No. 679,389. Patented July 30, 1901.

H. M. McCALL.

GOVERNOR FOR EXPLOSIVE ENGINES.

(Application filed Jan. 22, 1901.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 4.

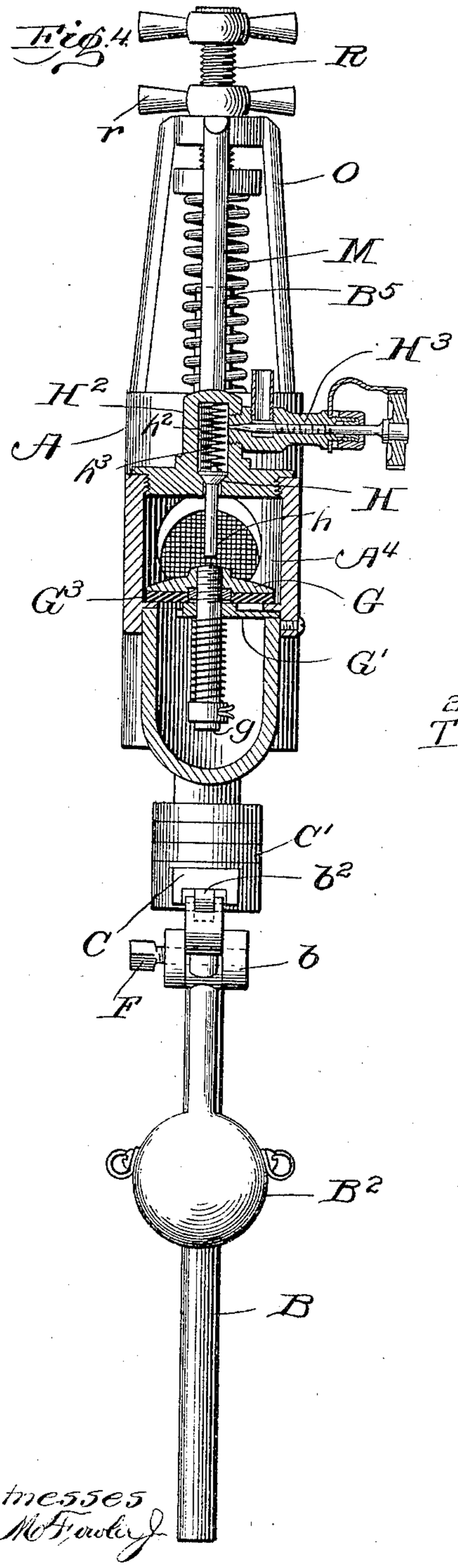

Fig. 1.

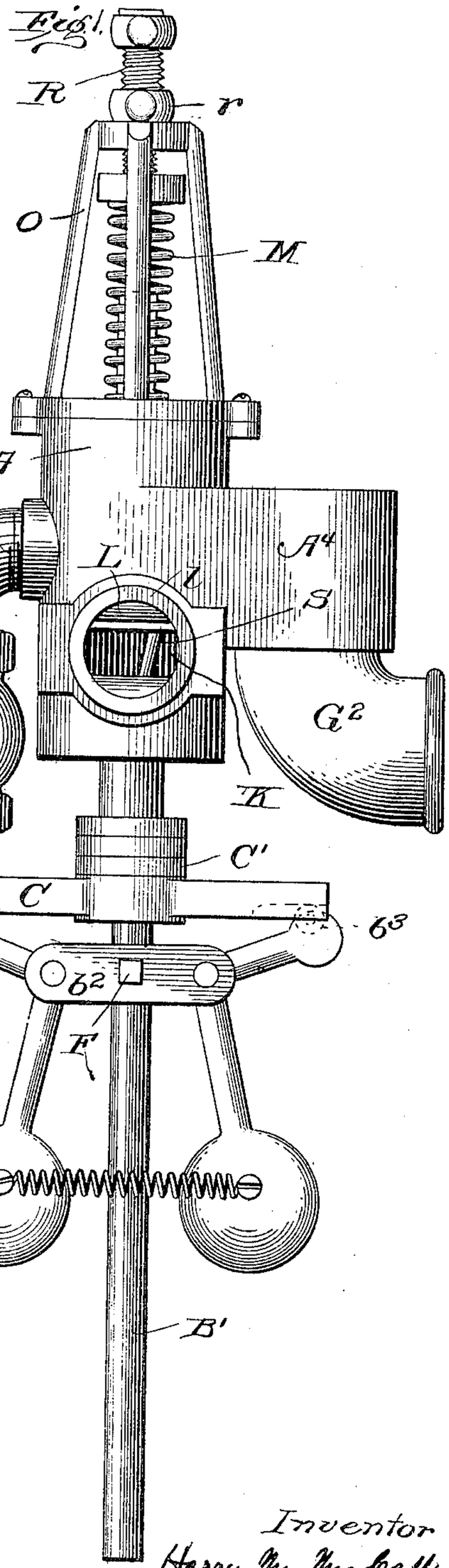

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Fig. 2.

