No. 847,326. PATENTED MAR. 19, 1907.

W. FERRIS & J. M. ALLEN.

THROTTLE VALVE.

APPLICATION FILED APR. 4, 1906.

3 SHEETS—SHEET 1.

Fig. 1.

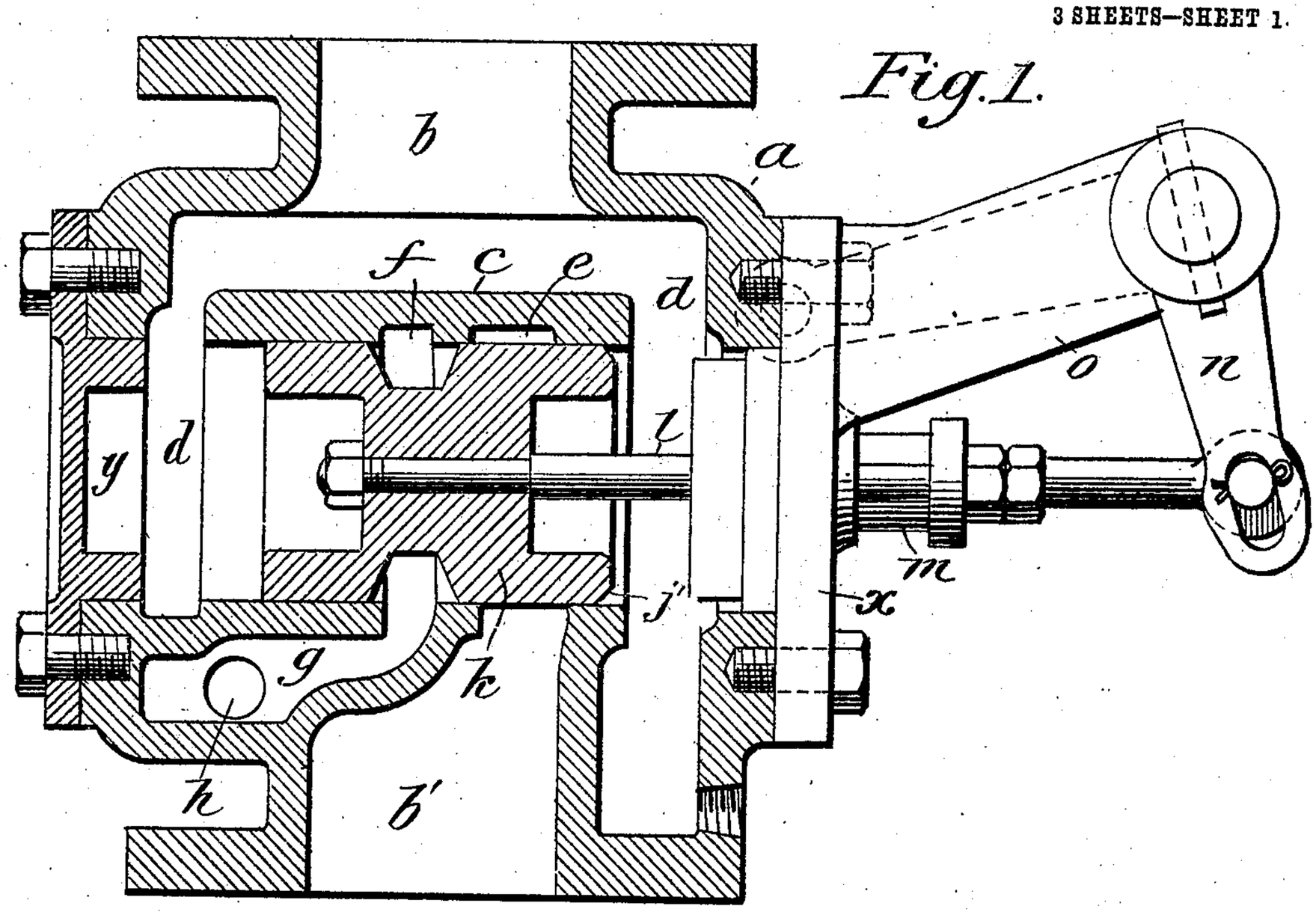
