

No. 684,019.

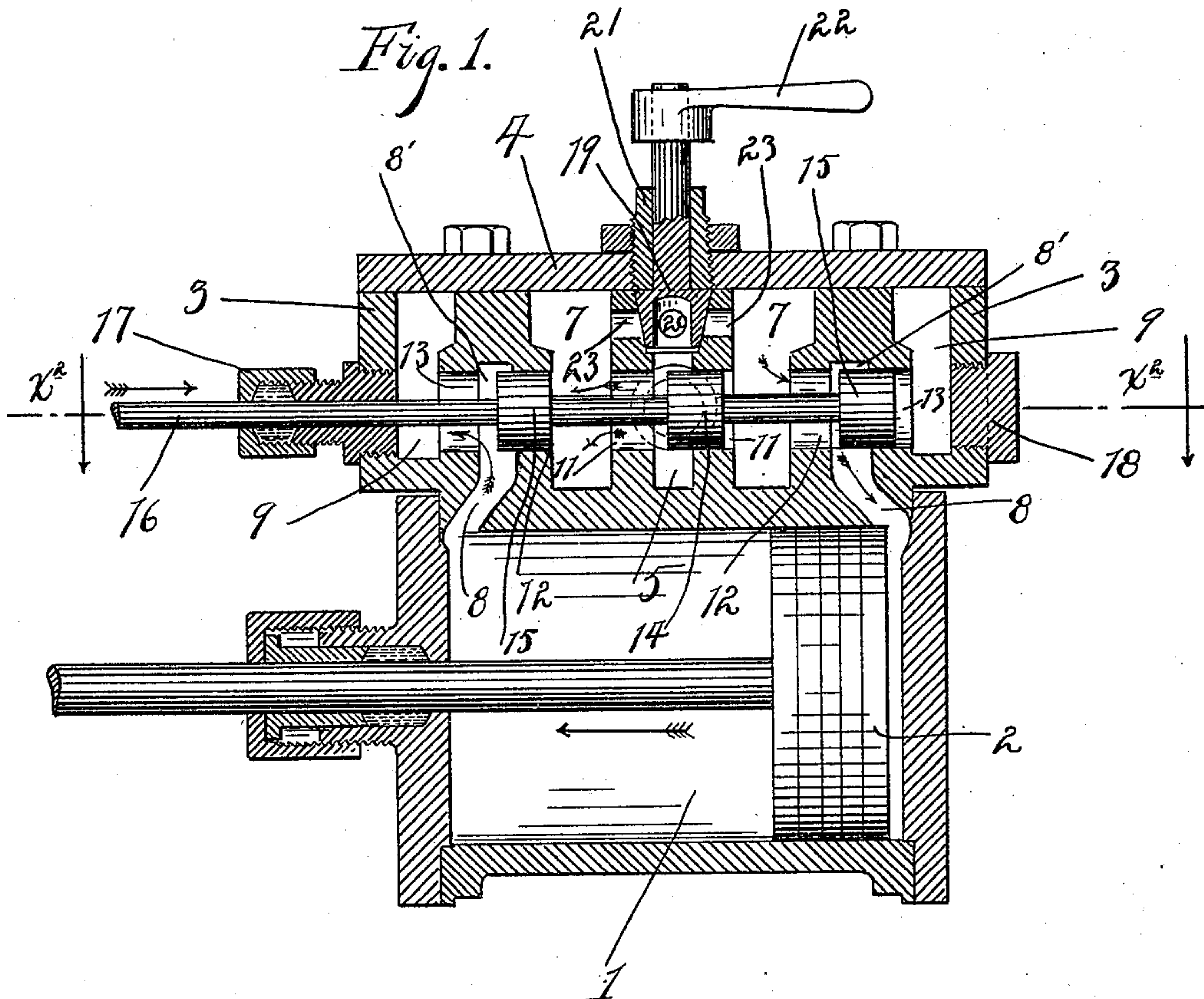
Patented Oct. 8, 1901.

