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J. F. DURYEA.

INLET VALVE GOVERNING MECHANISM FOR ENGINES.

(Application filed Dec. 27, 1900.)

(No Model.)

2 Sheets—Sheet 1.

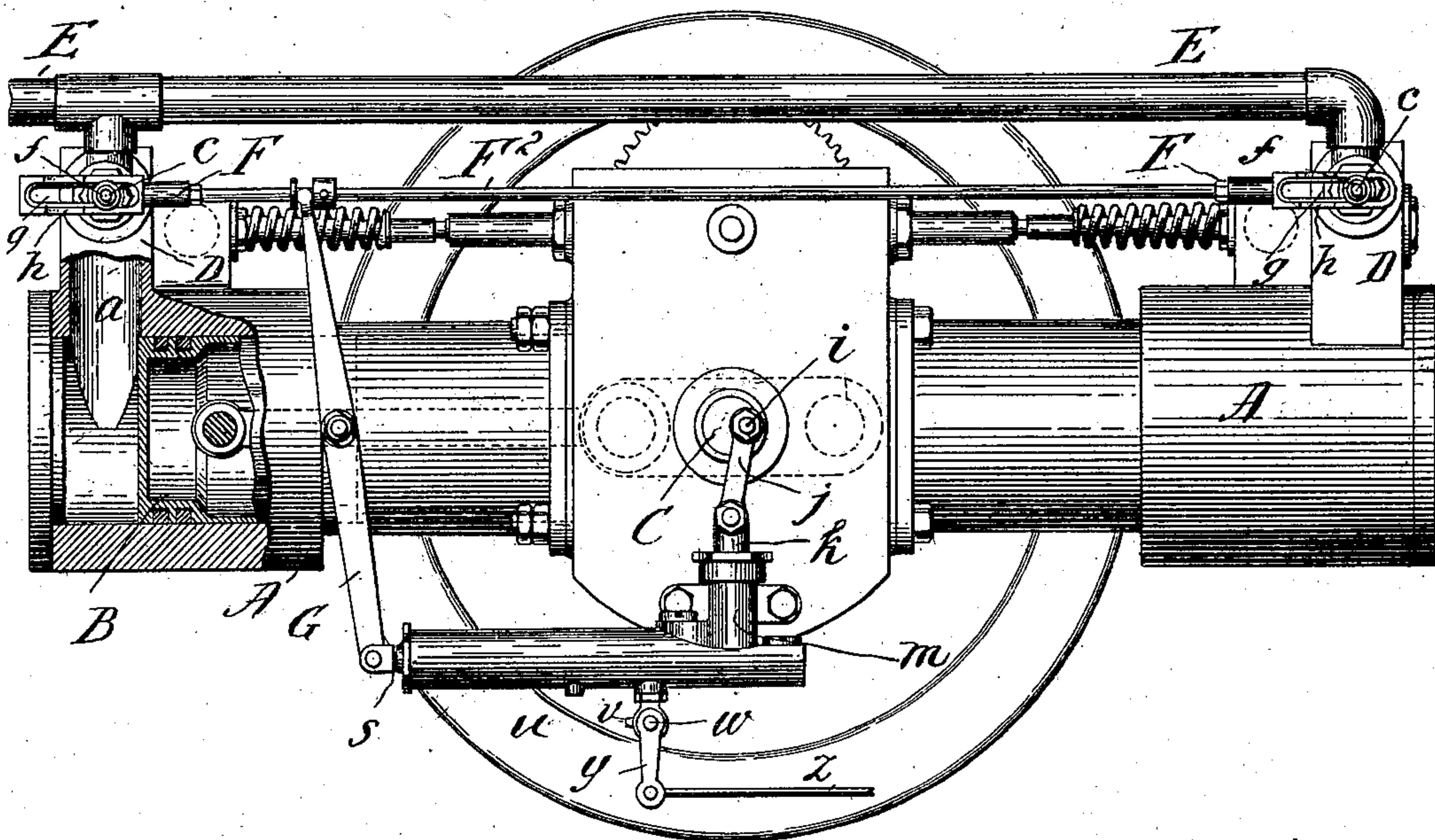
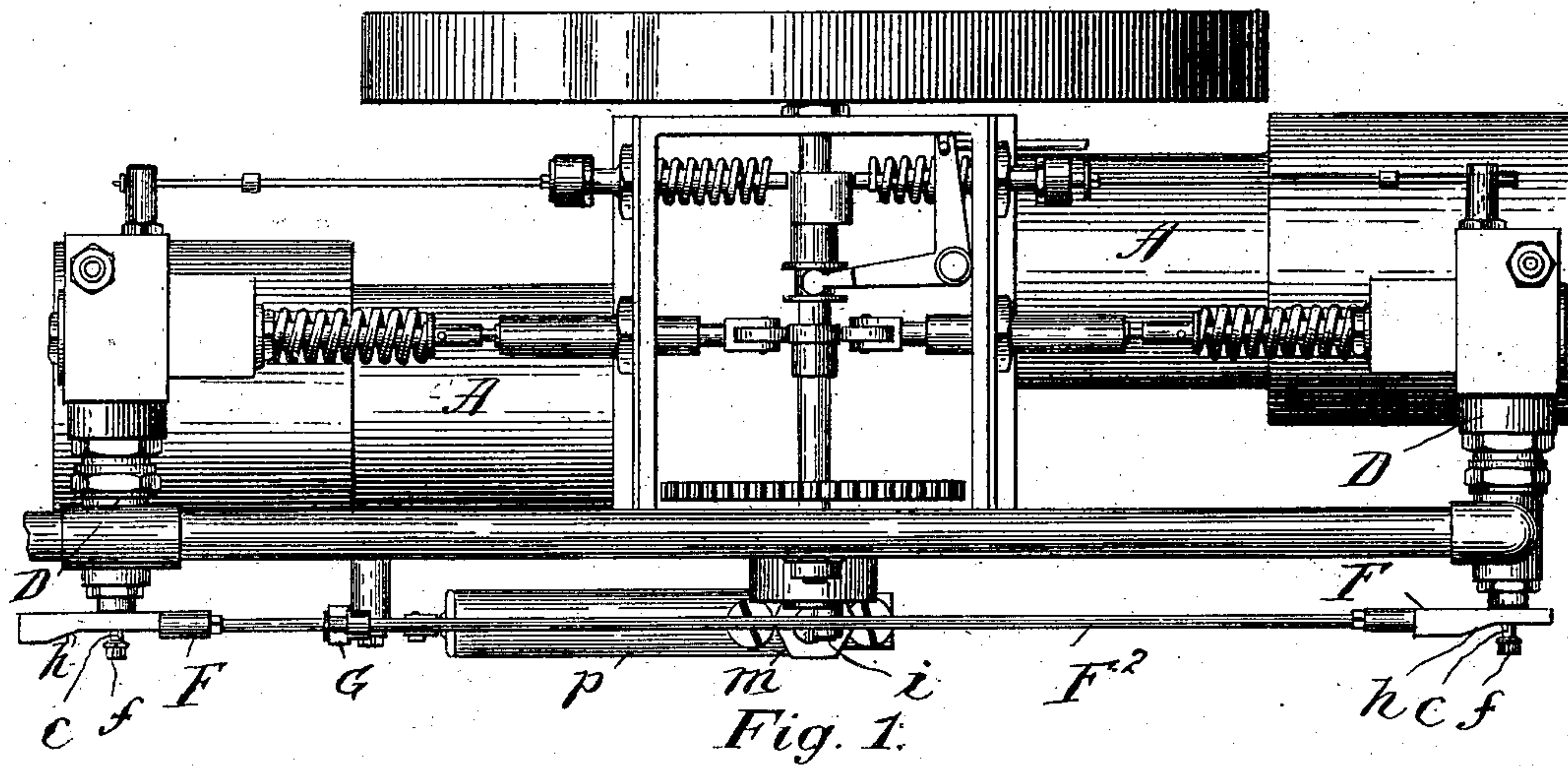