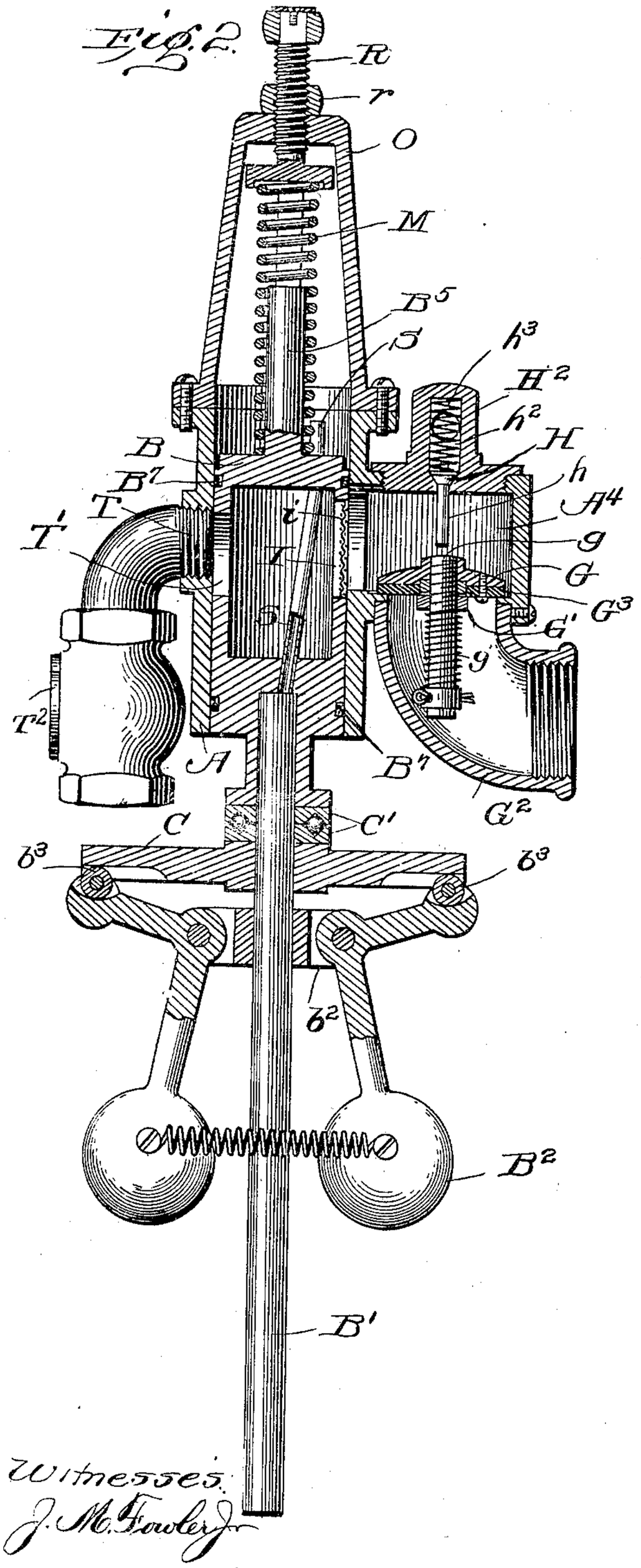

Fig. 3.