I. W. WEPPL0.
STEAM ENGINE.

(Application filed Feb. 16, 1901.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses

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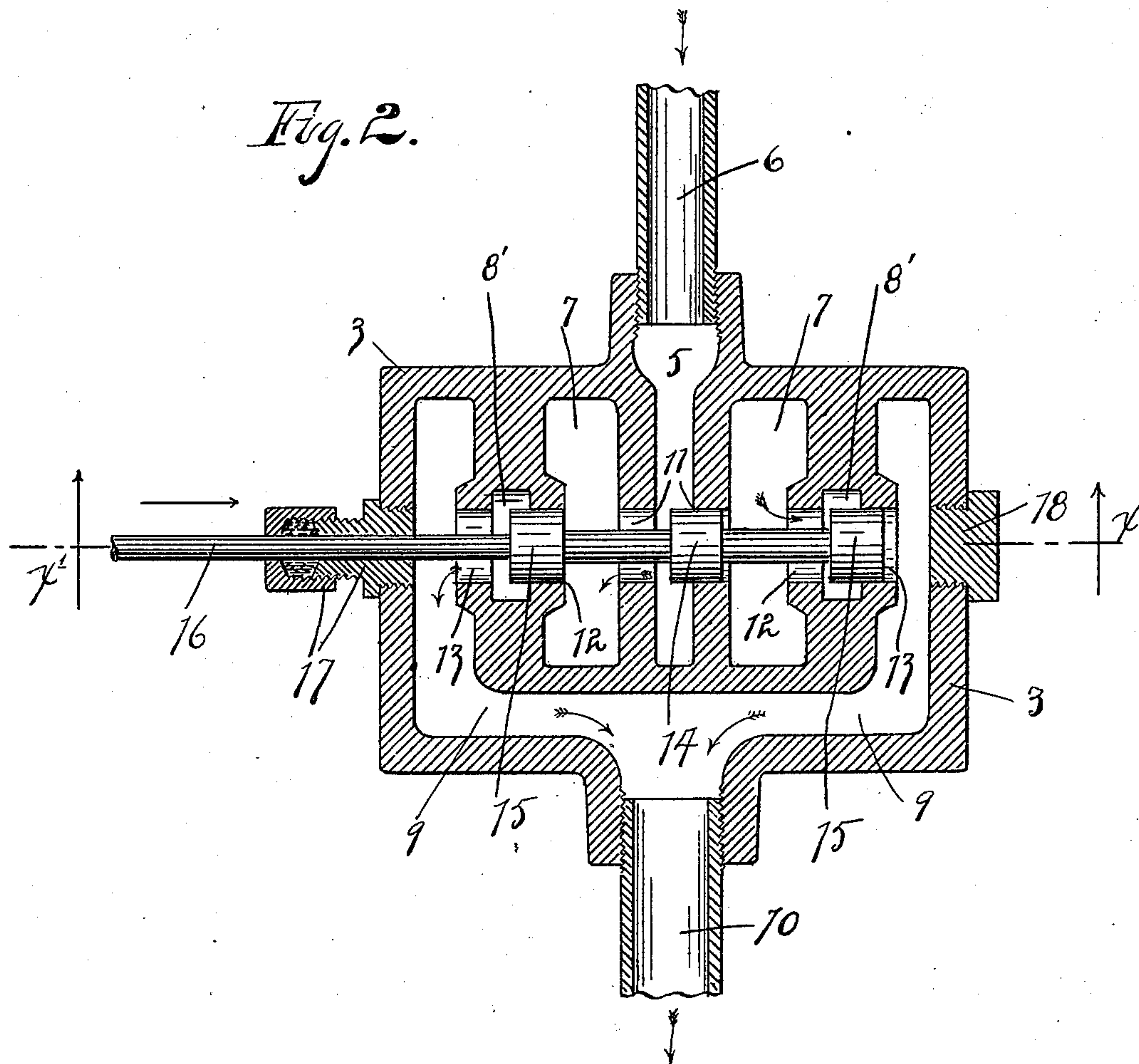
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UNITED STATES PATENT OFFICE.

