

No. 771,551.

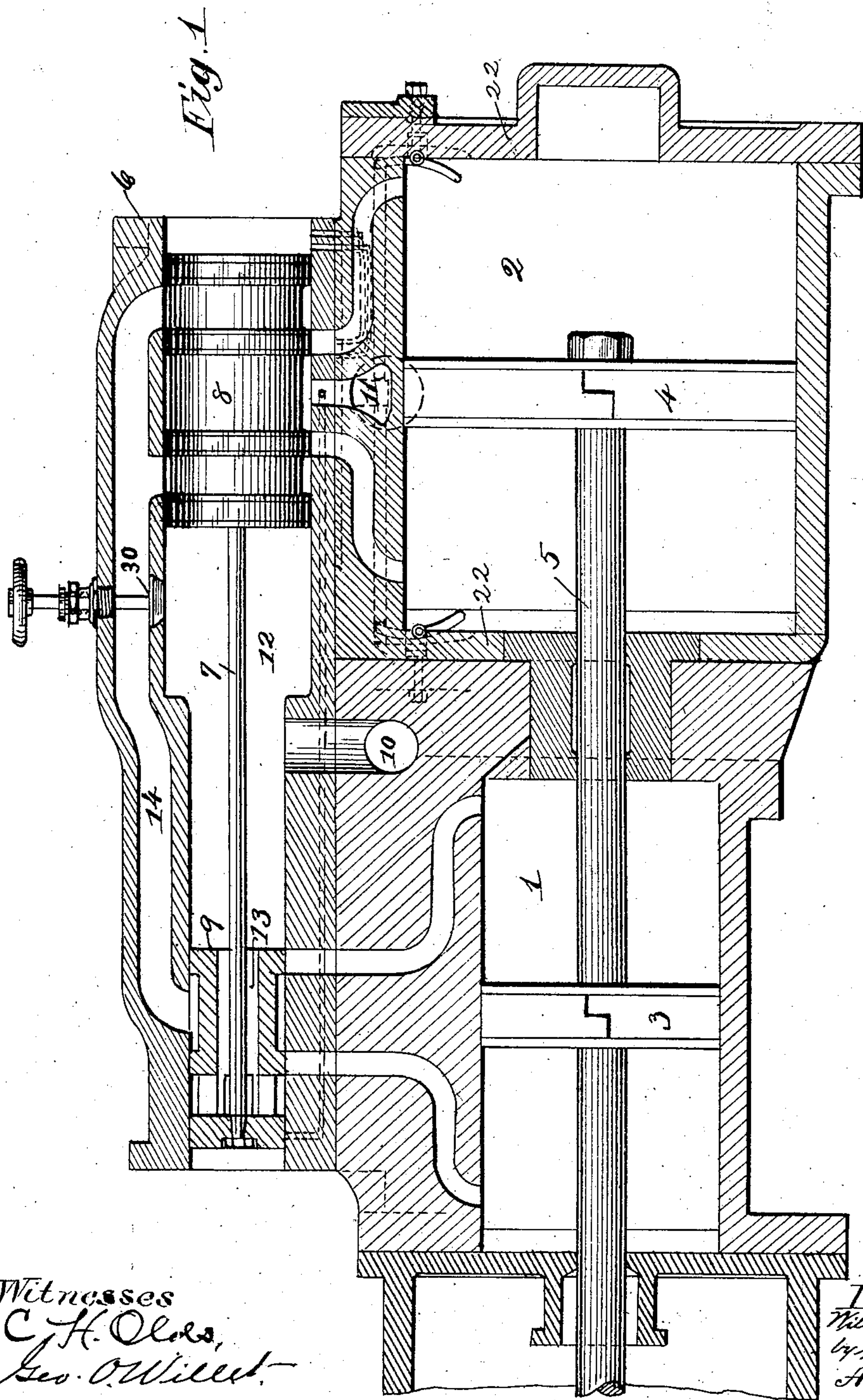
PATENTED OCT. 4, 1904.

