

No. 702,488.

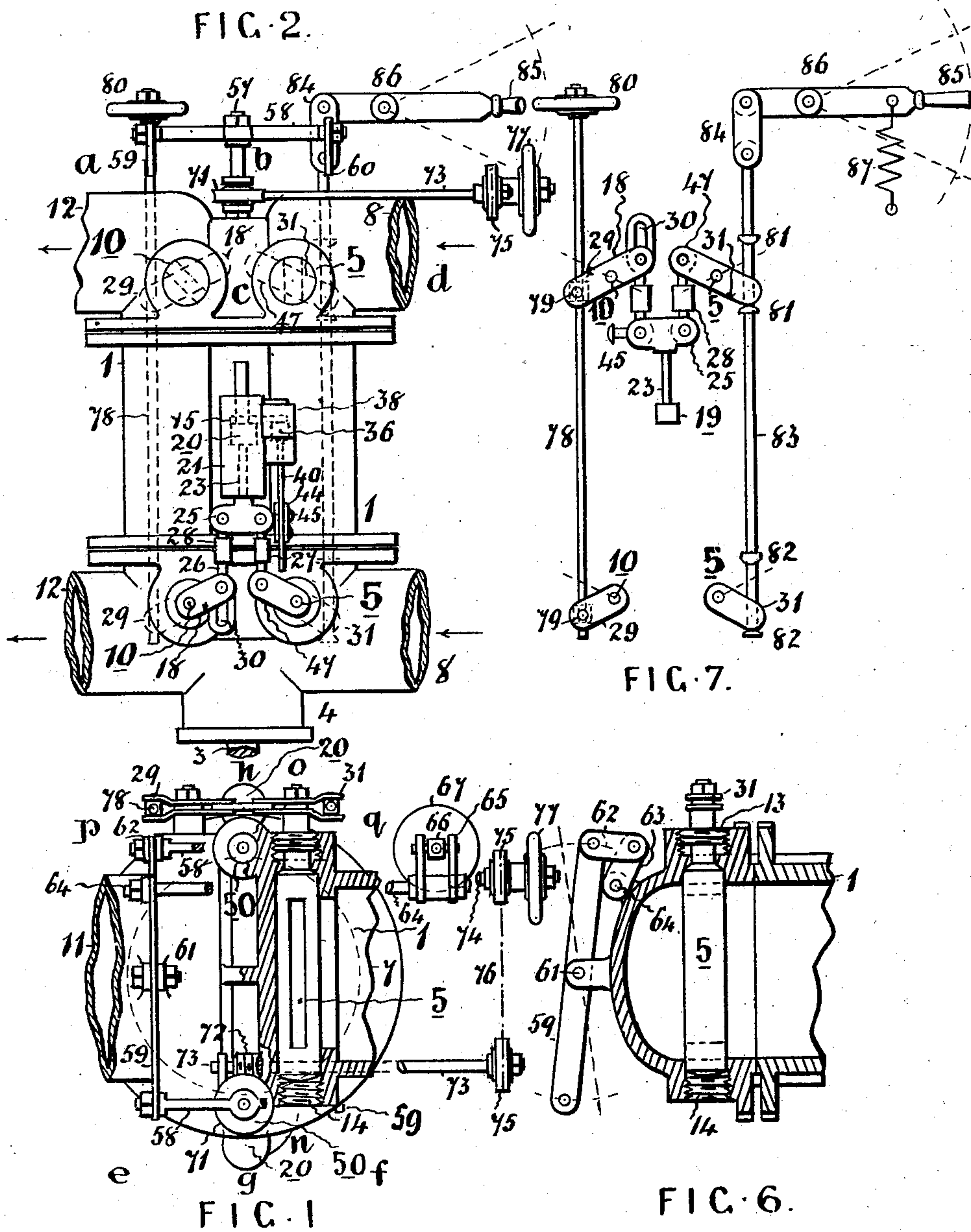
Patented June 17, 1902.