ISAAC W. WEPPLLO, OF MINNEAPOLIS, MINNESOTA.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 684,019, dated October 8, 1901.

Application filed February 16, 1901. Serial No. 47,590. (No model.)

To all whom it may concern:

Be it known that I, ISAAC W. WEPPLLO, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Steam-Engines; 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.

My present invention relates particularly to steam-engines, and has for its object to improve the same with a view of obtaining by simple means the greatest possible economy and efficiency in the use of steam.

To the above end the invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

In accordance with my invention I provide in close proximity to the cylinder or cylinders one or more so-called "caging-chambers," into which the live steam is admitted, and in connection therewith I provide distribution-valve mechanism which operates first to let live steam into the caging-chamber, then to cut off communication between the caging-chamber and the supply of live steam, and then to open up communication between the said chamber and the cylinder. In this way the fluid confined in the caging-chamber equalizes with the pressure in the cylinder back of the piston, and the engine is run entirely by expansion.

It is of course well known by all persons familiar with the construction of standard or ordinary steam-engines that live-steam communication is opened up directly between the source of supply and the cylinder during more or less of the working stroke of the piston and that the engine is run by expansion during only that final part of the working stroke after the steam has been cut off. This is not the most economical way of using steam.

My invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout both views.

Figure 1 is a vertical section taken through a portion of an engine constructed in accordance with my invention on the line $x'x'$ of Fig. 2, some parts thereof being broken away;

and Fig. 2 is a horizontal section on the line x^2x^2 of Fig. 1.

The numeral 1 indicates the cylinder, and the numeral 2 the piston of the engine. 55

The numeral 3 indicates a portion of the cylinder which corresponds to some extent to the ordinary steam-chest, the same, as shown, having a detachable top plate 4. The section 3 is formed with a central live-steam chamber 5, into which the live-steam-supply pipe 6 opens. On each side of the chamber 5 is one of a pair of so-called "caging-chambers" 7. 60

Cylinder-ports 8 lead from the ends of the cylinder and terminate in enlarged upper extremities 8' just outward of the caging-chambers 7. An exhaust-chamber 9, from which, as shown, an exhaust-pipe 10 leads outward, is provided with prongs that extend in the section 3, one on the outer side of each port termination 8'. Primary admission-ports 11 open from the live-steam chamber 5 into the caging-chambers 7. Secondary admission-ports 12 open from each caging-chamber 7 into the cylinder-port termination 8', and each port termination 8' opens through an exhaust-port 13 into the adjacent prong of the exhaust-chamber 9. The ports 11, 12, and 13 are, as shown and preferred, of cylindrical form and are located on a common axis or in straightline. 70

The distribution-valve, which coöperates with the said ports, is made up of three valve-heads of piston-like form (indicated by the numerals 14 15 15) secured on a common valve-stem 16, which valve-stem, as shown, works outward through a stuffing-box 17 in one end of the steam-chest section 3. In its opposite end the said section 3 is shown as provided with a removable plug 18, which closes a passage that is so located and of such size as to pass the valve-heads 14 and 15. The valve-head 14 closely fits the primary admission-ports 11 and coöperates therewith to open up the caging-chambers 7 in alternate order. This valve-head 14 is of such length that it overlaps the two primary admission-ports 11 in its intermediate position, and thereby closes both of the same. The valve-heads 15 coöperate with the secondary admission-ports 12 and the exhaust-ports 13, and they are of such length that they overlap with the coöperating ports and always close the one port 85

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before they open the other. This latter feature is important, as will hereinafter appear. The said valve-heads 14 and 15 are so set with respect to each other that the primary and secondary exhaust-ports 11 12 on a given side will be opened in alternate or reverse order and that the primary admission-port 11 and exhaust-port 13 on a given side will be opened and closed in the same order or by the same movement of the distribution-valve.

