

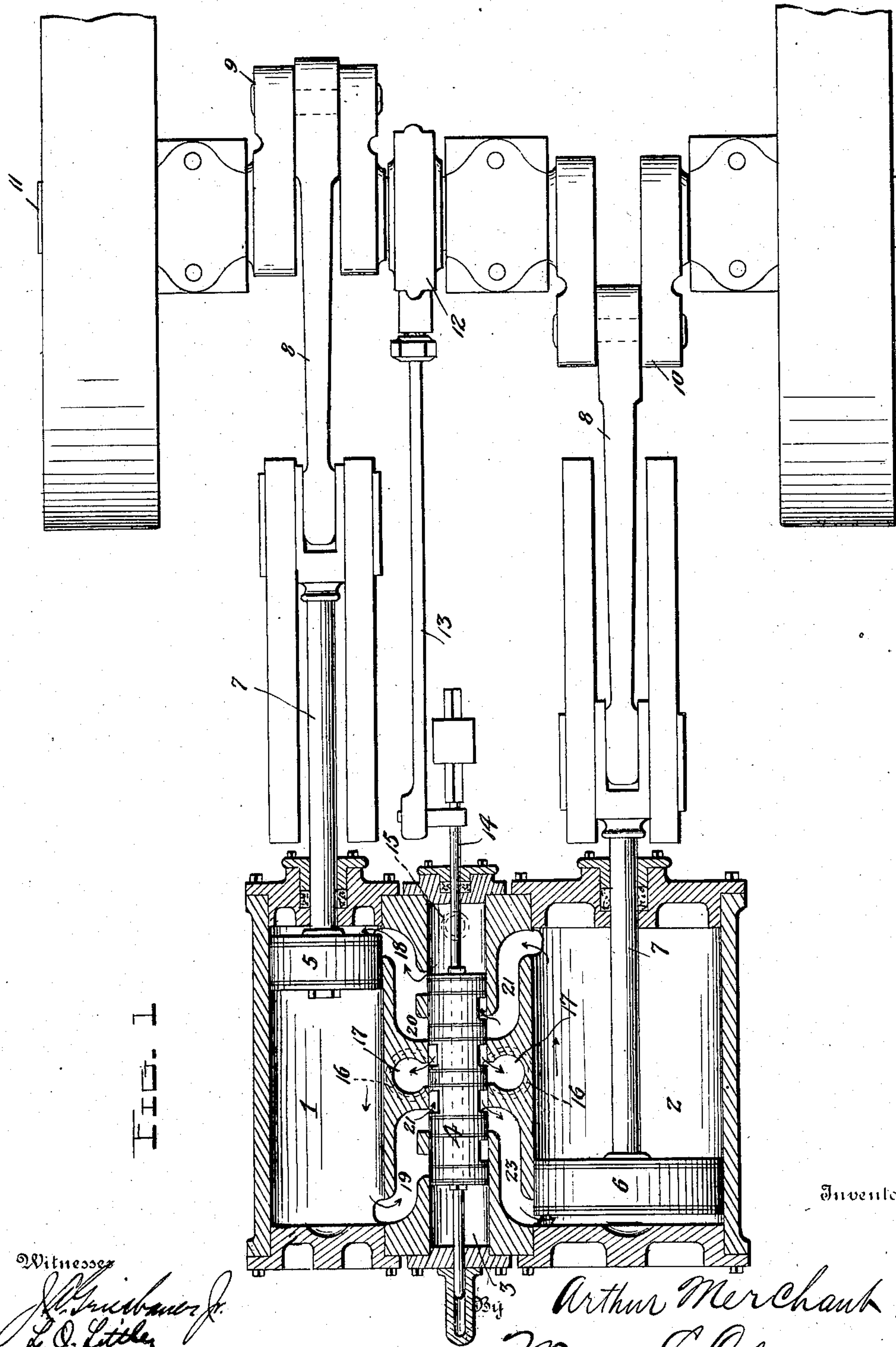
No. 858,664.

PATENTED JULY 2, 1907.

A. MERCHANT.
COMPOUND ENGINE.

APPLICATION FILED FEB. 23, 1907.

