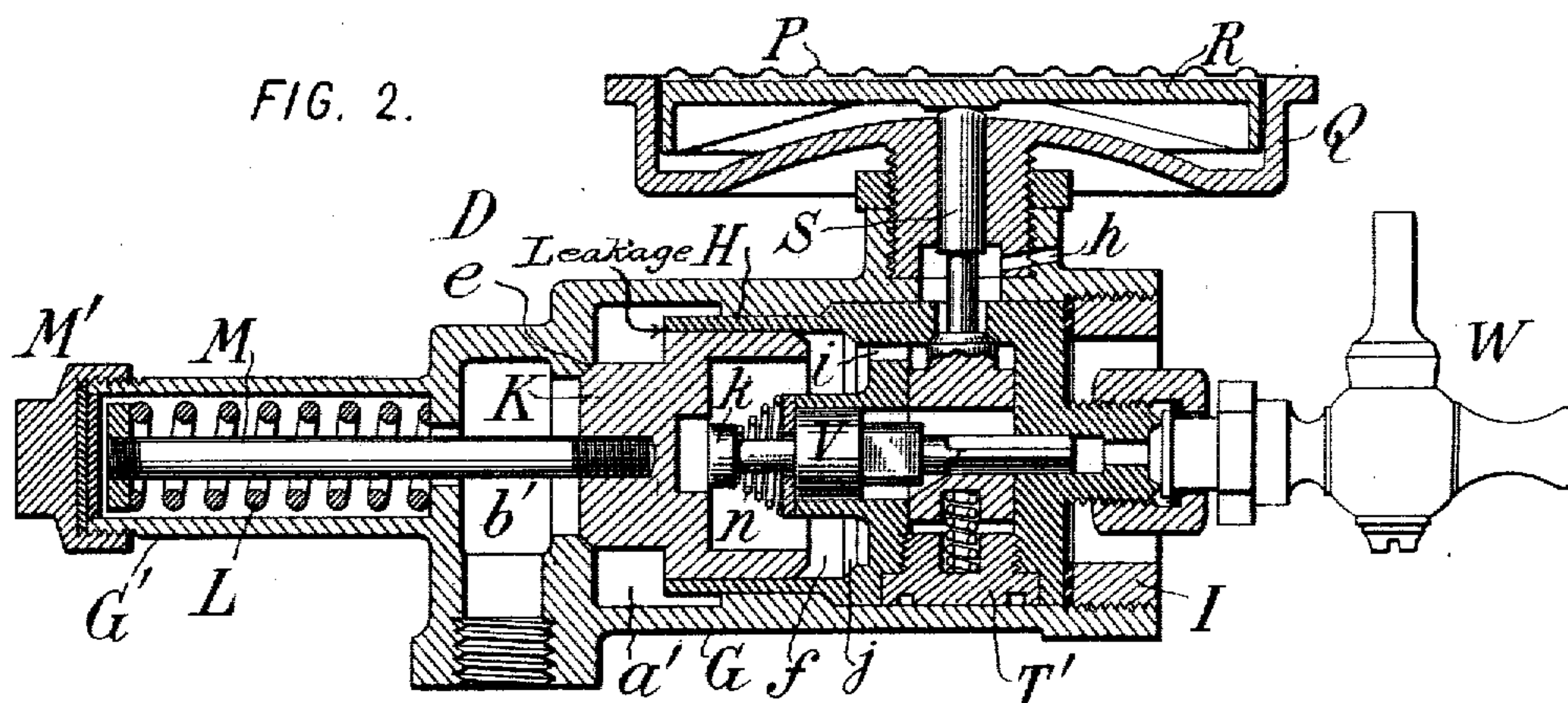
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

FRANK M. LEAVITT, OF NEW YORK, N. Y., ASSIGNOR TO E. W. BLISS COMPANY, OF BROOKLYN, NEW YORK, A CORPORATION OF WEST VIRGINIA.

STARTING-VALVE FOR AUTOMOBILE TORPEDOES.

No. 814,055.

Specification of Letters Patent.

Patented March 6, 1906.

Application filed May 3, 1904. Serial No. 206,249.

To all whom it may concern:

Be it known that I, FRANK M. LEAVITT, a citizen of the United States, residing in the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Starting-Valves for Automobile Torpedoes or the like, of which the following is a specification.

This invention provides a valve for admitting a flow of fluid under pressure to start an engine. It is especially designed for use in automobile torpedoes where it is required to start the flow of compressed air to the engine during the ejection of the torpedo from the launching-tube. In the Whitehead torpedo, for example, this starting-valve is operated mechanically by a hook-shaped arm projecting from the shell of the torpedo, and which as the latter is forced through the launching-tube engages a projection in the latter by which the arm is thrown back. This movement of the arm is communicated mechanically to the valve to admit the compressed air to the engine. My invention avoids the use of mechanically-engaging parts and utilizes for the purpose of opening the valve the gaseous pressure within the launching-tube by which the torpedo is ejected. This pressure is commonly derived from the combustion of an explosive at the breech of the launching-tube.