Fig. 2.

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2 Sheets—Sheet 2.

Fig. 3.

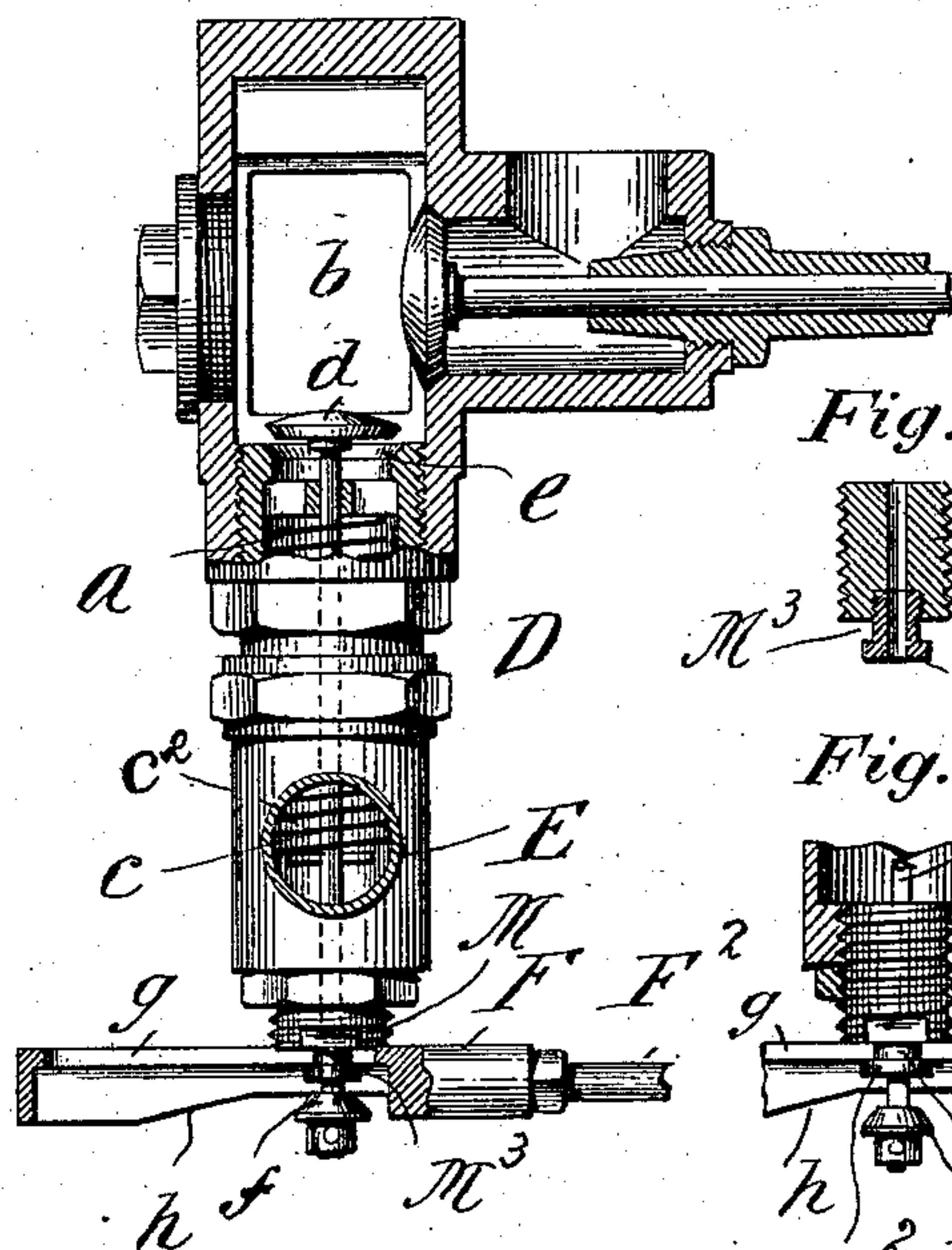


Fig. 4.

