

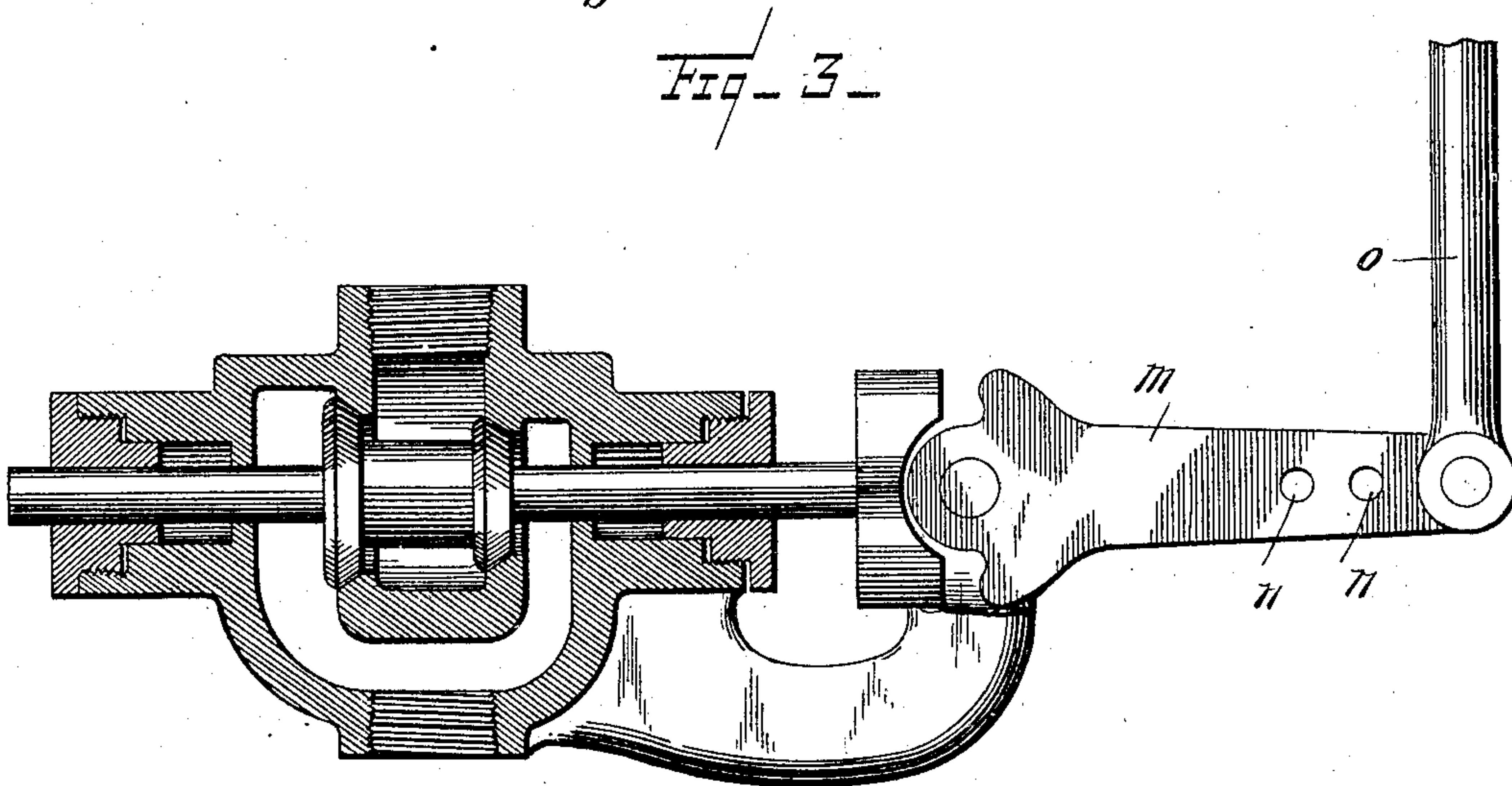
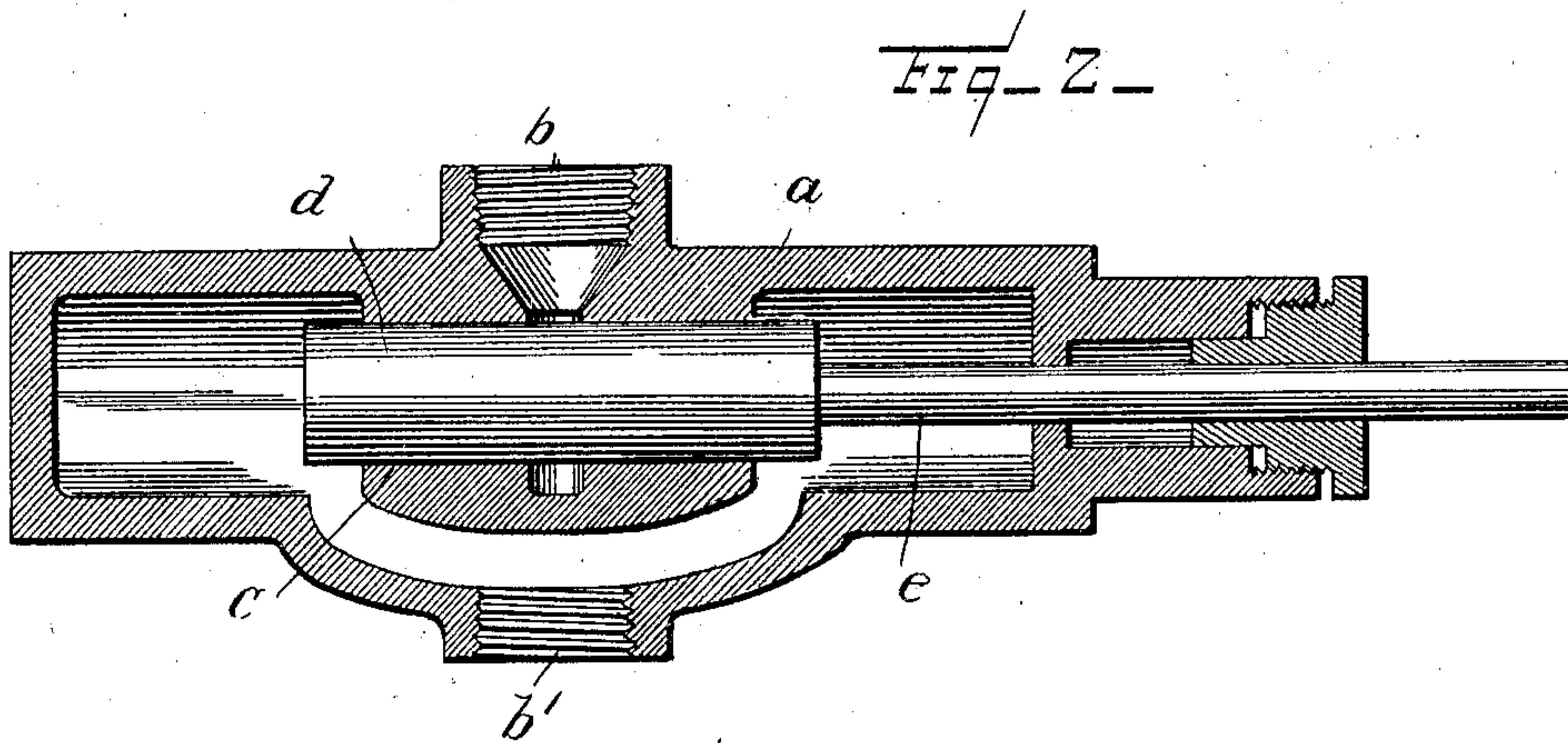