2 SHEETS—SHEET 1.



Inventor:

Witnesses

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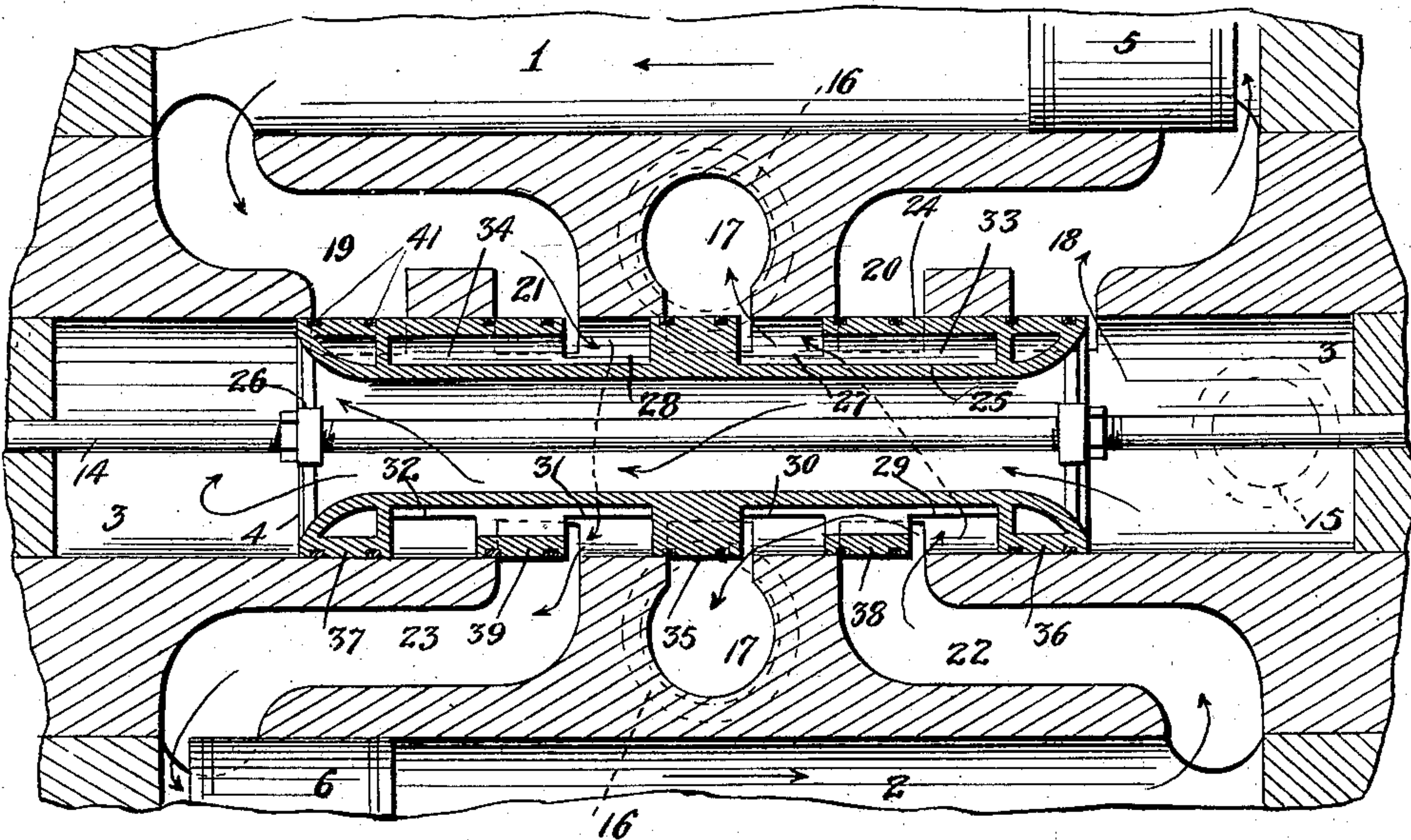