W. H. HUGHES.
STEAM EXPANSION ENGINE.

APPLICATION FILED JAN. 2, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



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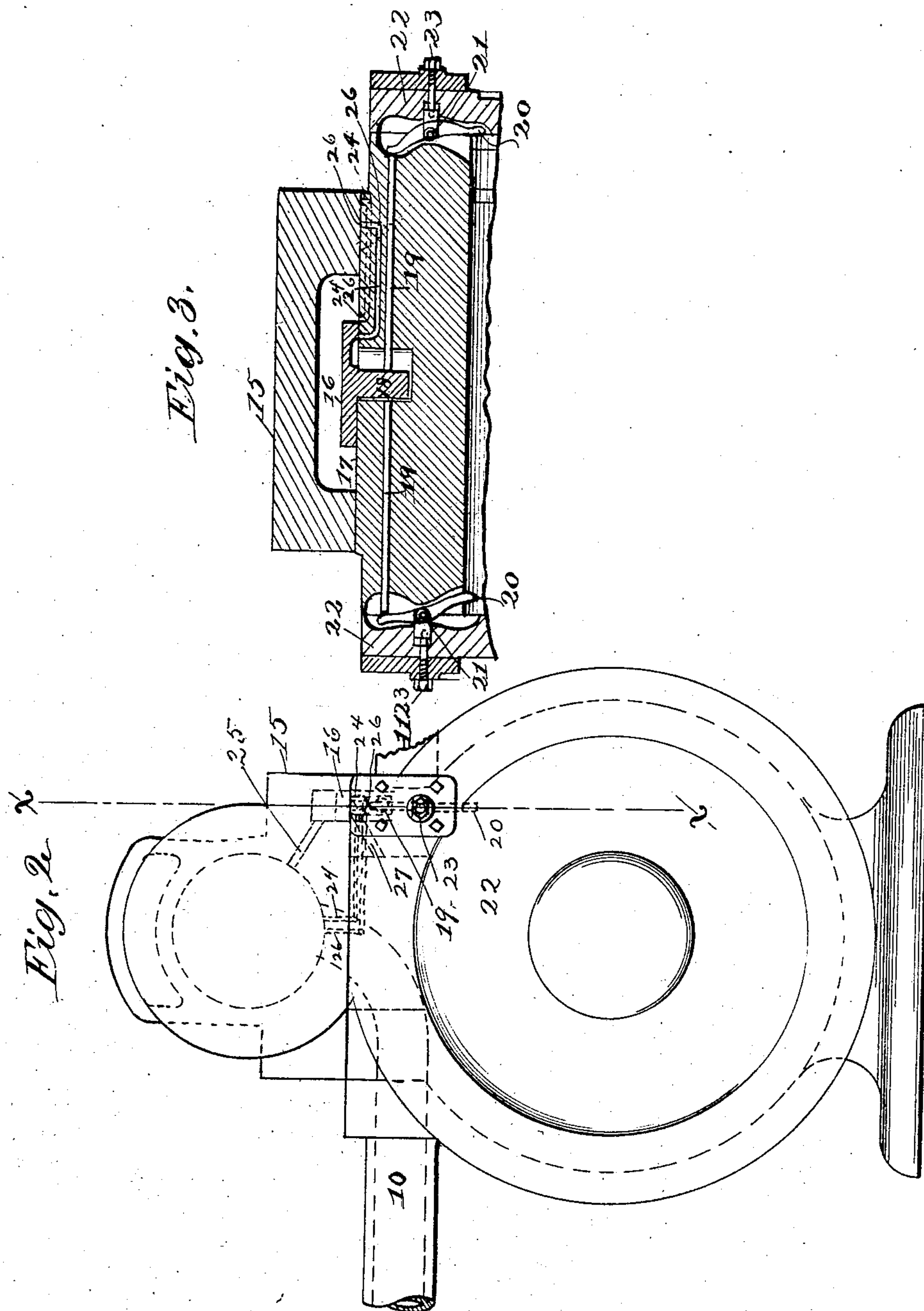
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Witnesses
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UNITED STATES PATENT OFFICE.