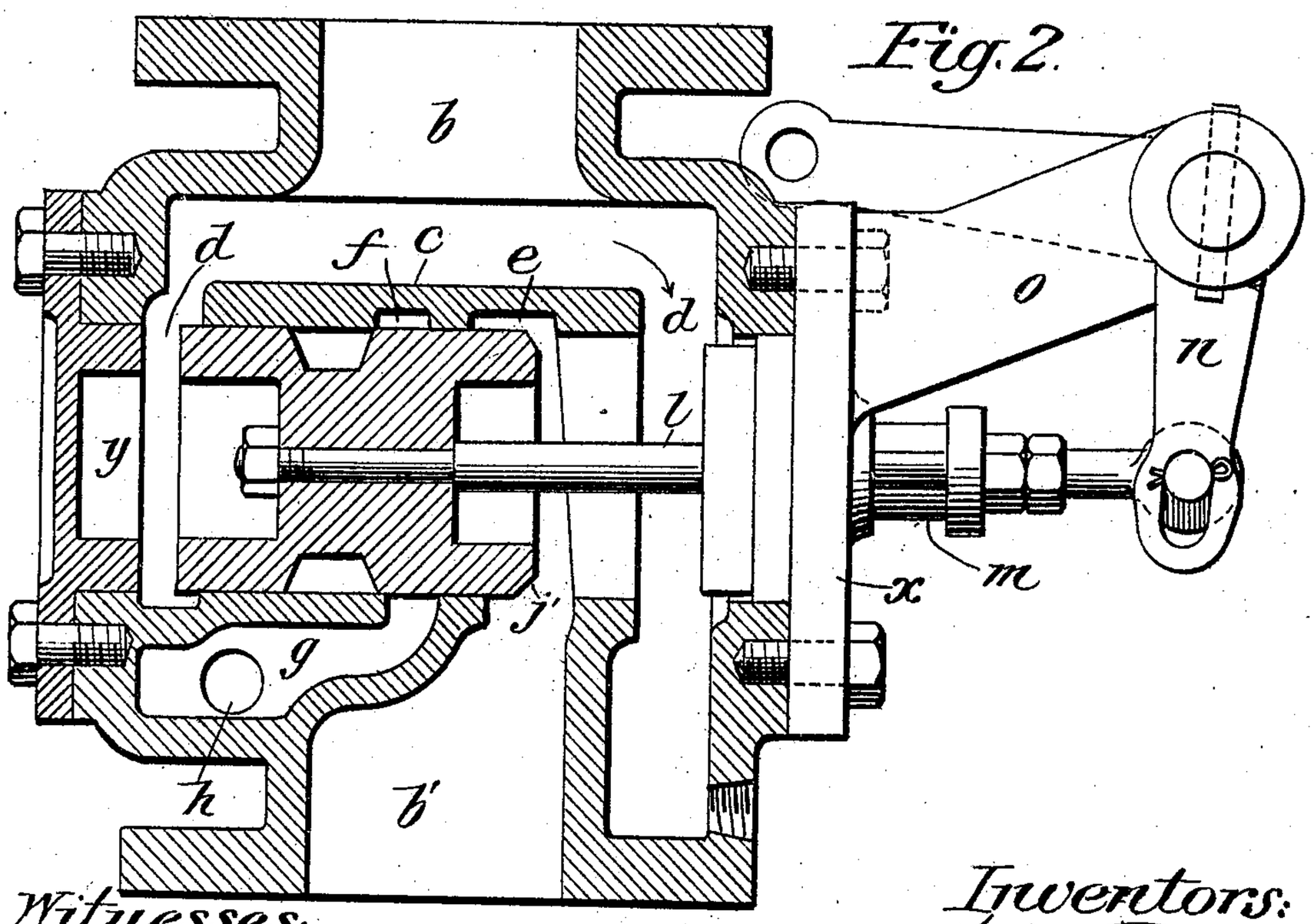


Fig. 2.



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R. L. Court.

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3 SHEETS—SHEET 2.

Fig. 4.