FIG. 2

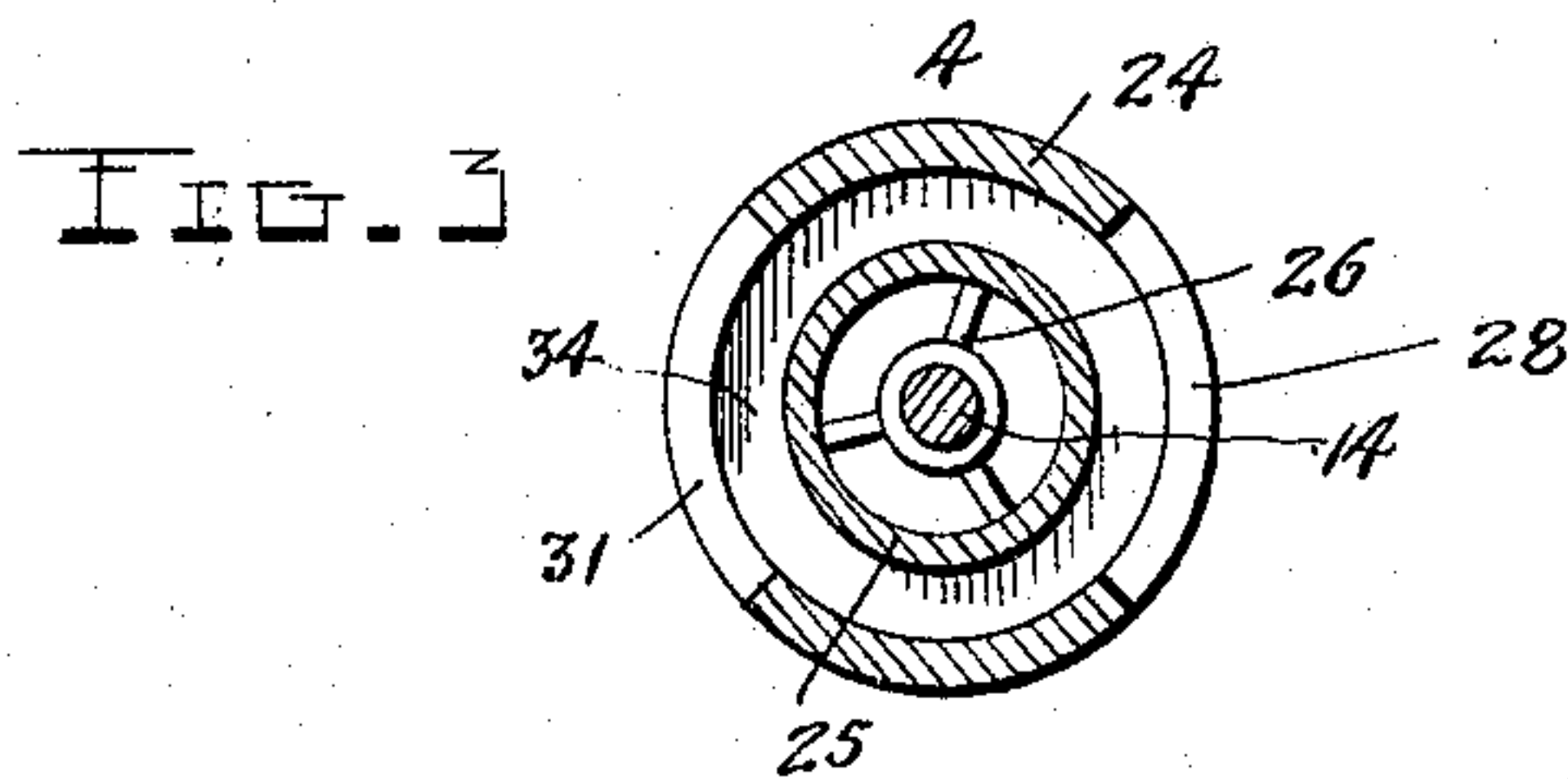
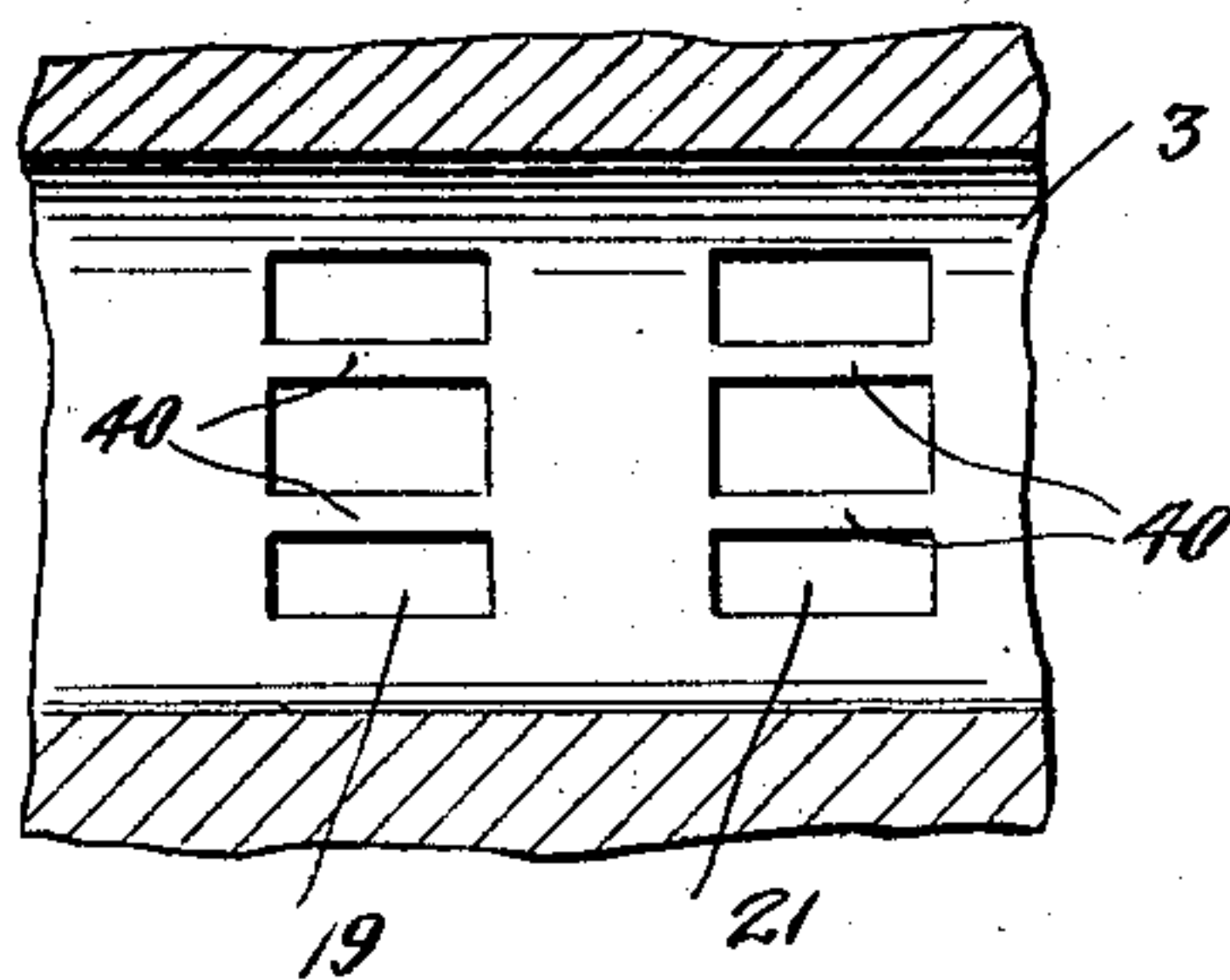