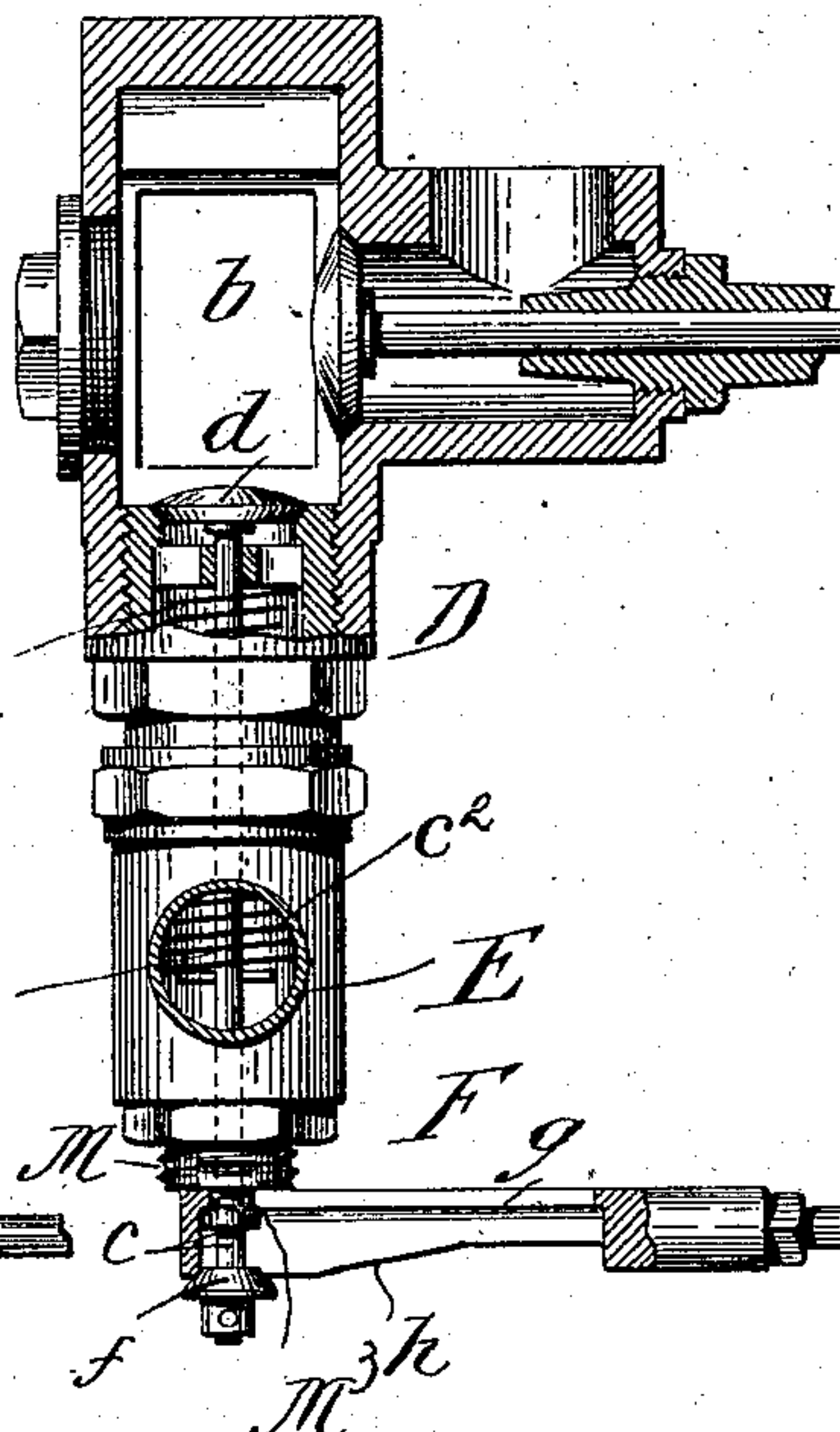


Fig. 8.

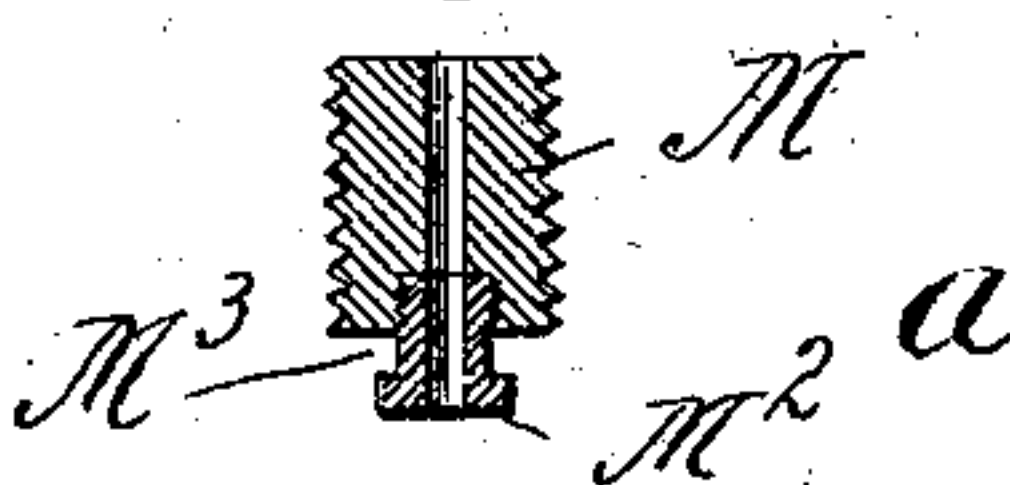


Fig. 7.