WILLIAM H. HUGHES, OF CLEVELAND, OHIO.

STEAM-EXPANSION ENGINE.

SPECIFICATION forming part of Letters Patent No. 771,551, dated October 4, 1904.

Application filed January 2, 1903. Serial No. 137,469. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. HUGHES, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, State of Ohio, have invented certain new and useful Improvements in Valve-Movements for Steam-Expansion Engines, of which I hereby declare the following to be a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in non-balanced cylinder-valves for tandem and other compound engines in which the steam is used expansively; and the objects of the invention are to provide in connection with the valve automatic means for operating it as soon as the live steam is admitted to the engine.

The invention also has reference to means for employing the larger cylinder as a high-pressure engine. This portion of the device is useful when a greater power is desired than the normal capacity of the engine or when starting and the small ports are cold and likely to congeal the steam.

My invention consists in the combination and arrangement of the various parts and construction of details, as hereinafter described, shown in the accompanying drawings, and specifically pointed out in the claims.

In the accompanying drawings, Figure 1 is a central longitudinal vertical section through high and low pressure cylinders and valve-chamber, showing live and exhaust steam ports. Fig. 2 is a rear elevation of the engine and valve-chamber, showing valve-operating mechanism. Fig. 3 is a longitudinal central section of the accessory or starting valve and operating mechanism therefor, which is engaged by the piston of the large or low-pressure cylinder.

In the views, 1 is the live-steam or high-pressure cylinder; 2, the large or low-pressure cylinder.

3 and 4 are the pistons in the respective cylinders.

5 is the common piston-rod.

6 is the valve-chamber. 7 is a valve-stem therein, at one end of which is the cylinder-

valve 8, which regulates the entrance of expanded steam to the low-pressure cylinder and the exhaust therefrom, and at the other end is the smaller cylinder-valve 9, which regulates the admission of live steam to the high-pressure cylinder and exhaust therefrom.

10 is the live-steam-admission pipe; 11, the pipe through which the steam is exhausted from the engine.

12 is an intermediate valve-chamber into which the live steam is first admitted.

13 is a central passage in the valve to the high-pressure cylinder through which the live steam is admitted thereto.

14 is a longitudinal passage on the back of the chamber through which the exhaust from the high-pressure cylinder is admitted to the low-pressure cylinder.

15 is an auxiliary or starting valve chamber in which is a small slide-valve 16, moving upon a seat 17. From this valve depends the pin or lug 18, which is engaged by the rods 19, which pass longitudinally through the seat 17 and are in contact at their outer extremities with rock-arms 20, pivoted on bearings 21, adjustably secured in the cylinder-heads 22 by means of screws 23. The lower extremities of these rock-arms are alternately thrown in and out by the piston, which strikes them at each limit of its stroke, thus moving the auxiliary valve backward and forward on its seat and opening and closing the live-steam and exhaust passages leading to the rear of the large cylinder-valve, as shown in the figures, where 24 is the live-steam passage in the seat of the auxiliary valve and 25 is the live-steam passage leading from the main-valve chamber to the auxiliary chamber. Again, 26 is the exhaust-steam passage in the valve-seat, and 27 is the exhaust-passage to the low-pressure cylinder. The exact location of the passages in the valve-seat and cylinder is unimportant; but they may be represented as in Fig. 2 in dotted lines.

