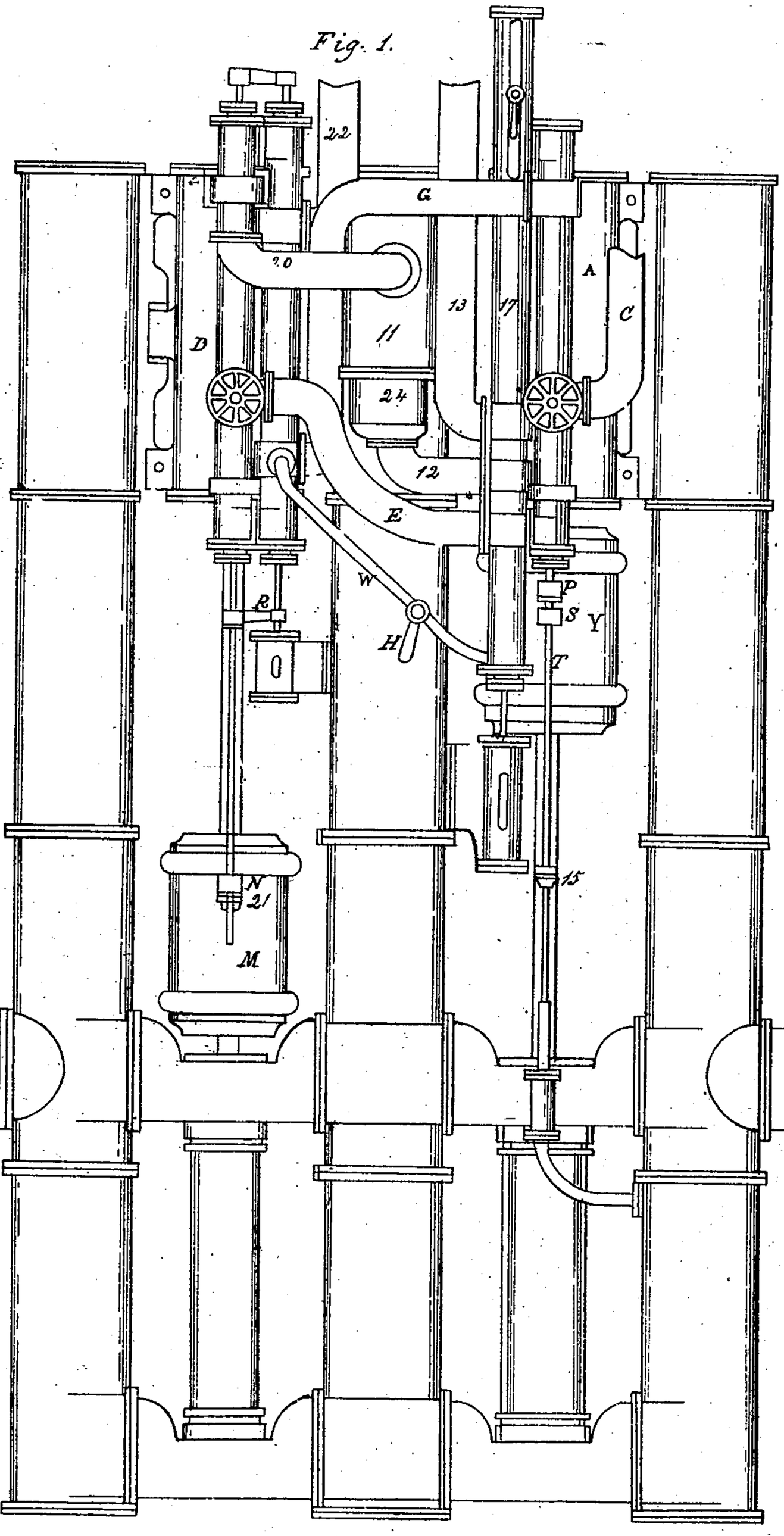
Sheet 1 - 2 Sheets.

J. L. Lowry
Steam-Engine

No 75283

Patented Mar. 10, 1868.

Fig. 1.