FIG. 3

FIG. 4



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UNITED STATES PATENT OFFICE.

ARTHUR MERCHANT, OF PITTSBURG, PENNSYLVANIA.

COMPOUND ENGINE.

No. 858,664.

Specification of Letters Patent.

Patented July 2, 1907.

Application filed February 23, 1907. Serial No. 358,856.

To all whom it may concern:

Be it known that I, ARTHUR MERCHANT, a subject of the King of Great Britain, and a resident of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Compound Engines, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to improvements in double expansion compound steam engines and more particularly to improved piston valves therefor.

The object of the invention is to provide a valve of this character which will govern the admission of steam to both ends of the high pressure cylinder, the passage of the steam from the high pressure to the low pressure cylinder and the exhaust from both ends of the low pressure cylinder.

Further objects and advantages of the invention, as well as the structural features by means of which these objects are attained, will be made clear by an examination of the following specification taken in connection with the accompanying drawings, in which

Figure 1 is a longitudinal section through the cylinders and valve chamber of a double expansion compound steam engine of the horizontal type; Fig. 2 is a detail section on an enlarged scale, through the improved piston valve and its chamber or chest; Fig. 3 is a detail cross section through the valve; and Fig. 4 is a detail longitudinal section through a portion of the valve chamber or chest, showing the bars or grating across its ports for preventing the packing rings of the piston valve from dropping into the ports.

The numerals 1 and 2 denote respectively the high and low pressure cylinders between which is arranged the steam chest or chamber 3 for the piston valve 4. As illustrated in Fig. 1, the two cylinders and the interposed steam chest are in a single casting and have their ends closed by suitable heads, but it will be understood that these parts may be otherwise constructed. The pistons 5, 6 in the cylinders 1, 2 have the cross heads on the outer ends of their rods 7 connected to pitmen 8 which are in turn connected to cranks 9, 10 arranged at an angle of 180° to each other upon the shaft 11. On the latter is also arranged an eccentric 12 surrounded by a strap carrying a rod 13 which is connected to a stem 14 on the piston valve 4.

The numeral 15 denotes the steam inlet for the valve chamber 3 and the numeral 16 the two exhausts which may lead to a condenser or to the atmosphere as desired. These exhaust pipes 16 are in communication with the oppositely disposed exhaust ports 17 arranged centrally in the chamber 3.