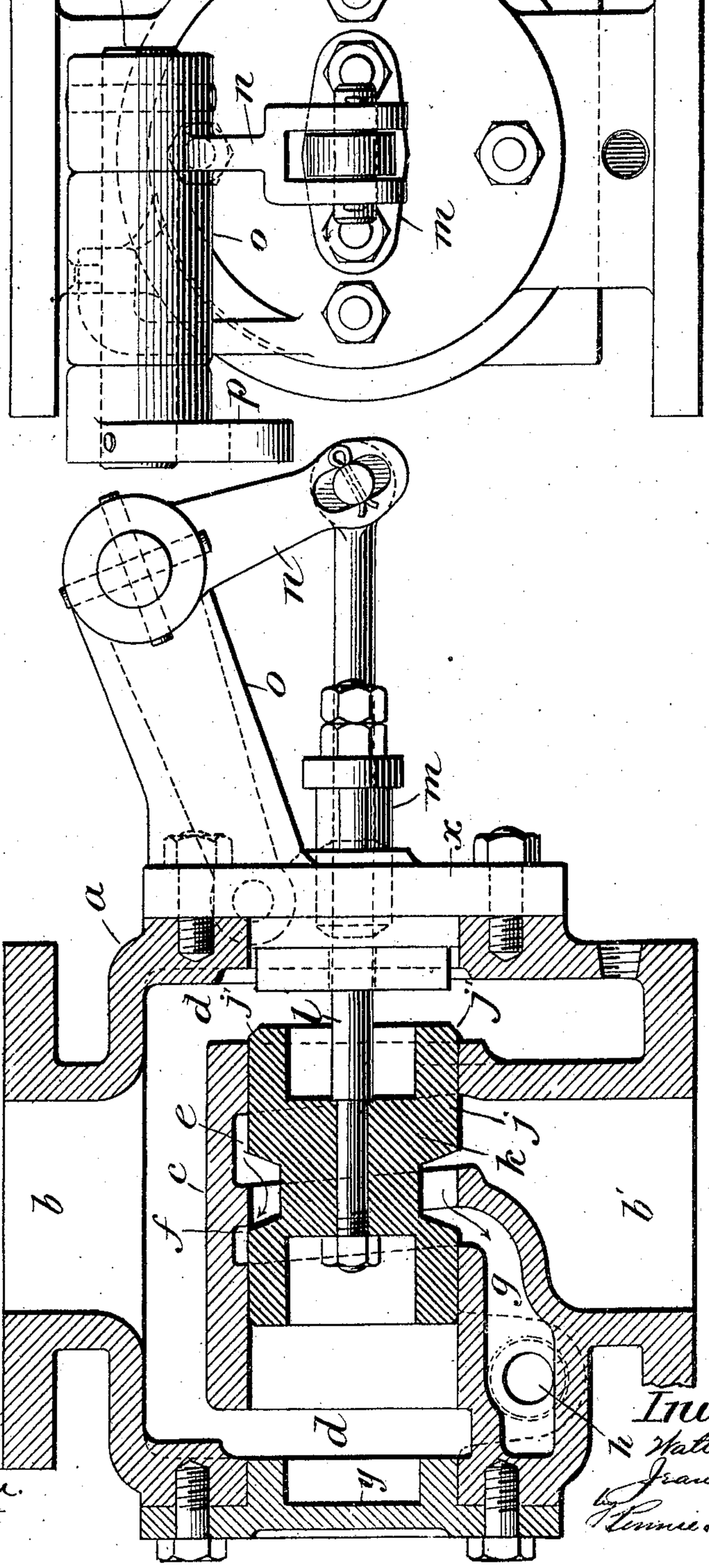

Fig. 3.

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3 SHEETS—SHEET 3.