Witnesses.
Robt. T. Ford
Thos. Lowry

Inventor.
Joseph L. Lowry

J. L. Lowry

Steam-Engine.

2 Sheets. Sheet 2

No 75283 Patented Mar. 10, 1868.

Fig. 2.

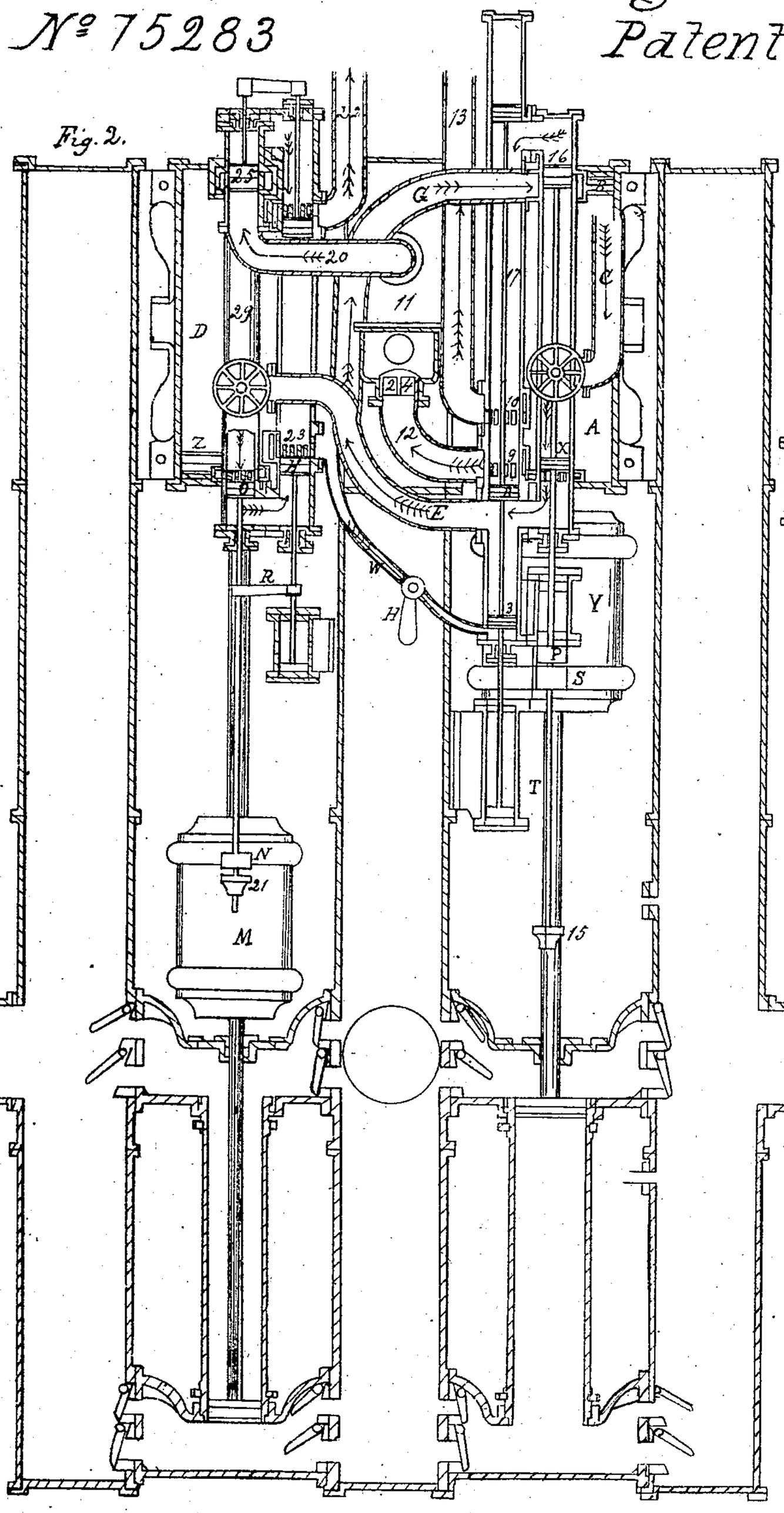
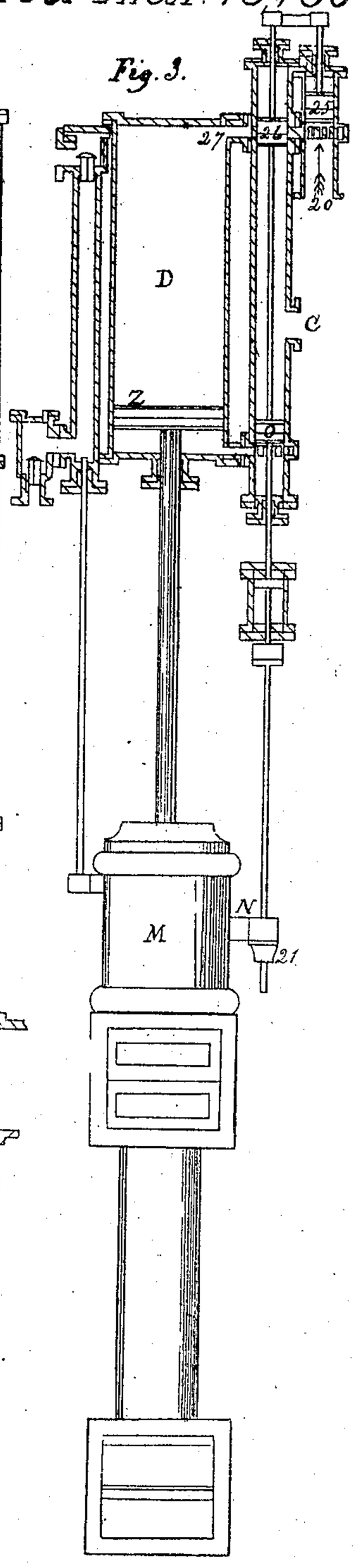