R. C. SAYER.
FLUID PRESSURE ENGINE.

(Application filed Apr. 20, 1900.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses.

Samuel Percival

Frederick Burnham

Inventor.

Robert Cooke Sayer

By his Attorneys.

Wheatley Mackenzie

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FIG. 3.

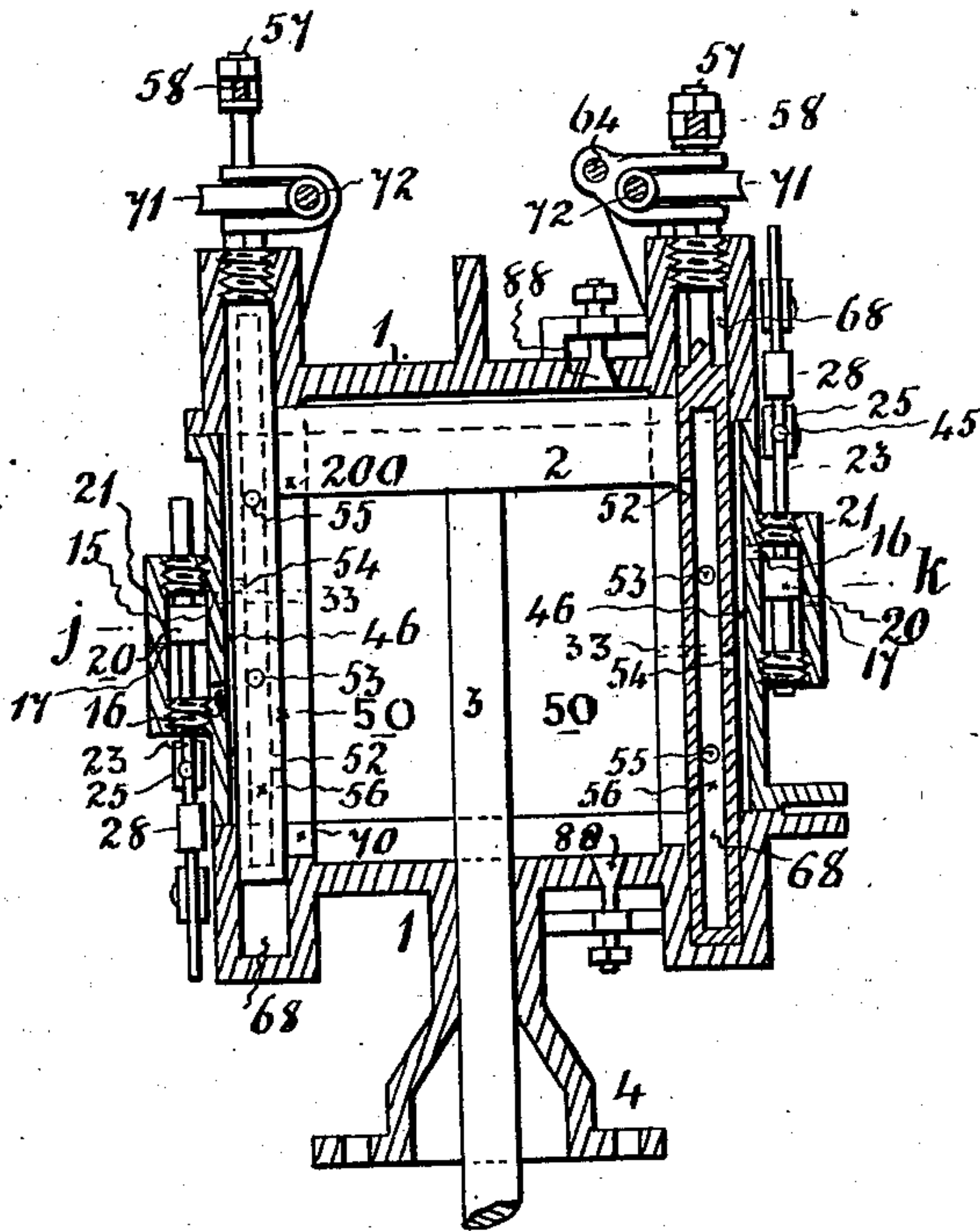


FIG. 4.