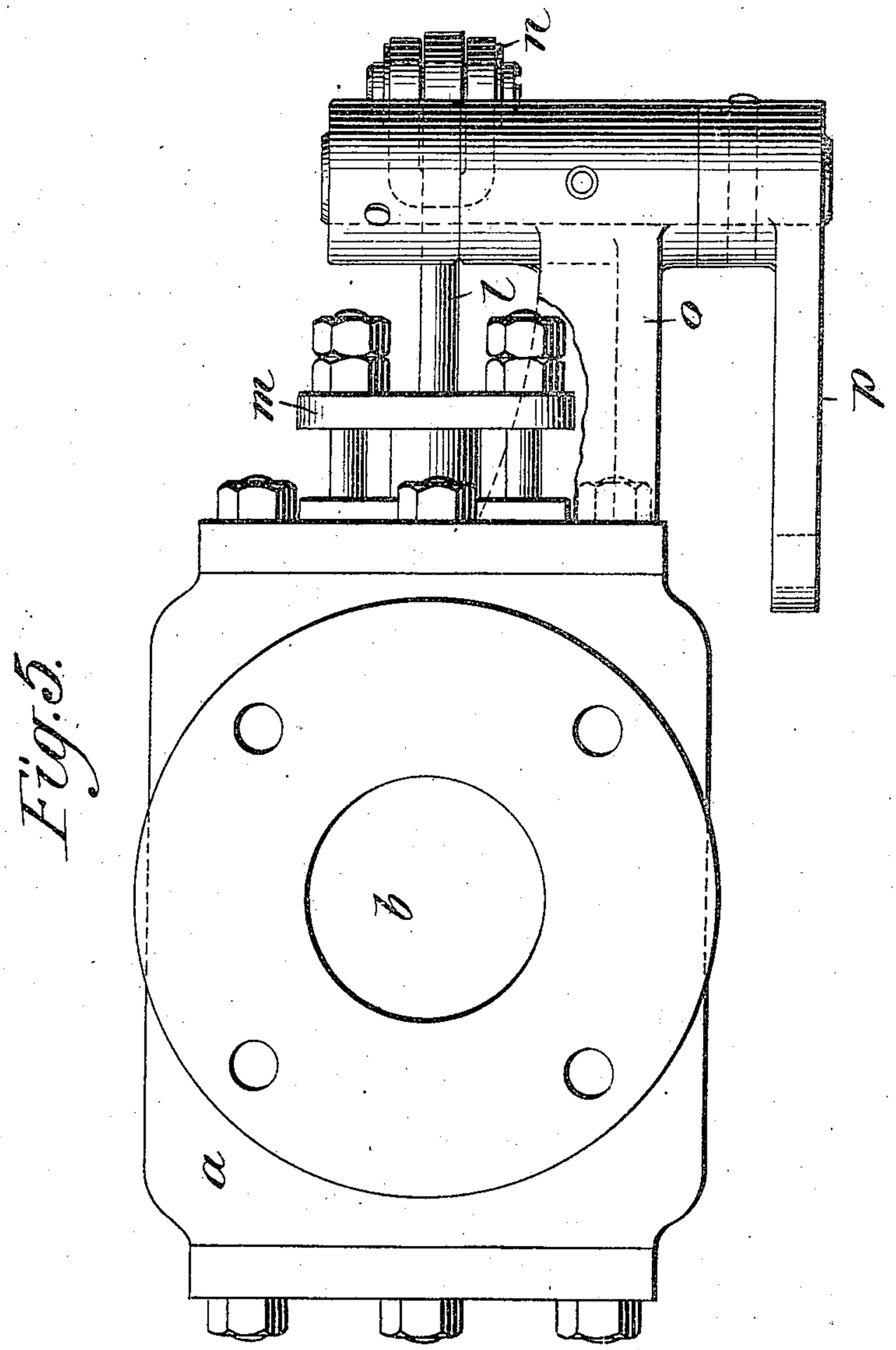

Fig. 3.

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UNITED STATES PATENT OFFICE.

WALTER FERRIS AND JEAN MARCH ALLEN, OF SOUTH MILWAUKEE, WISCONSIN, ASSIGNORS TO THE BUCYRUS COMPANY, OF SOUTH MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

THROTTLE-VALVE.

No. 847,326. Specification of Letters Patent. Patented March 19, 1907.

Application filed April 4, 1906. Serial No. 309,820.