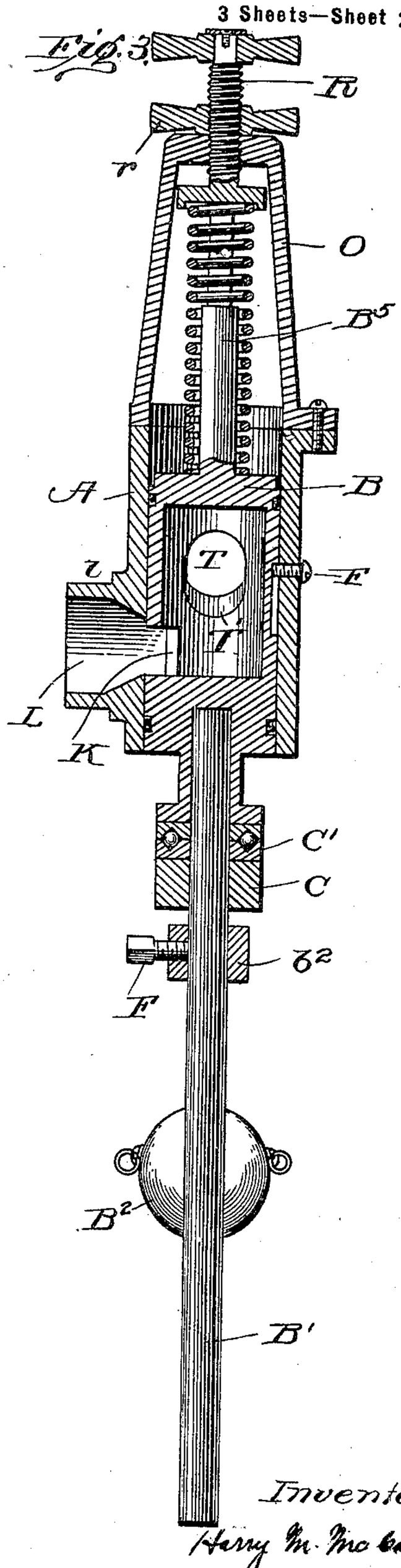

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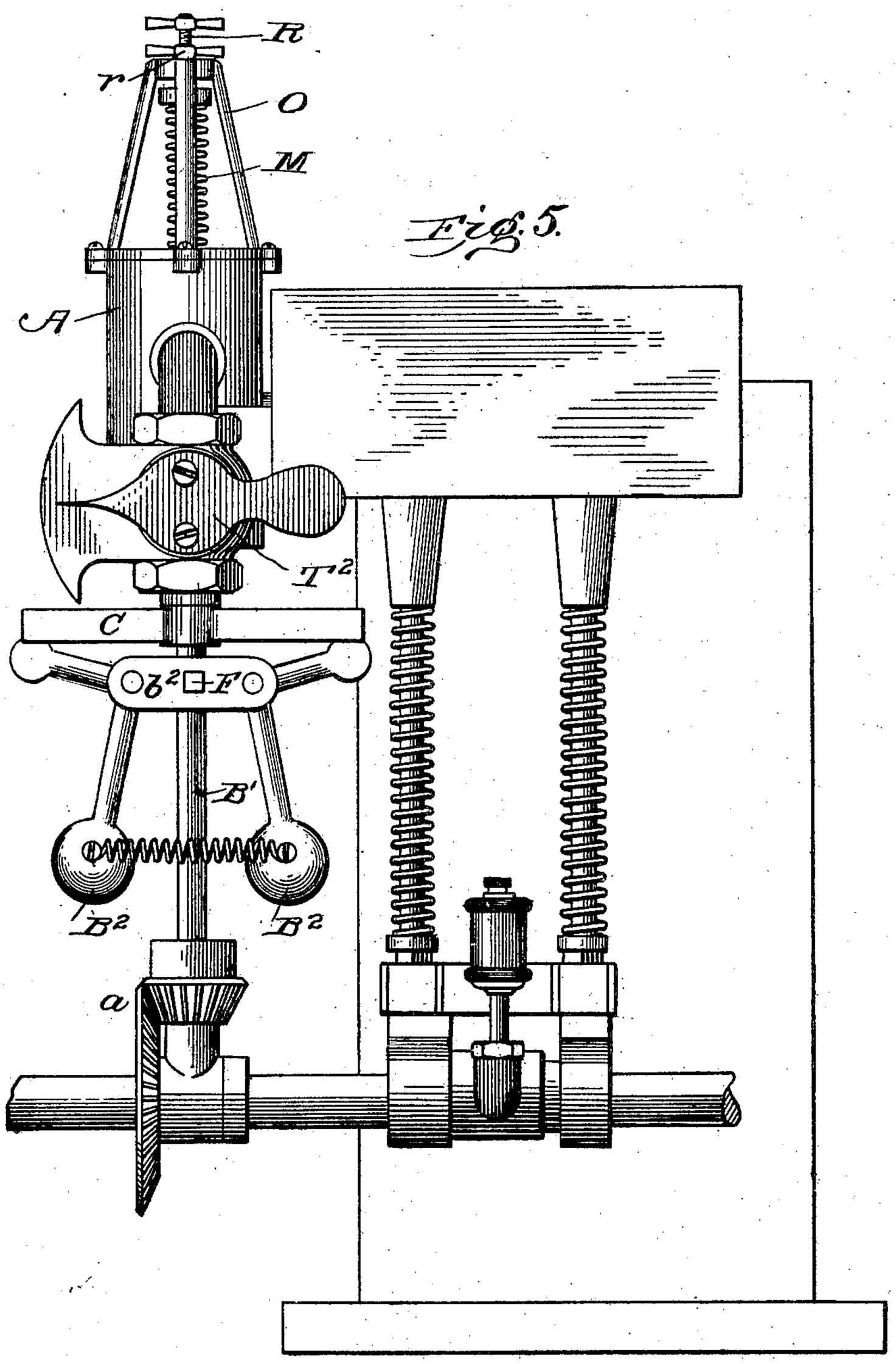
Fig. 5.