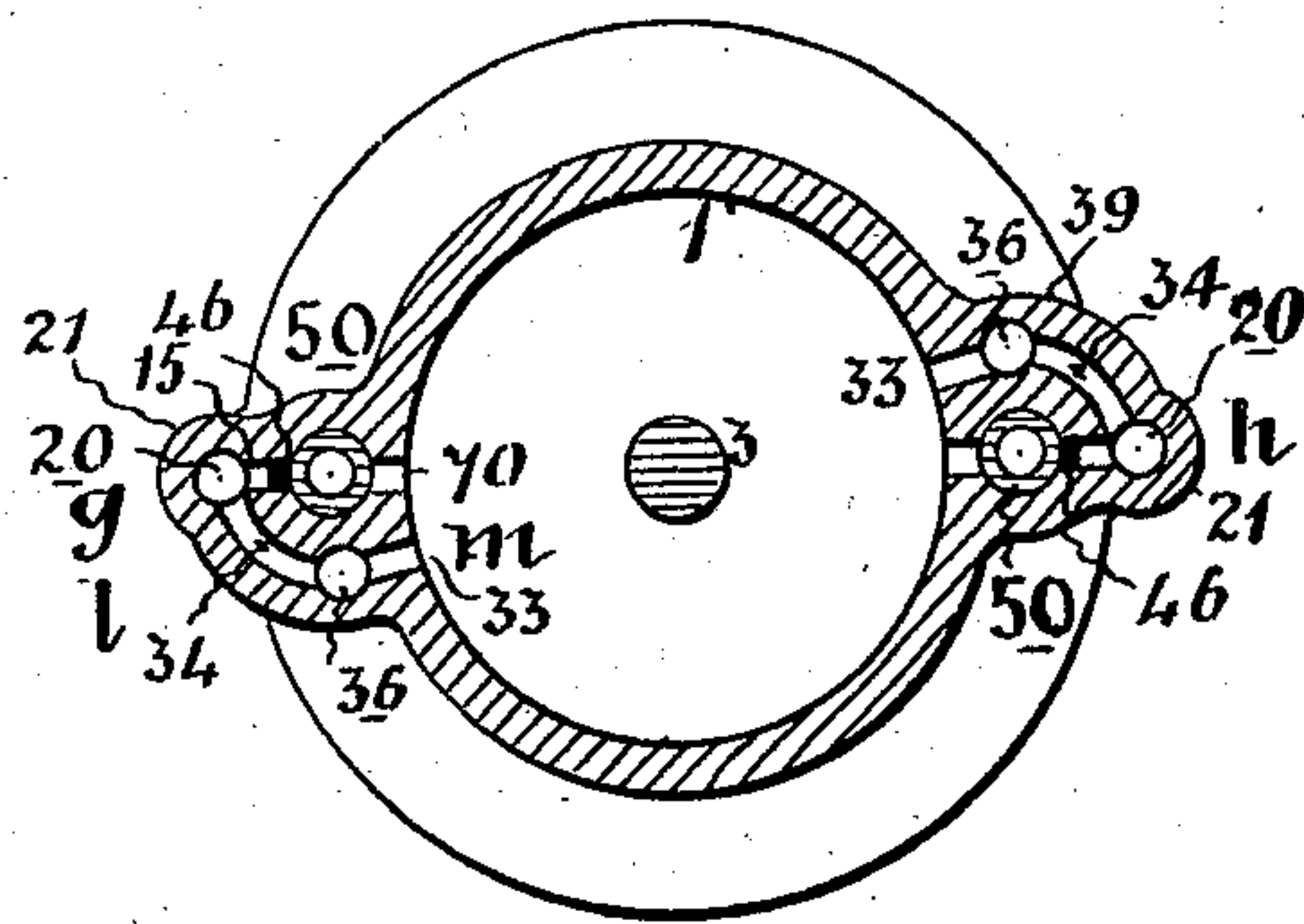