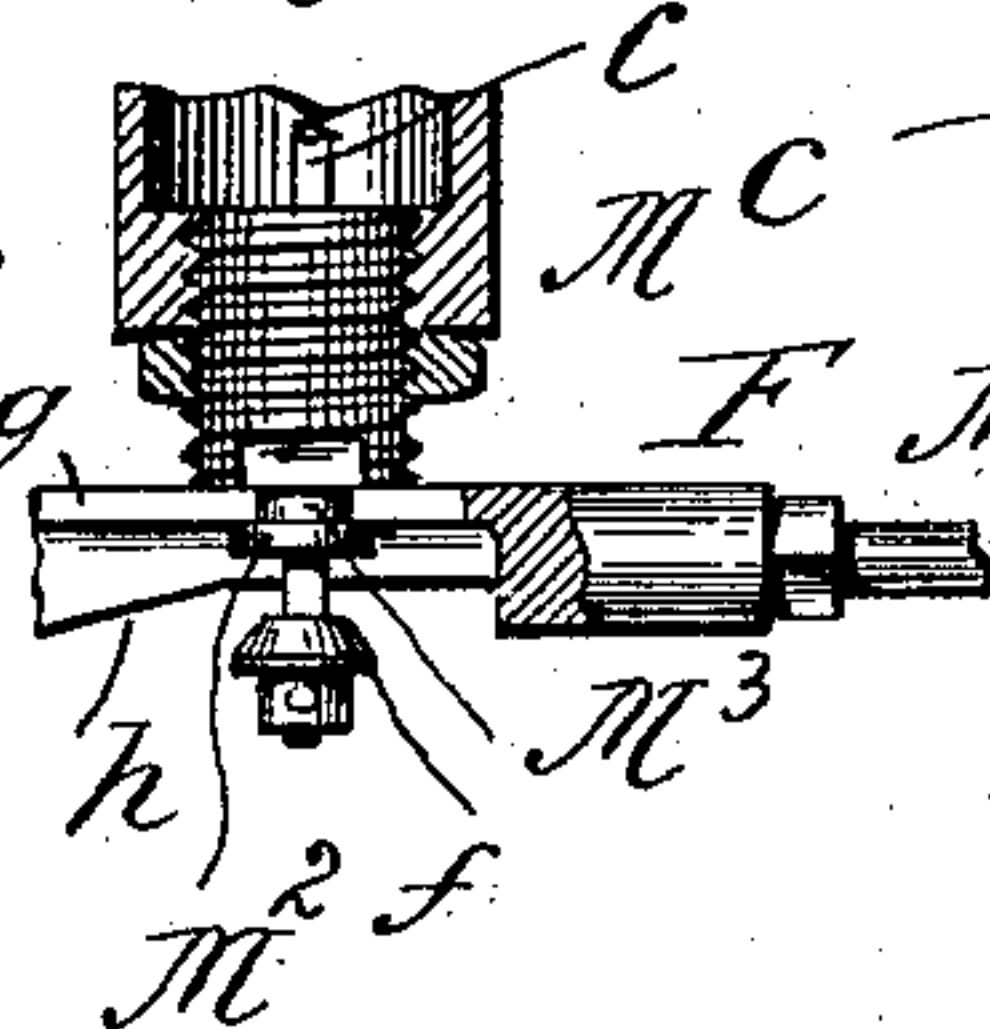


Fig. 5.