According to my invention the gaseous pressure acts upon a diaphragm or other equivalent moving part which it displaces and which in turn operates the main air-valve or throttle-valve to admit air to the engine.

In the accompanying drawings, Figure 1 is a vertical section through a fragment of a torpedo, showing one mode of applying the improved valve provided by my invention. Fig. 2 is a vertical section of the valve in its closed position. Fig. 3 is a similar section of the valve in its open position. Fig. 4 is a transverse section through the auxiliary valve. Fig. 5 is a vertical section of the inner shell removed. Figs. 6 and 7 are elevations of the auxiliary valve removed. Fig. 8 is an elevation of the tappet or plunger V. Fig. 9 is a section of the main valve, showing a modification.

Referring to Fig. 1, let A designate the

shell of the torpedo; B, the compressed-air reservoir or flask; C, any usual or suitable filling valve or plug through which compressed air may be charged into the flask; D, the starting-valve; E, the reducing-valve, and F the engine or motor, which in this case is shown as a turbine, although any kind of engine may be used. From the flask B the compressed air passes by a pipe *a* to the inlet of the valve D, thence by a pipe *b* to the regulator E, and thence by a pipe *c* to the inlet of the nozzle *d* of the turbine. This arrangement may of course be greatly varied.

The preferred construction of the valve D is shown in Figs. 2, 3, and 4. The valve is best constructed with an outer shell G and an inner shell or bushing H, fixed in place therein—for example, by screwing up a ring I behind it. The shell G is formed with a valve-seat *e*, separating its inlet-chamber *a'* from its discharge-chamber *b'*. Within the shell G is a suitable valve K, adapted to close against the seat *e* and constructed as a piston or plunger moving freely within the shell H, with which it makes a close working fit, but preferably without any packing, so as to permit a slight leakage past the piston, or any other means for slowly admitting fluid past the valve may be used. This valve K is normally held to its seat by the pressure of a spring L, which is conveniently applied to act against a valve-stem M, the spring being housed in a tubular extension G' of the shell G, which is closed at its outer end by a suitable cap M'. The piston of the valve K when closed is pressed to its seat by the pressure of air acting against its rear face in a chamber *f*, into which compressed air flows through the narrow space around the piston.

A diaphragm P is arranged to be exposed to the gaseous pressure generated during the firing of the torpedo. It may be arranged as shown in Fig. 1, where it is mounted in an opening formed in the shell of the torpedo. The rim of the diaphragm is fastened to a circular shell Q, forming a chamber, within which is inclosed a disk R, which backs the diaphragm, and when the latter is forced inwardly by the pressure communicates motion to a pin or valve-stem S, which is connected to an auxiliary valve T. Instead of the diaphragm any other equivalent moving

part may be provided. The stem S and valve T preferably are arranged transversely to the axis of the main valve; but this is not essential. The valve T closes against a seat *g*, which on one side communicates, through a port *h*, with the exterior and on the other communicates, through a port *i*, with the chamber *f*. A spring U is arranged to press up the valve T, the latter being preferably constructed as a plunger working in a cylindrical chamber H' in the shell H and accessible by removing the latter and unscrewing a cap T'.

The operation may now be understood. Prior to the launching the plug C is opened to admit compressed air through pipe *a* to the inlet *a'* of the valve. The air-pressure acts temporarily to unseat the valve against the pressure of the spring M until sufficient air-pressure leaks around the valve K into the chamber *f* to cooperate with the spring and reseat the valve. (See Fig. 2.) Thereafter the air-pressure in the chamber *f*, acting against a larger area on the back of the valve K than that against which acts the air-pressure in the chamber *a'*, holds the valve pressed strongly to its seat. At the instant of firing the gaseous pressure in the launching-tube presses in the diaphragm, as shown in Fig. 3, and unseats the auxiliary valve T, thereby providing an escape for the pressure confined in the chamber *f*, which accordingly blows out through the port *i*, seat *g*, and port *h*. This relieves the pressure on the back of the piston-valve K and permits the pressure in the inlet-chamber *a'* to force back the valve to the position shown in Fig. 3. Thereby a wide opening is permitted for the outflow of air through the pipe *b* to the pressure-regulator E and to the engine, and this flow continues during the entire run of the torpedo. It is desirable to prevent any further leakage of compressed air back of the valve K, since the air thus leaking past it would simply blow out through the ports *i g h* and be wasted. To prevent this, the rear face of the piston-valve K is made to act against a valve-seat *j*, being preferably ground to fit this seat, as shown, so that in the position shown in Fig. 3 a substantially tight joint is made.