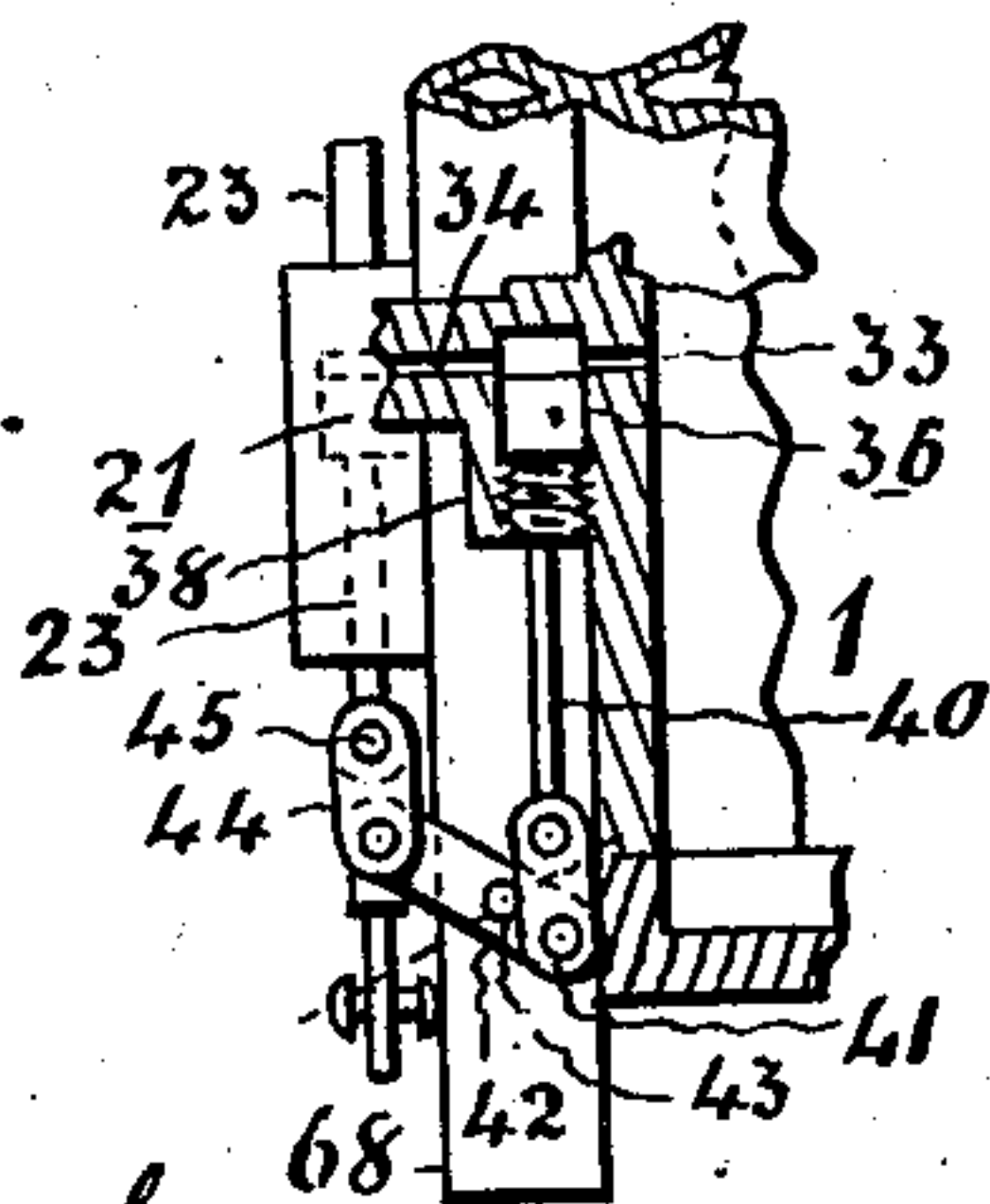