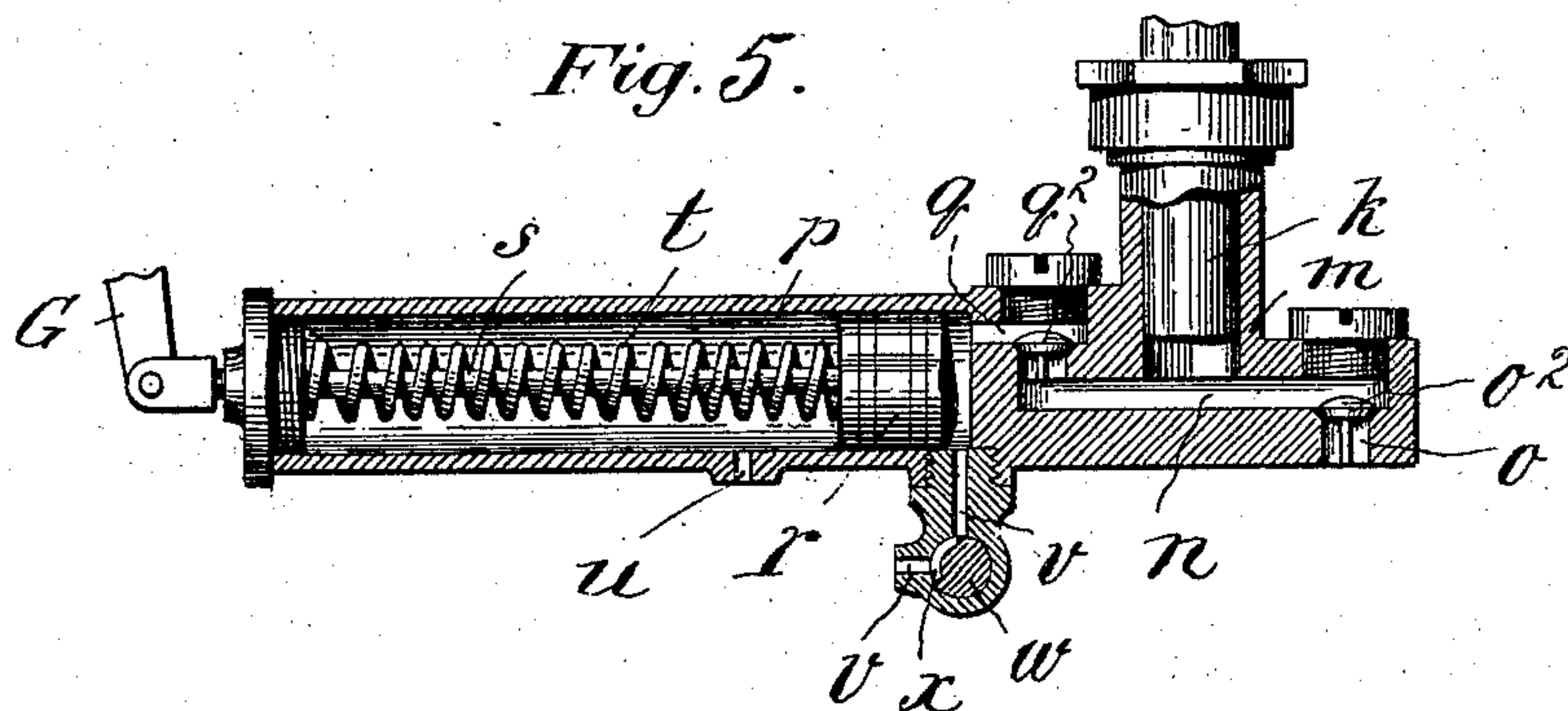
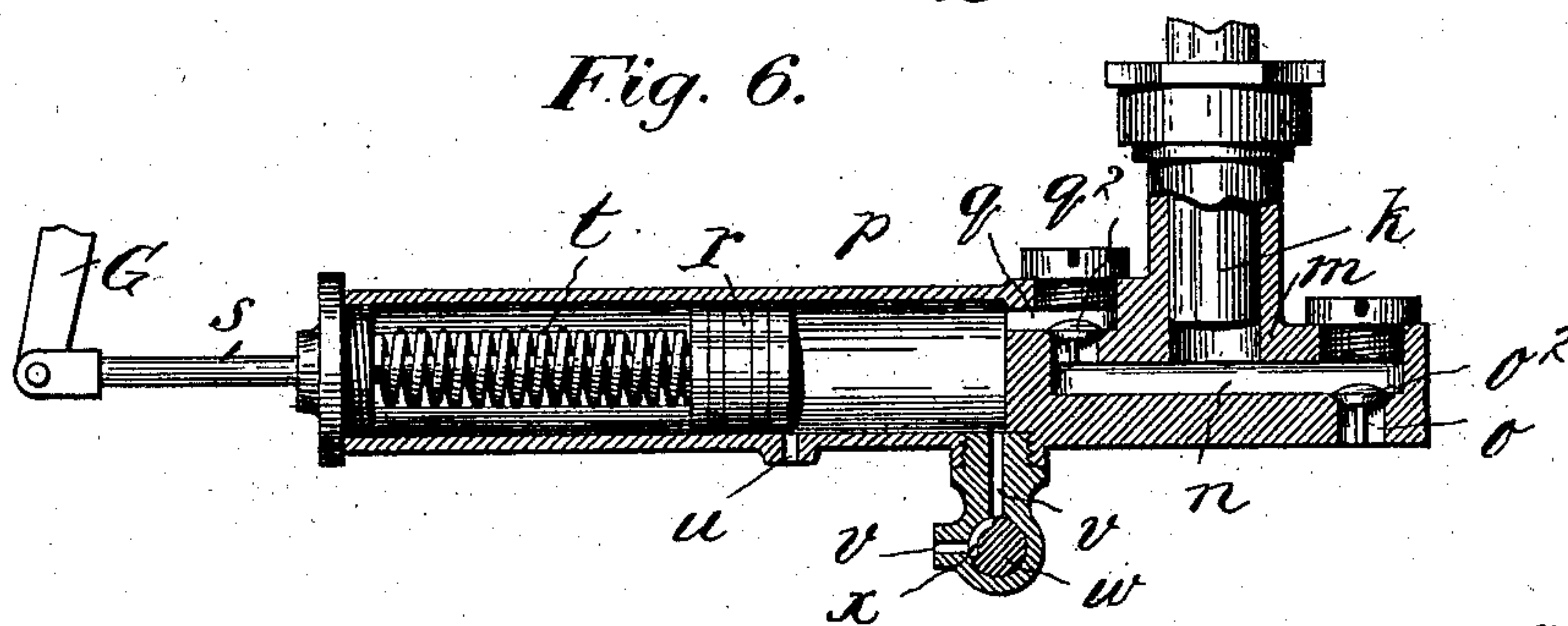