To all whom it may concern:

Be it known that we, WALTER FERRIS, a citizen of the United States, residing in South Milwaukee, county of Milwaukee, State of Wisconsin, and JEAN MARCH ALLEN, also a citizen of the United States, residing in South Milwaukee, county of Milwaukee, State of Wisconsin, have invented certain new and useful Improvements in Throttle-Valves; and we do hereby 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.

The invention relates to throttle-valves for steam, hydraulic, or other fluid pressure engines, and has for its object to produce a substantially balanced steam-tight non-leaking valve which may be successfully operated to permit steam or other pressure to be gradually admitted to the engine in desired quantity; to permit the pressure to be cut off at the supply and passed back from the engine or motor by way of the outlet through the valve to the exhaust; to permit the engine or motor to be reversed rapidly or slowly, as desired, and to permit the pressure to be cut off absolutely between the inlet, outlet, and exhaust openings. A valve having these characteristics finds a particularly advantageous application in controlling the operation of hoisting engines or motors when it is found necessary to raise or lower the load gradually or rapidly or to hold the load in any desired position and belongs generally to the class of control or throttle valves, such as those illustrated in the patents to George W. King, No. 701,574, issued June 3, 1902, Kieckhefer and Cadman, No. 477,055, issued June 14, 1892, and Joseph K. Smith, No. 653,187, issued July 3, 1900.

In the accompanying drawings, Figure 1 is a vertical section showing the valve closed. Fig. 2 is a similar view showing the valve open to the discharge. Fig. 3 is a similar view showing the valve closed to the supply and open between the discharge and the exhaust. Figs. 4 and 5 are end views of the valve.

Referring to the drawings, *a* indicates the valve-casing, which is provided with an inlet-opening *b*, an outlet-opening *b'*, and an exhaust-opening *h*, connected with the interior of the casing by means of a passage *g*. The inlet-opening *b* communicates with piping leading to a source of steam, hydraulic, or other fluid pressure, and the outlet-opening *b'* communicates with the engine, motor, or other mechanism adapted to be operated by the fluid-pressure.

Mounted longitudinally in the valve-casing *a* and preferably between the inlet-opening on one side and the outlet and exhaust openings on the other side is a valve-chamber *c*, which may be conveniently formed as an open-ended cylinder which communicates with the inlet *b* by means of side passages *d d* adjacent to the open ends of said cylinder. The interior walls of the valve-chamber *c* are provided with grooves *e* and *f*, which may be conveniently extended entirely around the periphery of said chamber to constitute annular ports communicating with the outlet *b'* and the passage *g* leading to the exhaust *h*. The annular ports *e* and *f* are preferably inclined axially to the valve-chamber, and therefore to the coöperating valve, for a purpose to be hereinafter more fully explained.

Slidably mounted in the valve-chamber *c* is a piston-valve *j*, which fits steam-tight within the walls of the chamber and is adapted to be reciprocated therein by means of a stem *l*, provided with an operating-lever *n*, mounted upon a suitable shaft *u* and having an operating-handle *p*. The stem may be packed in any suitable manner, as by means of a stuffing-box *m*, to avoid leakage of steam or fluid pressure past the stem. The valve *j* is provided with a reduced portion *k* intermediate its ends, which is adapted to be brought into registry with the annular ports *e* and *f* in order to establish communication between the engine or motor and the exhaust *h*. The outer peripheral edge of the piston-valve adjacent the stuffing-box is beveled or chamfered, as at *j'*, so that when the valve is moved inward to establish communication between the inlet *b* and the outlet *b'* through the corresponding end of the valve-chamber *c* the chamfered edge *j'* will coöperate with the axially-inclined port *e* to throttle the fluid-pressure to any desired degree, according to the extent of movement of the valve. The casing *a* is preferably provided with end caps *x* and *y*, by means of which ready access may be had to the interior of the casing and the valve.