FIG. 5.



Witnesses.

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UNITED STATES PATENT OFFICE.

ROBERT COOKE SAYER, OF BRISTOL, ENGLAND.

FLUID-PRESSURE ENGINE.

SPECIFICATION forming part of Letters Patent No. 702,488, dated June 17, 1902.

Application filed April 20, 1900. Serial No. 13,659. (No model.)

To all whom it may concern:

Be it known that I, ROBERT COOKE SAYER, a subject of the Queen of Great Britain and Ireland, residing at 11 Clyde road, Redland, Bristol, in the county of Bristol, England, have invented certain new and useful Improvements in Fluid-Pressure Engines, (for which I have made application for patent in Great Britain, No. 19,809, dated October 3, 1899;) and I 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.

This invention has for its object to work the pistons of pressure-engines with pressure "cut-off" to expand at any point of its stroke by valves actuated by its own pressure.

In the accompanying two sheets of illustrative drawings, Figure 1 is a sectional plan at *a b c d* on Fig. 2; Fig. 2, an elevation at *e f* on Fig. 1; Fig. 3, a section at *g h* on Figs. 1 and 4; Fig. 4, a section at *j k* on Fig. 3; Fig. 5, a section at *l m* on Fig. 4; Fig. 6, in part, a section at *n o* on Fig. 1; Fig. 7, an elevation of valve-levers at *p q* on Fig. 1.

The cylinder 1 is provided at each end with a main supply-valve 5 and pipe 8 and main exhaust-valve 10 and pipe 12. It is also provided with two valve-cylinders 68, extending the whole length and communicating with the main cylinder 1 by the longitudinal grooves 70 and with the valve-cylinders 21 by the grooves 46 and ports 16. Working in each valve-cylinder 68 is a hollow valve 50, having ports 52 53 54 55 or more, arranged helically around the valve, so that as the valve is rotated its interior is successively put into communication with the groove 70 at different parts of its length, while one port always puts it into communication with the groove 46, and thus with one end of the valve-cylinder 21. The piston 2 is provided with side extensions 200, that extend to and slide over the valve 50. As the piston makes its stroke the extension 200 passes that port in communication with the groove 70, and steam is admitted to the hollow valve, and thus to the valve-cylinder 21, to cut off the supply. The valve 50 is also arranged to slide longitudinally to still further vary the point of cut-off. Each valve-cylinder 21 is provided with a

central exhaust-port 17 and with a port 15, situated at the opposite end to the port 16 and communicating with the main cylinder by the passage 34 and port 33, situated at such a distance from the end of the cylinder to allow the pressure admitted when it is uncovered to effect the necessary motions to reverse the direction of stroke. The piston 20 of each valve-cylinder 21 is directly connected to one main supply-valve 5 and by slotted connections 30 to both exhaust-valves, so that when the piston 20 is operated by pressure from the port 33 the exhaust-valve at one end is closed, the supply-valve at the same end is opened, the exhaust-valve at the other end is opened, and the passage from the port 33 is closed. When the piston 20 is operated in the other direction from the cut-off port 52, 53, 54, or 55, the supply is closed and the passage from the port 33 is opened. Slide-valves 36, that open and close the passages 34, are operated from the pistons 20.

Each piston 20 is connected by a rod 23 to a cross-head 25, directly connected by adjustable links 27 to a lever 47 on the main supply-valve 5, here shown as a vibrating plug-valve. It is also connected by the adjustable slotted link 26 to a lever 18 on the exhaust-valve at the same end of the cylinder, and the levers 29 of the two exhaust-valves are connected together by the links 78, so as to be operated together. The cross-head 25 is also connected, Fig. 5, by the link 44, lever 42, centering at 43, and link 41 and rod 40 to the valve 36.