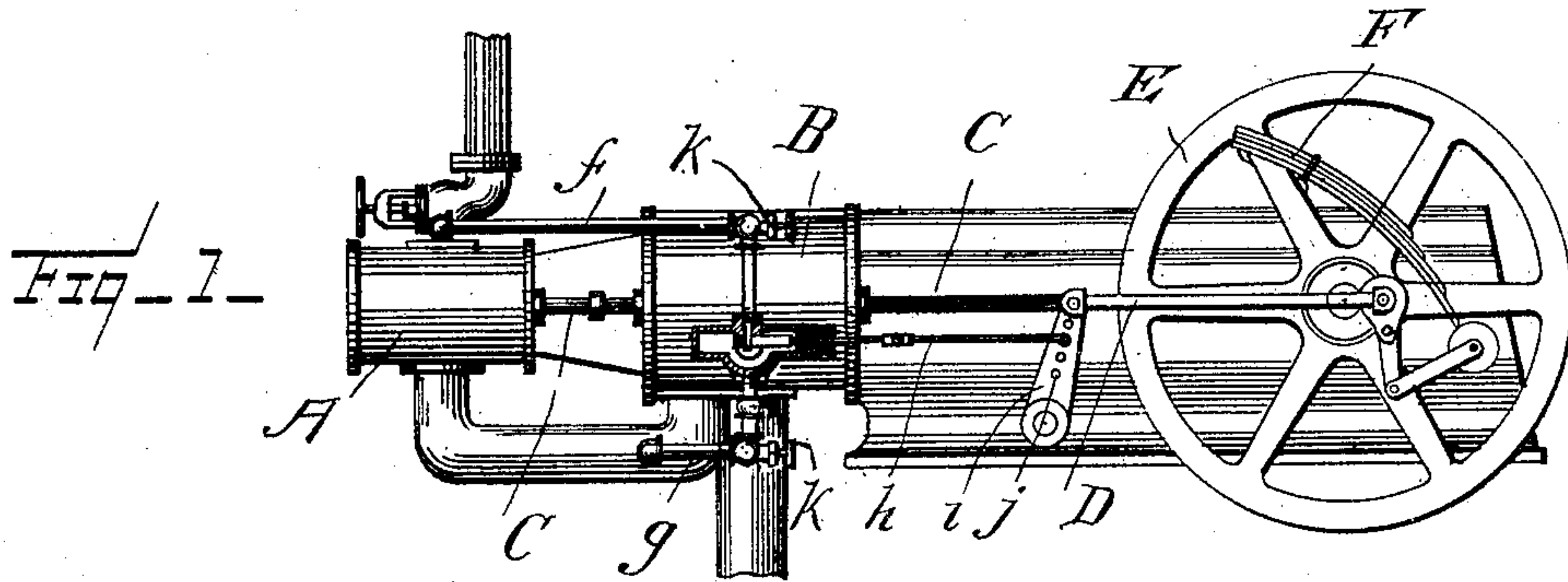
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PATENTED NOV. 27. 1906.