The numerals 18, 19 denote the ports or passages leading to the ends of the high pressure cylinder 1,

said ports or passages having their inner ends provided with the branches 20, 21 through which the steam escapes from said cylinder as presently explained.

The numerals 22, 23 denote the ports or passages leading to the ends of the low pressure cylinder. The latter passages have their inner ends arranged opposite the ports or passages 20, 21.

The improved valve 4 is composed of outer and inner cylindrical shells 24, 25 united at their centers and at each end, as clearly shown in Fig. 2. The inner shell 25 is closed except at its two ends which are flared outwardly and in communication with the chamber 3 to permit of the free passage of steam through the valve. The stem 14 preferably, but not necessarily, extends entirely through the valve and is suitably secured in spiders 26 arranged in the ends of the inner shell 25. In one side of the outer shell 24 are formed ports or openings 27, 28 and in the opposite side of said shell are formed similar ports or openings 29, 30, 31, 32. These ports or openings in connection with the central and end partitions between the two shells of the valve, form within the latter two annular internal chambers 33, 34 and they also divide it into five pistons, namely, a central one 35, two end ones 36, 37 and two intermediate ones 38, 39 arranged centrally between the central and end ones. The end pistons 36, 37 control the passage of steam from the chamber 3 to the ports 18, 19 leading to the ends of the high pressure cylinder, while the central piston 35 controls the exhaust port or ports 17. The two intermediate pistons 38, 39 control respectively the ports 20, 22 and 21, 23, and hence the passage of the steam from the high pressure cylinder through the two internal chambers 33, 34 of the valve to the opposite ends of the low pressure cylinder.

The operation of the invention will be readily seen upon reference to Fig. 2 in which the arrows indicate the passage of the steam. Assuming the two pistons to be in the position shown, that is at the beginning of a stroke, the live steam in the chamber 3 enters the port 18 and in rear of the piston 5 driving it to the left. At the same time the steam in front of the piston 5 passes through the port 21, the internal chamber 34 of the valve and the port 23 and enters the low pressure cylinder 2 in rear of the piston 6, thereby driving the latter to the right. At the same time the steam in front of the piston 6 escapes through the port 22, and the internal chamber 33 to the two exhaust ports 17. The arrangement of the latter, as shown, permits of a free exhaust of the steam after leaving the ports in the valve. It will also be noted that owing to the free passage of the live steam through the valve there will be no pressure on either heads of the steam chest or the valve and hence the latter will be balanced. By making the end pistons 36, 37 of slightly greater length than the others

the proper lap may be given to the steam inlet ports 18, 19 leading to the high pressure cylinder. Upon the opposite strokes of the pistons the above described operations are reversed, the exhaust steam passing 5 through the internal chamber 34 and to the two exhaust ports 17, as will be readily understood.

If found desirable, the ports of the steam chamber or chest 3 may be covered by a grating consisting of longitudinally extending bars 40, as shown in Fig. 4. These 10 bars will effectively prevent the packing rings 41 on the piston from entering said ports.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a compound engine, high and low pressure cylinders, an interposed valve chest having steam exhausting 15 passages arranged between the steam inlet passages leading to the ends of the two cylinders, the steam inlet passages leading to the high pressure cylinder having at their inner ends branches providing the ports 18, 19 for the 20 inlet of live steam from the valve chest and the ports 20, 21 for the outlet of the steam passing from the high pressure cylinder, and a hollow and chambered slide valve mounted in the valve chest and having a central piston to

control the exhaust passages, end pistons to control the ports 18, 19 and intermediate pistons to control the ports 25 20, 21, substantially as set forth.

2. In a compound engine, high and low pressure cylinders, an interposed valve chest having steam exhaust passages arranged between the steam inlet passages leading 30 to the ends of the two cylinders, the steam inlet passages leading to the high pressure cylinder having at their inner ends branches arranged opposite the inner ends of the passages leading to the ends of the low pressure cylinder, and the hollow valve consisting of inner and outer shells 35 united at their centers and ends, the inner shell having its ends in communication with the steam chest and the outer shell having in its opposite sides ports or openings to provide the central, end and intermediate pistons, and the internal chambers arranged within the intermediate 40 pistons and between the center and end pistons, substantially as shown and for the purposes set forth.

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

his
ARTHUR X MERCHANT.
mark.

Witnesses:

W. J. SCOTT,
GEORGE GLOVER, Jr.