Fig. 3.



Witnesses.
Robt. L. Ford
Thos. Lowry.

Inventor
Joseph L. Lowry

United States Patent Office.

JOSEPH L. LOWRY, OF PITTSBURG, PENNSYLVANIA.

Letters Patent No. 75,283, *dated March* 10, 1868; *antedated February* 20, 1868.

IMPROVEMENT IN STEAM-ENGINES.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, JOSEPH L. LOWRY, of Pittsburg, in the county of Allegheny, and State of Pennsylvania, have invented a new and improved Method of Working Steam in Engines; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings forming part of this specification, and to the letters of reference marked thereon.

The nature of my invention consists in so combining the cylinders of two vertical pumping-engines and a steam-reservoir as that the steam, after acting against the under side of the piston in the first engine, sufficient to drive it to the top of its cylinder, is then shut off and allowed to pass into and raise the piston of the second cylinder. All communication between the lower part of the cylinders being now closed, the steam under the piston in the second cylinder is allowed to pass above the piston of the first cylinder. Simultaneously with the passage of the steam from below the piston of the second cylinder to the upper part of the first cylinder, the steam under the piston of the first cylinder passes into a reservoir communicating with the upper part of the second cylinder until the pressure in the reservoir is equal to that remaining in the lower part of the first cylinder. The passage is then closed and the balance of the steam under the piston of the first engine allowed to escape. All resistance to the downward movement of the piston in the first cylinder being removed, the steam from the lower part of the second cylinder expands and forces it down. On the completion of the stroke of this piston, the steam in the upper part of the first engine and the lower part of the second cylinder escapes. Pressure from beneath the piston in the second cylinder being removed, the steam from the reservoir acts by expansion and forces it down. The connection is then cut off, retaining a portion of the steam in the reservoir, while the steam that forced down the second piston is allowed to escape, thus completing the up and down stroke of both engines.

To enable others to understand and use my invention, I will proceed to more particularly describe the operation, by reference to the accompanying drawings, wherein—

Figure 1 represents a front elevation of two pumping-engines.

Figure 2 is a vertical section of the same.

Figure 3 represents a transverse vertical section of one of the engines.

All the drawings are lettered, and similar letters denote corresponding parts in the several views.