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UNITED STATES PATENT OFFICE.

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GOVERNOR FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 679,389, dated July 30, 1901.

Application filed January 22, 1901. Serial No. 44,277. (No model.)

To all whom it may concern:

Be it known that I, HARRY M. McCALL, a citizen of the United States, residing at Pittsburg, in the county of Allegheny, State of Pennsylvania, have invented certain new and useful Improvements in Gas-Engine Governors; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

This invention relates to improvements in devices for governing the speed of gas-engines by throttling the supply of explosive mixture as the speed of the engine increases; and it has for its object to provide an efficient, simple, and convenient mechanism for accomplishing this desirable end, together with a convenient means whereby the explosive mixture may be formed in such relation to the supply-controlling devices that it will maintain its stability until supplied to the engine-cylinder and ignited.

The invention consists in certain novel details of construction and combinations and arrangements of parts, all as will be now described, and pointed out particularly in the appended claims.

Referring to the accompanying drawings, Figure 1 is a side elevation of a governor and mixing mechanism embodying my present improvements. Fig. 2 is a vertical section through the same. Fig. 3 is a similar section at right angles to Fig. 1 taken vertically through the governor-valve. Fig. 4 is a similar section taken at right angles to Fig. 1 through the hydrocarbon and air-supply valve. Fig. 5 is a front elevation.

Like letters of reference in the several figures indicate the same parts.

In illustrating this invention I have not deemed it necessary to illustrate the gas-engine proper, inasmuch as the invention relates more particularly to the mixing and controlling mechanism for the explosive mixture, and, referring to the drawings, the letter A indicates a cylinder or fitting having a cylindrical bore adapted for the reception of a cylindrical longitudinally-movable governor-valve B, which valve B is operated by means of a centrifugal governor mechanism rotated from the valve or engine shaft by means of miter-gears *a* or other appropriate driving mechanism. In order to effectually control the governor-valve, it is preferably mounted in line with a governor-shaft B′, which carries centrifugal weights B^2, suitably pivoted in brackets or a cross-piece b^2.

The governor-weight levers are in the form of bell-cranks and at their upper ends are adapted to bear against or have rolling contact by means of rollers b^3 with the under surface of a longitudinally movable and rotary cross-piece C. This cross-piece C is the direct means whereby the governor-valve is raised or lowered in accordance with the position assumed by the governor-weights, and it is preferably provided with a bearing on its upper surface which coöperates with a corresponding bearing C′ on the governor-valve B. If desired, a raceway and antifriction-balls may be interposed between the bearings to avoid friction.

The upper end of the governor-shaft takes a bearing in the lower end of the governor-valve; but while the valve is movable longitudinally it does not rotate with the shaft, but is held against rotation and its longitudinal movement also limited by a set-screw F, passing through the wall of the fitting and entering a slot or recess milled in the side of the valve.

The fitting A at one side is formed or provided with an enlargement constituting a mixing-chamber A^4, having at the bottom a valve G, of relatively large size, constituting the air-inlet valve, and at the top a valve H, controlling the admission of hydrocarbon. The stem *g* of the valve G preferably works in a bearing formed in a spider G′, held in place by a guard-elbow G^2, extending away from the air-valve. The valve is seated by gravity or by a light spring surrounding the stem on the side of the spider opposite to the valve, and to avoid noise by the valve striking its seat the face of the valve is preferably provided with a disk of leather G^3, secured thereto in any suitable manner. The valve H is located centrally above valve G, and its stem *h* is adapted to contact with valve G as the latter moves up in opening, thereby open-

ing valve H and permitting a small quantity of hydrocarbon to flow down on valve G and mix with the incoming air to form the explosive mixture. The top surface of the air-valve is preferably rounded, so as to distribute the hydrocarbon evenly in a thin film, which will be readily taken up by the incoming air.