E. J. ARMSTRONG.

VALVE MECHANISM FOR COMPOUND ENGINES.

APPLICATION FILED AUG. 18, 1904. RENEWED APR. 17, 1906.



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EDWIN J. ARMSTRONG, OF ERIE, PENNSYLVANIA.

VALVE MECHANISM FOR COMPOUND ENGINES.

No. 836,911.

Specification of Letters Patent.

Patented Nov. 27, 1906.

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To all whom it may concern:

Be it known that I, EDWIN J. ARMSTRONG, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Valve Mechanism for Compound Engines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to the valve mechanism of compound engines of that type in which the admission of steam to one or more of the cylinders is controlled by varying the travel of some or all parts of the valve-gearing.

The object of the invention is to provide means whereby steam may be by-passed from the high-pressure steam-chest to the low-pressure steam-chest and whereby the governor of the engine may control such by-passing mechanism to the end that the steam-pressure in the low-pressure steam-chest may be automatically raised when desirable and the maximum power of the engine thereby increased, thus enabling a smaller engine to carry the required overloads and permitting smaller loads to be carried at later cut-offs. This in the case of non-condensing engines is very desirable, as the most economical load for such engines is at or near their maximum capacity, while the average loads are ordinarily much less. Hence by increasing the maximum capacity in the manner stated the average load may be carried with greater economy.

A further object of the invention is to provide means whereby the by-passing device may be made an attachment for, rather than an integral part of, the engine, so that in the manufacture of such engines the device may at any time be put on or left off, as the operating conditions may make desirable.

It is also an object of the invention to provide means whereby the point in the range of travel of the valve-gearing at which the by-pass begins to open may be adjusted to meet the conditions of different installations.