Fig. 6.



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INLET-VALVE-GOVERNING MECHANISM FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 702,090, dated June 10, 1902.

Application filed December 27, 1900. Serial No. 41,233. (No model.)

To all whom it may concern:

Be it known that I, JAMES FRANK DURYEA, a citizen of the United States of America, and a resident of Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Inlet-Valve-Governing Mechanism for Engines, of which the following is a full, clear, and exact description.

This invention relates to improved governing or speed-controlling mechanism for engines, and more particularly for engines operated by explosive charges of gas.

The invention relates to that class or type of engines comprising the combination, with the inlet-valve for the cylinders of the engine, of a device movably arranged relative to the inlet-valve to impede, obstruct, or limit according to its change of position the extent of opening of the inlet-valve and means for controlling the position of said valve-limiting device relatively to the stem of the valve.

An object of the invention is to generally improve, simplify, and render more desirable and efficient the constructions and combinations of parts comprised in a gas-engine, notably the gas-inlet valve for the cylinder and its abutment-provided valve-stem, a device arranged for a reciprocatory movement having a cam-face for coöperation with the valve-stem abutment, an air-pump having connection to be operated in conjunction with the air-pump to have changed positions according to the pressure developed by the pump, and connections between the piston and the cam-faced device.

Another object is to provide in the engine apparatus or mechanism comprising the instrumentalities just above mentioned, a means, here exemplified in a blow-off cock, leading from the pressure chamber of the air-pump, whereby the degree of sensitiveness of the operation of the cam-faced inlet-valve-controlling device may be modified.

Another object of the invention is to simplify and improve the constructions and arrangements pertaining to the intake-valve, its valve-stem, and an externally accessible and adjustable part of the casing or conduit adjacent the gas-inlet port of the engine, through which the valve-stem axially plays, and the movable valve-stem-limiting device, which co-

operates with an abutment on the valve-stem and which has an engagement with the said valve-stem-guiding part, all so that said valve-stem-guiding part serves to guide the valve-stem-limiting part and also so that by the adjustment of the said guiding part the limiting part may be bodily adjusted transversely of its line of reciprocatory movement to occupy a position relatively to the valve-stem abutment to modify the controlling action on the inlet-valve which it naturally has by reason of its endwise motions; and to these ends the invention consists in the construction and arrangements or combinations of parts, all substantially as hereinafter described, and set forth in the claims.