For a specific illustration note the drawings, particularly Fig. 1, wherein it will be noted that live steam is being admitted from the live-steam chamber 5 into the left-hand caging-chamber 7 and that the left-hand end of the cylinder is open to exhaust, while at the same time the right-hand caging-chamber 7 is open to the right-hand end of the cylinder and that the exhaust-port 13 from the right-hand end of the cylinder is at this time closed. At the particular instant illustrated the piston has just commenced its movement toward the left, while the distribution-valve is continuing its movement toward the right, which continued movement toward the right does not, however, change the port-openings except as to the amount of opening. We will assume that the cylinder 1 when the piston is moved to an extreme position will hold four times as much as will one of the caging-chambers 7, and we will also assume, for illustration, that the steam is let into the said caging-chamber under a pressure of one hundred pounds per square inch. Hence it is evident that the pressures in the caging-chamber equalize with that in the piston and that at the time of exhaust they will have been reduced to approximately twenty pounds. Now since the valve-heads 15 must close the secondary exhaust-ports 12 before they can open the exhaust-ports 13 it is evident that a pressure of twenty pounds will be kept in the caging-chambers 7 after exhaust from the cylinder has taken place. This, of course, prevents a great loss of steam which would take place if the caging-chamber were to be opened up to exhaust. Of course by the action of the throttle-valve the amount of steam or, in other words, the pressure of steam which will be admitted to the caging-chambers may be varied, so that the engine will be driven with more or less power. It is also important to note that all of the above manipulations of the ports are accomplished by means of a single valve. The valve shown is a balanced valve of piston form; but it will of course be understood that this valve may be varied in many ways.

In order to render direct steam-pressure available in cases of emergency, such as starting a heavy load with a locomotive or running up a steep grade, I provide a converting-valve, (indicated in Fig. 1 by the numeral 19,) the same shown being a tapered rotary valve perforated at 20 and mounted in a removable

bushing 21, seated in the plate 4 of the chest-section 3. The stem of the valve 19 projects outward through the bushing and is provided with a handpiece 22, by means of which it may be turned. The cavity of the valve 19 opens into the live-steam chamber 5, and its diametrically opposite ports 20 are adapted to be turned into oppositely-projecting ports 23, which open one into each of the caging-chambers 7. Normally the valve 19 is closed, as shown in Fig. 1; but when the same is given a quarter-turn it will open up the live-steam chamber 5 directly to the caging-chambers 7, so that the engine will then be run by live-steam pressure throughout the complete strokes of the piston. When the bushing 21 is removed, the valve 19 is removed therewith.

It will of course be understood that any suitable valve-gear mechanism for imparting movements to the valve 14 15 16 may be employed.

I claim—

1. The combination with a cylinder and piston and supply connection for the motive fluid, of caging-chambers, primary admission-ports between said supply connection and caging-chambers, cylinder-ports opening into the ends of the cylinders, secondary admission-ports between said caging-chambers and cylinder-ports, exhaust-ports opening from said cylinder-ports, and a valve having a plurality of heads, the intermediate of which alternately open and close said primary admission-ports, the outer of which close said secondary ports when the corresponding primary ports are open, and vice versa, and further, open said exhaust-ports when the corresponding secondary ports are closed, and vice versa.

2. The combination with a cylinder, piston and supply connection for the motive fluid, of caging-chambers, primary admission-ports between said supply connection and said caging-chambers, cylinder-ports, secondary admission-ports between said caging-chambers and said cylinder-ports, exhaust-ports opening from said cylinder-ports, a valve having a plurality of heads, the intermediate member of which alternately opens and closes said primary admission-ports, and the outer members of which, close said secondary admission-ports when the corresponding primary ports are open, and vice versa, and open said exhaust-ports, when the corresponding secondary admission-ports are closed, and vice versa, and a converting-valve operative at will to connect said caging-chambers with the supply of live fluid for utilizing the full pressure of the live fluid to the end of the piston-stroke, substantially as described.

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

ISAAC W. WEPFLO.

Witnesses:

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