The invention consists in the parts and combinations of parts hereinafter described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a side elevation of an engine with the by-passing device applied thereto; Fig. 2, a vertical lon-

gitudinal section of one form of valve adapted for use in my by-passing device, and Fig. 3 a similar view of a different form of valve which is equally well adapted for such use.

Similar letters refer to similar parts throughout all the views.

Referring to the drawings, A represents the high-pressure cylinder, B the low-pressure cylinder, C the piston-rod, D the eccentric-rod, E the fly-wheel, and F a governor mounted on said wheel, of a compound steam-engine, all of which may be of the usual or of any suitable construction and arrangement.

In carrying out my invention I provide a valve which is attached to the engine and connected at one side by suitable pipes with the high-pressure steam-chest and at the other side to the receiver of the low-pressure cylinder, the stem of said valve being connected to the governor, so as to be operated thereby.

In Fig. 2 I show one form of valve adapted to carry out my invention, in which *a* represents a valve casing or body having the threaded openings *b b'* at opposite sides and the seat *c* for the piston-valve *d*, having a stem *e*.

As shown in Fig. 1, the valve is attached in any desired manner to the engine, and one side thereof is connected by a pipe *f* to the high-pressure-cylinder steam-chest and the other side by a pipe *g* to the receiver of engine, which receiver is in communication with the steam-chest of the low-pressure cylinder.

The valve *d* has a considerable lap and is adapted to open at either end of the idle movement provided for by the lap.

A jointed link *h* connects the valve-stem *e* to the rock-arm *i* of the engine, which is reciprocated by the governor F through a movement varying with the load which the engine is carrying, thereby giving a movement of the same character to the by-pass valve *d*. When the load is increased to a point where the valve travel is approaching the maximum, the by-pass valve *d* will be opened at either end of its movement and will admit steam from the high-pressure-cylinder steam-chest to the low-pressure-cylinder steam-chest, thus enabling a much larger load to be carried by the engine than could otherwise be done. It is desirable that the device be capable of adjustment whereby the point in the range of travel of the valve-gear at which the by-pass valve begins to

open can be changed to suit conditions. This may be accomplished in several ways, and in Fig. 1 I have shown the rock-arm formed with holes *j*, whereby the link *h* may be attached thereto at different radii from the rocker-arm pivot. Also I provide stop-valves *k* for the pipes *f* and *g*, whereby the by-pass valve may be cut off from the high and low pressure cylinders when desired.

In Fig. 3 I show another form of valve—a puppet-valve—to the stem of which a lever *m* is connected, which connects with the valve motion. This arrangement allows of considerable movement of the lever without opening the valve; but further movement in either direction will cause it to open, and thus permits the steam from the high-pressure-cylinder steam-chest to flow to the lower-pressure cylinder similar to the form of valve first described.

The lever *m* is formed with the holes *n* in order to provide for a change in position of attachment of said lever to the link *o*, which connects with the valve motion.

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

1. In an engine having high and low pressure cylinders and a governor operating to give a variable travel to the valve-gear, a by-pass valve connecting the high and low pressure steam-chests and adapted to be opened by a long travel of the said valve-gear.

2. In an engine having high and low pressure cylinders and a governor operating to give a variable travel to the valve-gear, an auxiliary by-pass valve connecting the high and low pressure steam-chests, and adapted to be opened only by a long travel of the valve-gear.

3. In an engine comprising high and low pressure cylinders, a governor operating to give a variable travel to the valve-gear, a by-pass valve connecting the high and low pressure steam-chests and adapted to be opened by a long travel of the valve-gear, and means whereby the point in the range of travel of the valve-gear at which the by-pass valve opens may be adjusted to suit varying conditions.

4. An engine comprising high and low pressure cylinders, a governor operating to give a variable travel to the valve-gear, an auxiliary by-pass valve connected to said valve-gear and adapted to be opened by a long travel of said valve-gear, said by-pass valve having communication with the high and low pressure steam-chests, and stop-valves for cutting off said communication.

In testimony whereof I affix my signature in presence of two witnesses.

EDWIN J. ARMSTRONG.

Witnesses:

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