In the position of the valve illustrated in

Fig. 1 it will be noted that communication between the inlet *b* and the outlet *b'* and between the outlet *b'* and the exhaust *h* is cut off absolutely and no fluid-pressure is admitted to the engine or motor, and correspondingly any pressure stored in the motor is prevented from exhausting back through the outlet *b'* to the exhaust-opening *h*. When it is desired to start the engine or motor, the valve *j* is moved inward until the edge *j'* thereof begins to uncover the annular port *e*. Owing to the chamfer or bevel on the edge *j'* and the axial inclination of the annular port *e*, it will be noted that an efficient throttling of the pressure may be effected, first, because the beveled edge *j* will gradually open communication with port *e*, and, second, because the axial disposition of said port with respect to the movement of the valve will cause the latter to uncover the port gradually as the valve is advanced. By these means any desired degree of throttling action may be attained. When the valve has been advanced to the extreme limit of its forward throw, the annular port *e* is entirely opened and free communication is established between the inlet *b* and the outlet *b'*. It will thus be seen that by shifting the valve backward and forward through its various open positions the pressure may be throttled by any desired amount and the motor or engine may be operated at any desired speed. Should it be found desirable to lower the load, the engine or motor may be permitted to reverse by moving the valve *j* to a position to uncover the passage *g*, communicating with the exhaust, to establish communication between the exhaust and the outlet *b'* by way of annular ports *e* and *f* and the reduced portion *k* of the valve, as shown in Fig. 3. As the port *f* is also axially inclined, it will be apparent that any desired degree of throttling of the pressure between the motor and the exhaust may be accomplished by adjusting the position of the valve to cause the reduced portion *k* thereof to register to a greater or less extent with said inclined port *f*. It will thus be seen that by adjusting the valve through its various positions the pressure may be cut off entirely from the engine or motor, as in Fig. 1, may be admitted to the engine or motor with any degree of throttling, as in Fig. 2, or may be cut off between the supply and the motor and the fluid remaining in the motor and its connecting pipes permitted to escape at any desired rate of speed past the reduced portion *k* of the valve to the exhaust, as in Fig. 3, and thereby permit the engine or motor to turn backward at any desired speed.

What we claim is—

1. A throttle-valve, comprising a valve-casing provided with inlet, outlet and exhaust openings, an interior cylindrical valve-seat provided with an annular port in the inner walls thereof, communicating with the exhaust-opening of the casing, and a piston-valve having a reduced portion intermediate the ends thereof coöperating with said valve-seat, whereby communication may be established between the outlet and the exhaust openings of the casing, said annular port being inclined with respect to the axis of the valve to effect a gradual opening or closing of said port.

2. A throttle-valve, comprising a valve-casing provided with inlet, outlet and exhaust openings, an interior cylindrical valve-seat provided with annular ports in the inner walls thereof communicating with the exhaust and outlet openings, respectively, of the casing, and a piston-valve coöperating with said valve-seat, said valve having a reduced intermediate portion to establish communication between the outlet and exhaust openings of the casing by way of one of said annular ports, said annular ports being inclined to the axis of the valve to effect a gradual opening or closing of said ports.

3. A throttle-valve, comprising a valve-casing provided with inlet, outlet and exhaust openings, a cylindrical valve-seat in said casing open at both ends and having in the inner walls thereof axially-inclined ports communicating with the outlet and exhaust openings, respectively, and a valve slidably mounted in said seat adapted to establish a throttling connection past the end thereof between the inlet and outlet openings, and having a reduced intermediate portion adapted to establish a throttling connection between the outlet-opening and the exhaust-opening.

4. A throttle-valve, comprising a valve-casing provided with inlet, outlet and exhaust openings, a cylindrical valve-seat in said casing open at both ends and having in the inner walls thereof axially-inclined ports communicating with the outlet and exhaust openings, respectively, and a valve slidably mounted in said seat adapted to establish a throttling connection past the end thereof between the inlet and outlet openings, the end of said valve being chamfered to coöperate with the axially-inclined port communicating with the outlet-opening, said valve having a reduced intermediate portion adapted to establish a throttling connection between the outlet-opening and the exhaust-opening.

In testimony whereof we affix our signatures in presence of two witnesses.

WALTER FERRIS.
JEAN MARCH ALLEN.

Witnesses:
H. B. HAYDEN,
RIDGELY FLETCHER.