A gas-engine of a common and well-known type is illustrated in the accompanying drawings, showing the present improvements applied thereon, and in said drawings—

Figure 1 is a plan view of the engine. Fig. 2 is a side view of the same. Fig. 3 is substantially a sectional view through the portion of the engine comprising the inlet-valve, which is shown as opened and showing the relative location to the abutment-provided stem of the valve of the movable device for under certain conditions limiting the said valve in its opening movement. Fig. 4 is a view similar to Fig. 3, but showing a changed relative position of the valve-limiting device, whereby the opening movement of the valve is limited or prevented. Fig. 5 is a sectional view longitudinally through the portion of the apparatus which comprises the pneumatic pump and the mechanism which operates or controls the valve-limiting device, the mechanism latterly referred to being shown in the position which it occupies when the engine and the pneumatic pump are run at comparatively low speed. Fig. 6 is a sectional view the same as Fig. 5, but with the mechanism which controls the valve-limiting device shown in the position which it occupies when the engine and the pneumatic pump are running at an excessive speed. Figs. 7 and 8 are sectional views of a detail of construction hereinafter referred to.

Similar characters of reference indicate corresponding parts in all the views.

In the drawings, A A represent the cylinders of a gas-engine of the well-known "four-

cycle" type, in which the pistons B thereof have connection with the cranks of the centrally-arranged shaft C.

D D represent casings having passages *a* therein, which lead through the valve-seat openings *e* and inlet-ports *b* into the outer ends of the cylinders, said casings comprising suitable stuffing-boxes and guides for the stems *c* of the inlet-valves *d*, which valves are understood as opening by the forces created by the suction-strokes of the pistons and closed by suitable means, such as springs *c*².

E represents the pipe for the conveyance to the inlet-passage *a* of the engine of the gaseous or vaporized charges therefor from a carbureter or suitable supply. The valve-stems are extended parallel with each other right-angularly to the lengths of the cylinders A. Each valve-stem *c* has on its outer end a shoulder or abutment *f*. Coacting with each abutment-provided valve-stem is a bar F, the portion thereof adjacent the valve-stem being constructed with an elongated slot *g*, the opposite walls of which loosely embrace and may have a sliding movement relatively to the valve, while the face of the bar adjacent the valve-stem abutment *f* is provided with an incline or cam *h*.

i represents a crank-pin formed as a part of or affixed to the crank-shaft of the engine or to any suitable driven rotary part thereof, the same having by connecting-rod *j* connection with the plunger *k*, which works in the casing *m* of the pneumatic pumping apparatus. The said casing *m* has a chamber *n* therein, leading into which is the air-ingress opening *o*, provided with a check-valve *o*², and as a continuation of said chamber is a secondary chamber *p*, connected with the chamber *n* by the passage *q*, in which a check-valve *q*² is provided.

r represents a piston fitted in the cylindrical chamber *p*, the same having the stem or rod *s*, surrounding which is a spiral spring, the tendency of which is to maintain the piston *r* normally in a position toward the plunger *k*.

G represents a lever, which is intermediately thereof pivotally mounted on the side of the engine, one end of this lever having connection with the piston-rod *s*, while the opposite end of the lever has an engagement with the bar F or with the elongated stem or continuation F² thereof. Said cam-faced bars F and the intermediate uniting rod or stem F² therefor are all in line at right angles to the lengths of the valve-stems.

In the running of the engine, assuming that the engine develops an excessive running-speed, there will be as a consequence an accelerated reciprocation of the pump-plunger *k*, which will result in the compression of air in a corresponding degree to force the piston *r* and its stem in an endwise direction against the spring *t*. This causes a swinging of the lever G and a corresponding endwise movement of the bar F, arranged adjacent the

stem of each inlet-valve of the engine, so as to place some portion of the cam-face in a limiting relation to the abutment *f* of the valve-stem, whereby the valve becomes limited as to its opening movement on the suction-strokes of the piston within the cylinder. Thus if the bar F is moved considerably it will bring a more prominent portion of its cam-face *h* to the obstructing or limiting engagement with the valve-stem abutment than would be the case when the bar has imparted thereto a lessened degree of endwise movement, and so correspondingly according to the movement of said bar F may the inlet-valve be opened much, little, or scarcely any, whereby is regulated the quantity of the explosive charge which may be drawn into the cylinder for the operation of the engine by the explosive action therein. The air-compression chamber *p* is shown as having the relief-opening *u* at such position as may be passed by the piston *r* when moved by the compressed air therein to what may be regarded as the maximum or limit of its movement, which may be desired as the extreme, and *v* represents an outlet-passage leading from the air-compression chamber *p* at the portion thereof between the end of said chamber and the position of the piston therein when in its normal or unforced condition. A cock *w* is provided in said passage *v*, having a way *x* therein, so as to leave, according to the position of the cock, the passage *v* entirely closed or more or less open. This cock, as manifest, may be so adjusted as to regulate the pneumatic pump as to its sensitiveness and whereby at the pleasure of the attendant conditions may be established for having the opening movements of the inlet-valves restricted by either a high running of the engine and hard driving of the pump or by a comparatively moderate running of the engine resulting in a corresponding driving of the pump.