The diaphragm P remains depressed only while it is subjected to gaseous pressure in the launching-tube. Upon the ejection of the torpedo it is released from this pressure, and the valve T would then reseat itself, after which any leakage of compressed air past the main valve K into the chamber *f* might in course of time develop such a pressure in this chamber as to force the valve K against its seat, and thereby cut off the supply of air to the engine. This might occur before the torpedo had completed its prescribed run, which would defeat its intended operation. To guard against this possibility, I provide

means for holding the valve T unseated. A little plunger or tappet V, Fig. 8, is arranged to work in a suitable guide or socket V' in the lining-shell H and has a head *k* in position to be struck by the piston-valve K in its opening movement, whereby the plunger V is displaced or forced back to the position shown in Fig. 3. In this movement a shoulder *l* on this plunger acts against an incline *m*, formed in a recess in the body of the valve T, and acts to press downwardly against the valve T, and thereby to force this valve fully open and hold it in this position. It will be so held as long as the main valve K remains in the open position. It thus insures that the chamber *f* behind the main valve shall be kept in open communication with the external air, so that no pressure can accumulate in it, and the main valve cannot be resealed. At the end of the run, when the supply of compressed air is exhausted, the escape of its pressure from the inlet-chamber *a'* enables the spring M to restore the main valve to its seat. Thereupon a spring *n* restores the plunger V to its original position, thereby freeing the valve T and permitting its spring U to close it against its seat. Thus the parts are restored to their original position ready for the next operation.

Preferably a hand-operated relief-cock W is provided in order that the starting-valve D may be opened at will, as is required for making an experimental or test run of the engine. To this end, communication is afforded between the chamber *f* and the inlet to the cock W by means of a passage *p*, opening into the socket or chamber in which the plunger V works.

It must not be inferred from the particularity of detail with which I have described and illustrated the preferred form of my invention that I am necessarily restricted to the particular construction herein set forth. My invention is, in fact, susceptible of a wide range of modification within the judgment and skill of a mechanic or constructor. For example, I am not to be understood as limited to the main valve being necessarily a piston-valve, nor to the auxiliary valve being necessarily a plunger or tappet valve, nor to the means for retaining the valve open being a tappet or plunger displaced by the main valve.

Fig. 9 shows a modification in which the plunger V is omitted, and instead a tappet-stem V² is fixed to the rear of the valve K and carries a projection *l'*, which acts against the incline *m* in place of the shoulder *l* in the construction first described.

What I claim is—

1. A starting-valve for admitting fluid-pressure to an engine, comprising a valve member and a movable part, the latter exposed to be operated by fluid-pressure and

adapted when displaced thereby to operate the valve member to open the valve and start the engine.

2. A starting-valve for an automobile torpedo, comprising a valve member and a diaphragm connected to operate it and exposed to be operated by external fluid-pressure, whereby such pressure during the launching of the torpedo acts through the diaphragm to open the starting-valve and start the engine.

3. A starting-valve for admitting fluid-pressure to an engine, comprising a main valve, an auxiliary valve controlling it, and a diaphragm connected to operate the auxiliary valve and exposed to be operated by fluid-pressure, whereby such pressure acting through the diaphragm and auxiliary valve opens the main valve to start the engine.

4. A starting-valve for an automobile torpedo comprising a main valve, an auxiliary valve controlling it, and a diaphragm connected to operate the auxiliary valve and exposed to be operated by external fluid-pressure, whereby such pressure during the launching of the torpedo acts through the diaphragm and auxiliary valve to open the main valve and start the engine.

5. A starting-valve comprising a shell forming a chamber, a main valve movable therein, an auxiliary valve controlling a vent-passage from said chamber, and a diaphragm for operating said auxiliary valve.

6. A starting-valve comprising a shell having an inlet and outlet chamber, and an interposed seat, a main valve movable therein against said seat, a chamber behind said valve communicating through a restricted passage with a source of pressure, an auxiliary valve controlling a vent-passage from said latter chamber, and means for operating said auxiliary valve.

7. A starting-valve comprising a shell, having a seat and inlet and outlet chambers, a main valve moving in the inlet-chamber against said seat, having means for slowly admitting fluid to the chamber behind said

valve to seat said valve, a vent-passage from said latter chamber to the exterior, and an auxiliary valve for controlling said vent.

8. A starting-valve for an automobile torpedo, comprising a valve member, a diaphragm connected to operate it and exposed to be operated by external fluid-pressure, whereby such pressure during the launching of the torpedo acts through the diaphragm to open the valve, and means for holding the valve open during the run of the torpedo.

9. A starting-valve for an automobile torpedo, comprising a main valve, an auxiliary valve controlling it, a diaphragm connected to operate the auxiliary valve and exposed to be operated by external fluid-pressure, and means for holding the auxiliary valve open during the run of the torpedo to prevent premature closing of the main valve.

10. A starting-valve comprising a shell, a main valve movable therein, having means for slowly admitting fluid behind said valve to close it, a vent for escaping said pressure to open the valve, an auxiliary valve controlling said vent, and means for holding said auxiliary valve open while the main valve remains open to prevent premature closing thereof.

11. A starting-valve comprising a shell, with inlet and outlet chambers, a seat between them, and a back seat, a main valve movable against either seat, and an auxiliary valve controlling the movements of the main valve.

12. A starting-valve comprising a shell, a main valve K, an auxiliary valve T, a diaphragm for opening said auxiliary valve, and a tappet V adapted to be displaced by the opening of the main valve and to engage and hold the auxiliary valve.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

FRANK M. LEAVITT.

Witnesses:

DOMINGO A. USINA,
FRED WHITE.