The action of the device may be described as follows: When live steam is admitted to the main-valve chamber, (supposing the auxiliary valve to be in the position as shown in Fig 3 and both pistons at the rear ends of

their respective cylinders,) the steam will enter the auxiliary-valve chamber through the passage 25, and thence through the passage 24 in the valve-seat the steam will enter the main-valve chamber behind the large cylindrical valve. The large end of the valve being then balanced by steam on both sides, the pressure on the small cylinder-valve will drive it forward until both the live-steam ports are opened to the cylinders and steam is admitted behind the pistons and both of the engine-exhaust ports are opened, when the pistons will move forward in the cylinders until the rock-arm at the forward end of the low-pressure cylinder is struck by the piston therein. This will move back the auxiliary valve, opening the exhaust-passage behind the large cylinder-valve, and the difference in pressure between the cylinder ends of the main valve will return the valve and admit live steam in front of the pistons while opening the exhaust freely therefrom. The cylinder-valves are thus automatically thrown at each end of the piston-stroke, thus making the operation positive, simple, and efficient, as well as automatic. When it is desired to use a sudden increase of power, the large cylinder can be transformed into a high-pressure cylinder without alteration of any of the parts by merely raising the valve from its seat in the main-valve chamber, thus admitting live steam directly into the passage leading to the larger valve and steam ports of the large cylinder. This valve is shown in Fig. 1 at 30. When this has been done, live steam will be admitted to both the live and exhaust ports of the high-pressure cylinder simultaneously, thus balancing it so that it moves without excess of pressure on either side.

The advantages of this form of pump are obvious where it is exposed to rough uses, such as a sinking or mining pump, where it may be covered by a fall of rock or struck by a blast, since all working parts are inclosed and are lubricated by the cylinders, so that the pump is almost indestructible.

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

1. In combination, in an expansion-engine provided with tandem high and low pressure cylinders and live-steam and exhaust ports therefor, of a valve-chamber connecting said cylinder-ports, a valve-stem and cylindrical valves therein, the valve for the high-pressure cylinder being smaller than the valve for the low-pressure cylinder, a steam-admission opening into the chamber between the valves,

a central opening and a port at one end of the smaller valve for live steam, an exhaust-passage leading from said valve to the larger valve, and means for automatically moving said valve to admit the live steam to the ports of the engine-cylinders, and to exhaust therefrom, comprising an auxiliary valve-chamber, and passage for live and exhaust steam controlled by the said valve-opening in said main valve-chamber behind the larger valve, substantially as described.

2. In combination in an automatic engine, high and low pressure cylinders, provided with steam and exhaust ports, and a valve-seat for each cylinder, a cylinder-valve for each cylinder, and valve-stem connecting the valves, the valve for the high-pressure cylinder being of less sectional area than the valve for the low-pressure cylinder, a valve-chamber continuous between the valves, a live-steam-admission opening in said chamber between the valves, an exhaust-passage leading from the smaller valve to the larger valve, a live-steam passage in the smaller valve opening into the inter-valve chamber, live-steam and exhaust passages opening into the valve-chambers behind the larger valve, and means for automatically opening and closing said passages to operate said valves consisting of, an auxiliary valve and chamber, and mechanism operated by the piston of the low-pressure cylinder at each limit of its stroke to reciprocate said valve, substantially as described.

3. The combination with high and low pressure cylinders, of cylinder-valves therefor, the high-pressure valve being smaller than the low-pressure valve; a stem connecting said valves whereby they move in unison, a continuous valve-chamber between the valves, a live-steam passage through the smaller valve, an exhaust-passage leading from the smaller cylinder to the larger one, live and exhaust steam passages behind the large valve; automatic mechanism adapted to open and close said passages, operated by the piston of one of the engine-cylinders, and means for introducing live steam directly to the large valve, consisting of a stop-valve in the exhaust-port connecting the large and small valves, whereby live steam will be admitted to both sides of the small valve, substantially as described.

In testimony whereof I hereunto set my hand this 27th day of December, 1902.

WILLIAM H. HUGHES.

Witnesses:

WM. M. MONROE,
GEO. O. WILLET.