The cock *w*, as shown, is provided with an operating-lever handle *y*, to which a rod *z* is connected. This rod may be extended to any convenient place to be operated for changing the sensitiveness of the governing mechanism for the engine.

As shown in Figs. 7 and 8, the member at the outer end of the conduit or casing D, through which the valve-stem *c* plays, is provided with a screw-plug M, which threads into the end of the casing and which has an axial opening for the stem. The outer end of the screw-plug has an endwise-extended boss or hub M², provided with a groove M³, engaged in which groove are the marginal portions of the slotted cam-bar F. This provides that the cam-bar will be constrained in its reciprocating movements without liability for lateral play, which would tend to render uncertain the governed action of the inlet-valve, and, moreover, it is possible and, in fact, most convenient, especially in adjusting the parts of the engine to bring it to the best run-

ning condition, by merely turning the bushing or screw-plug M to so change the location of the cam-bar F by movement thereof across its length and line of reciprocatory motion as to modify the controlling action by said bar on the inlet-valve which it naturally has because of its endwise motion.

The possibility and provision for the described adjustment is valuable in an increased degree in a double-cylinder engine, as here shown, Figs. 1 and 2, in which the double cam-bars F F, joined by the rod F², all in line at right angles to the lengths of the abutment-provided valve-stems c, for, as will be easily understood, without it, it would be difficult to have the inlet-valves of both cylinders controlled exactly alike.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an engine, the combination, with a valve-limiting rod; of a casing having the chamber, *m*; the plunger, *k*, operated by the engine; the inlet-valve, *o*²; the casing having also the chamber, *p*, and a passage connecting the chambers, *m*, and *p*; the check-valve, *q*², in said latter passage; the piston, *r*, working in chamber, *p*, and actuated by the pressure generated by said plunger, *k*; the retractile spring, *t*, the chamber, *p*, having the outlet, *v*, at its admission end; the adjustment-valve, *w*, in said outlet; the piston-rod, *s*; and means for causing said rod to operate said valve-limiting rod, substantially as set forth.

2. The combination, with a cylinder, a valve and valve-stem therefor, of movable means for limiting the movement of the valve-stem, means connected with the cylinder for guiding said limiting means during its movement, and means for adjusting the position of said guiding means so as to vary the amount of said limitation caused by said limiting means in its several positions.

3. The combination of a cylinder, a valve and valve-stem therefor, the valve-stem projecting out of the cylinder and having an abutment on its free end, and a movable bar having a slot therein and being so arranged that the valve-stem moves through its slot, the bar having a cam-face arranged to engage said abutment and thereby limit its movements.

4. The combination of a cylinder, a valve and valve-stem therefor, the valve-stem projecting out of the cylinder and having an abutment on its free end, a bushing connected with the cylinder and through which the valve-stem reciprocates, the bushing having

an annular groove, and a movable bar having a slot therein and having the margin of said slot arranged to engage said bushing at its groove, the bushing being adjustable on the cylinder in an axial direction, said bar having a cam-face arranged to engage said abutment and thereby limit the movement of the valve.

5. The combination of a cylinder, a valve and valve-stem therefor, the valve-stem projecting out of the cylinder and having an abutment on its free end, a bushing connected with the cylinder and through which the valve-stem reciprocates, the bushing having an annular groove, a movable bar having a slot therein and having the margins of said slot arranged to engage said bushing at its groove, the bushing being adjustable on the cylinder in an axial direction, said bar having a cam-face arranged to engage said abutment and thereby limit the movement of the valve, an air-pump operated by the engine, a cylinder containing a piston that is operated by pressure from said air-pump, and a lever connecting said latter piston with said cam-faced bar.

6. The combination of a cylinder, a valve and valve-stem therefor, the valve-stem projecting out of the cylinder and having an abutment on its free end, a screw-plug in the said cylinder having a bore engaging said valve-stem, a bushing threaded into said plug and through which the valve-stem reciprocates, the bushing having an annular groove, and a movable bar having a slot therein and having the margin, said slot arranged to engage said bushing at its groove, the bushing being adjustable on the cylinder in an axial direction, said bar having a cam-face arranged to engage said abutment and thereby limit the movement of the valve.

7. The combination, with a pair of cylinders each having a valve and stem therefor, said stems being arranged parallel, of a bar movable transversely to the valve-stems and having means for simultaneously limiting the movement of the valve-stems, a means connected with each cylinder for guiding its said limiting means during said movement, and means on each cylinder for adjusting the position of said guiding means so as to vary the amount of said limiting means in its several positions.

Signed by me at Springfield, Massachusetts, in presence of two subscribing witnesses.

J. FRANK DURYEA.

Witnesses:

WM. S. BELLows,
C. F. WHITE.