The valves 50 are connected to be rotated simultaneously by worm-wheels 71, worms 72, shafts 73, chain-gearing 75 76, connecting the shafts 73, and hand-wheel 77. The valves 50 are arranged to be slid longitudinally together from the handle-wheel 67, Fig. 1, on a screwed shaft, nuts 66, working on the screws, arms 65, shafts 64, arms 63, links 62, levers 59, and cross-heads 58, fixed on the valve-spindles 57.

The working is as follows: Supposing the parts to be in the position shown in Fig. 3, the upper supply-valve and the lower exhaust open, the piston 2 descends, and when it has descended below the port 52 the pressure enters the right-hand valve 50 and by ports 54 and 16, the upper end of the cylinder 21.

The piston 20 is forced to descend and lowers the cross-head 25. The cross-head 25 closes the supply-valve 5 at the top of the cylinder, the slotted link 26 not operating the exhaust-
 5 valves, and the slide 36 opens the passage for the port 33 on the right-hand side. When the piston descends below the port 33 on the left-hand side, the piston 20 on that side is lowered and lowers its cross-head 25, and
 10 thus closes the lower exhaust-valve and opens the upper exhaust-valve and then opens the main supply-valve and closes the passage leading from the port 33 on the right-hand side.

15 The link 78 is provided with right and left hand screws working in nuts 79, pivoted to the exhaust-valve levers 29, so that by turning the handle 80 both exhaust-valves can be closed. The cylinder 1 is also provided at
 20 its ends with air-inlet valves 88. To stop the engine, both exhaust-valves are closed, air being drawn in through the valves 88 and compressed.

The engine will run in either direction, and
 25 in order to start it in the required direction levers 31 are attached to the supply-valves 5, and the proper valve 5 can be operated by means of the hand-lever 85, connected by links 84 to the rod 83, provided with stops 81
 30 82 and spring 87.

What I claim, and desire to secure by Letters Patent, is—

1. A main cylinder provided with longitudinal slots, a piston with extensions working
 35 in the slots, main supply and exhaust valves, valve-cylinders extending the length of the cylinder and communicating with the slots, valves in the valve-cylinders having helically-arranged ports, valve-operating cylinders
 40 communicating with the valve-cylinder and with the main cylinder, supplementary valves controlling the communications between the valve-operating cylinders and the main cyl-

inder, pistons in the valve-operating cylinders and mechanisms for connecting the pistons
 45 in the valve-operating cylinders to the main supply and exhaust valves and the supplementary valves, substantially as described.

2. In an engine in which the cut-off is determined by the position of a port opening
 50 into the cylinder, a cylinder having a longitudinal slot, a valve-cylinder extending the length of the cylinder and communicating with the slot, a valve in the valve-cylinder having helically-arranged ports, and mech-
 55 anism for rotating the valve to bring the required port in communication with the slot, substantially as described.

3. In an engine in which the cut-off is determined by the position of a port opening
 60 into the cylinder, a cylinder having a longitudinal slot, a valve-cylinder extending the length of the cylinder and communicating with the slot, a valve in the valve-cylinder having helically-arranged ports, and mech-
 65 anism for sliding the valve in the valve-cylinder substantially as described.

4. A main cylinder provided with a port situated so that the piston passes it at the desired point of cut-off, a valve-operating cyl-
 70 inder communicating at one end by a passage with the cut-off port, and at the other end by another passage with a port situated so that the piston passes it near the end of its stroke, a valve in this second passage, a
 75 piston in the valve-operating cylinder, main supply and exhaust valves and mechanism connecting the valve-operating piston with the valves, substantially as described.

In testimony whereof I have affixed my sig-
 80 nature in presence of two witnesses.

ROBERT COOKE SAYER.

Witnesses:

LIONEL A. WILSON,
 CHARLES E. RICKETTS.