For convenience in assembling and repair the valve *h* is mounted in a cap H^2, which closes the top of the mixing-chamber, and a chamber h^2 is formed immediately above the valve for catching and holding a limited supply of hydrocarbon, which latter is admitted through a needle-valve H^3, screwed into the side of the cap H^2 and adapted to be adjusted by hand to control the feed of hydrocarbon. A light spring h^3 may be located in the chamber h^2 for holding the valve H closed.

From the mixing-chamber the air and hydrocarbon pass into the inside of the valve B through a port I, covered with a fine wire mesh *i* or other finely-perforated material, which will operate to exclude dirt, &c., and also to effect a thorough breaking up and mixing of the air and hydrocarbon.

In the side of the governor-valve B a port K is formed and adapted to coöperate with a port L in the side of the fitting for controlling the admission of the explosive mixture to the engine-cylinder. The port L is provided with an extended annular wall *l*, finished to fit a seat or opening in the cylinder or valve chest wall, thereby adapting the whole structure for ready application or removal from the engine proper.

The coöperating ports K and L are so positioned as to be open wide when the governor-weights are not swung out, but close more and more as said weights approach the horizontal, thereby shutting off more and more the supply of explosive mixture to the admission valve and cylinder of the engine.

In order to resist the action of the governor-weights in opening the valve, an adjustable spring M is placed above the valve B, so as to exert a constant downward pressure tending to open the valve, and this spring is held in a cage or housing O, secured to the top of the valve-fittings. In the upper end of the cage O is an adjusting-screw R, bearing on the upper end of the spring and adapted to be secured in adjusted position by a lock-nut *r*. The lower end of the spring is centered and held in place on the valve by a cylindrical projection B^5 on the valve itself.

When desired, ports K and L may be formed on opposite sides of the valve and fitting, and thus the governor may be used to control the supply of explosive mixture to two or more cylinders.

In the side of the fitting opposite the hydrocarbon or carbureted air or gas and air entrance another port T is formed, and a corresponding opening or port T′ is formed in the governor-valve and provided with a regulating-cock T^2. This inlet is designed for the admission of gas when liquid hydrocarbon is not used, and in practice the engines have been usually coupled up with both supplies, and with the arrangement shown the change from one fuel to the other may be made without stopping the engine.

The construction of the whole device is simple, the two chambers being straight cylinders, which may be easily formed and finished, while the governor-valve itself constitutes all the heads or ends necessary to employ for preventing the escape of explosive mixture above and below the valve, although as a precaution packing-rings B^7 are preferably located near the top and bottom of the valve.

The bearing in the lower end of the governor-valve may be lubricated through a tube S, extending from said bearing up through the top of the valve into convenient position for lubricant to be poured therein.

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

1. In a gas-engine governor, the combination with governor-weights operating by centrifugal force, a rotary shaft on which they are mounted and a rotary cross-piece moved longitudinally of the shaft by the outward swing of the weights, of a non-rotary longitudinally-movable governor-valve having a bearing in one end for the governor-shaft, a bearing coöperating with the cross-piece whereby the valve is moved longitudinally and a spring for holding the valve against the action of the weights; substantially as described.

2. In a gas-engine governor, the combination with a fitting having air and hydrocarbon inlet ports and valves controlling said ports, of a non-rotary longitudinally-movable valve controlling the exit of the mixture from the fitting, a bearing in the end of said valve, a governor-shaft journaled in said bearing and having a longitudinally-movable cross-piece coöperating with the valve to move it longitudinally, governor levers and weights carried by the shaft and coöperating with the cross-piece; substantially as described.

3. In a gas-engine governor the combination with a fitting having air and hydrocarbon inlet ports and valves controlling the same, of a non-rotary longitudinally-movable valve controlling the exit of mixture from the fitting, an adjustable spring bearing on one end of said valve, a governor-shaft journaled in the opposite end of the valve and having a cross-piece movable longitudinally thereon and coöperating with the valve, governor levers and weights coöperating with the cross-piece to move the same; substantially as described.

4. In a gas-engine governor, the combination with a fitting having a cylindrical opening therethrough with inlet and exit ports transversely thereof, spring-seated valves controlling the inlet-ports and a cylindrical

valve working in the fitting, an adjustable spring bearing on one end of the valve, a governor-shaft having a bearing in the opposite end of the valve and governor levers and weights on said shaft for moving the valve longitudinally in the fitting; substantially as described.

5. In a gas-engine governor, the combination with the fitting, the governor-valve working longitudinally therein, the governor-shaft having a bearing in the governor-valve but held against longitudinal movement therewith and the weights and levers carried by the shaft of a cross-piece moved longitudinally of the shaft by the governor-levers and an antifriction-bearing interposed between said cross-piece and the end of the valve in which the shaft is journaled; substantially as described.

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