To carry out my invention, I combine two ordinary pumping-engines, having a reservoir connected with their cylinders by means of pipes and valves in such a manner that the steam, in its passage from the boiler, enters the lower part of cylinder A, through the supply-pipe C, and lifts the piston B to the top, when the tappet S, on the heavy weight Y, strikes against the catch P, on the long rod T, and opens the valve *x*, which allows a portion of the steam to escape from under the piston B, through the pipe E, beneath the piston Z, in the second cylinder D, precisely in the same manner that the steam passed from the boiler into the first, raising, by expansion, the piston Z in the second cylinder D. At this instant the tappet N on the heavy weight M strikes against the tappet R and moves the valves O above its ports K, above the ports 23, and allows the greater part of the steam below the piston in the cylinder D to pass through pipe G into the cylinder A above the piston B. A portion of the steam which passed the ports 23 is conducted by the small pipe W underneath a small piston, 3, in side-pipe 17, which raises said piston, carrying with it the valve 8 above the ports 9, and permits a portion of the steam to pass through the pipe 12 into the reservoir 11, where it is held in reserve by the check-valve 24. The valve 8, by reason of the pressure of steam beneath the small piston 3, rises until the valve 8 passes the openings 10, which allows the balance of steam to escape through pipe 13, enabling that passing through pipe G to force down the piston in cylinder A, when the tappet S, on the heavy weight Y, strikes against the catch 15 on the valve-rod T, thereby drawing down the exhaust-valve 16 and induction-valve *x*, allowing the steam under the piston Z in the cylinder D to escape through pipe G, and simultaneously therewith the steam from above the piston B in the cylinder A to pass through the ports 16 and pipe 17, pressing down the valves 8 and piston 3, which permits the steam to pass through the ports 10 and out through the exhaust-pipe 13. The valve *x* having been drawn below its ports, the steam from the boiler rushes in below the piston B preparatory to the upward stroke. At this instant the reserved steam in the reservoir 11 passes

through pipe 20, lifting valve 25, entering the upper end of cylinder D, and presses down piston Z by force of expansion.

When the tappet N on the heavy weight strikes against the catch 21, drawing down the valves O, 26, and 25, shown in fig. 3, the steam from the reservoir 11 is cut off by valve 25, being carried below its ports in the side-pipe 20, while the valve 26 is also carried down, opening the ports 27 and allowing the steam to pass down pipe 23, so as to force down the valve 28 below its ports, enabling the steam to escape through the exhaust-pipe 22, the valve O being at the same time drawn down below its ports to admit steam from cylinder A preparatory to the upward stroke of engine D. The pistons in the cylinders *a* and *d*, having completed their up and down strokes, are in position to repeat their upward stroke.

Either engine can be worked separately, if required, but when working together the pistons move in the following order: The piston in the first cylinder ascends and the piston in the second cylinder descends at the same time, but the piston in the second cylinder ascends and the piston in the first cylinder descends separately, each waiting until the other has completed its stroke. The steam being admitted from the boiler into the first cylinder, raises the piston with its load to the upper end of the cylinder. The piston now rests until the steam expands from under it into the second cylinder, and, forcing the piston, with its load, to the upper end of the second cylinder, it now rests in turn until the steam in the second cylinder expands back into the first cylinder above the piston, pressing it down to the lower end of the cylinder, where it first started from. The steam from the boiler, as in the former stroke, forces the first piston up to the upper end of its stroke, and at the same time the steam in the reservoir expands into the second cylinder above the piston, forcing it down to the lower end of its stroke. The first engine receiving its motive-power from the boiler on its upward stroke, and second engine receiving its motive-power from the reservoir on the downward stroke, are not required to wait on each other, but the second engine receiving its motive-power on its upward stroke from the exhaust-steam of the first engine, has to wait until the first piston has completed its stroke, and in like manner the motive-power for the descending stroke of the first engine is received from the exhaust-steam of the second engine, so that it, in turn, has to wait until the upward stroke of the second engine is completed.

Having described the construction and movement of the engine, I will now state what is the benefit or gain of my improvement. For an example, the first cylinder being of sufficient area that steam, one hundred pounds to the square inch, when admitted into the cylinder under the piston, will raise the piston to the upper end of the cylinder with a load equal to fifty tons, instead of exhausting the steam as worthless, as is done by the common engines, the steam is expanded under the second piston, exerting a force of one hundred pounds to the square inch. As the piston ascends, the pressure of the steam decreases, until, at the end of the stroke, the pressure will have fallen to fifty pounds to the inch, the average pressure throughout the stroke being seventy-five pounds, sufficient pressure to raise thirty-seven tons. There being fifty pounds' pressure of steam remaining in the first cylinder, after having filled the second cylinder, this steam in the first cylinder is expanded into the reservoir, charging it to twenty-five pounds' pressure. The balance of the steam is then exhausted. The steam now in the second cylinder is exhausted at a pressure of fifty pounds back into the first cylinder above the piston, forcing it down at first with fifty pounds' pressure, gradually decreasing, until, at the end of the stroke, there are but twenty-five pounds to the inch, giving an average pressure of thirty-seven pounds to the square inch on the piston, equal to eighteen and a half tons, which, added to the thirty-seven already gained, make fifty-five and a half tons gained. The steam from the reservoir expands with a pressure of twenty-five pounds into the upper end of the second cylinder above the piston, forcing it down, the steam gradually decreasing, till, at the end of the stroke, the pressure has fallen to twelve and a half pounds, the average pressure on the piston being about eighteen and a half pounds, but the cut-off valve in the reservoir reserves the steam at the end of each stroke, so that for the first four strokes the pressure gradually rises until the fifth stroke, when the pressure ceases to rise higher, being a pressure of thirty-four pounds, and falling to seventeen pounds at the end of the stroke, giving an average pressure of twenty-five pounds, or equal to twelve and a half tons, which, added to the fifty-five and a half tons already gained, make a gain of sixty-eight tons, the whole duty performed being one hundred and eighteen tons, whereas the engines in common use will give but fifty tons duty with the same steam or fuel.

Another arrangement of the same principle will produce somewhat more favorable results, but cost double. Take four cylinders of equal size, and of sufficient area, that with one hundred pounds' pressure to the square inch, will raise fifty tons, the steam being admitted under the first piston will raise it to the end of its stroke, with its load of fifty tons. The steam is then exhausted into the second cylinder under the piston raising it, the steam acting with a pressure of one hundred pounds at first, and as the piston ascends the steam decreases in pressure, till, at the end of the stroke, it has fallen to fifty pounds, the average pressure being seventy-five pounds, sufficient to raise thirty-seven tons. The steam is now admitted under the piston of the third cylinder, the steam acting at first with a pressure of fifty pounds, and decreases as the piston ascends, till, at the end of the stroke, the steam has fallen to thirty-three pounds to the square inch. The average pressure throughout the stroke is forty-one and a half pounds, equal to twenty and a half tons. The steam is now admitted under the piston of the fourth cylinder. The steam acts at first with a pressure of thirty-three pounds. As the piston ascends the pressure decreases, until, at the end of the stroke, the pressure has fallen to twenty-five pounds, the average pressure being twenty-nine and a half pounds, equal to fourteen and a half tons. The whole duty performed or weight raised is one hundred and twenty-two tons. Or the same principle can be worked in a single cylinder by arranging the engine, that, the steam being cut off, say at one-fourth the stroke, the piston shall gain leverage over the pump-head or duty to be performed in proportion as the steam in the cylinder decreases in power by expansion; my object being that the steam, when admitted into the cylinder, shall be taxed with

all the duty that it has power to perform, and that as the steam becomes weakened by expansion the load to be raised or duty to be performed shall be correspondingly decreased until all the elastic power in the steam has been spent.

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

An arrangement of the cylinders, valves, and passages for the steam, by which I am enabled to use the steam alternately below and above the piston, substantially as herein described.

I also claim, in combination with the above-described arrangement, the reservoir for the reception of steam from the first and primary cylinder, substantially as herein described.

JOSEPH L. LOWRY.

Witnesses:

ROBT. T. FORD,

THOS. LOWRY.