

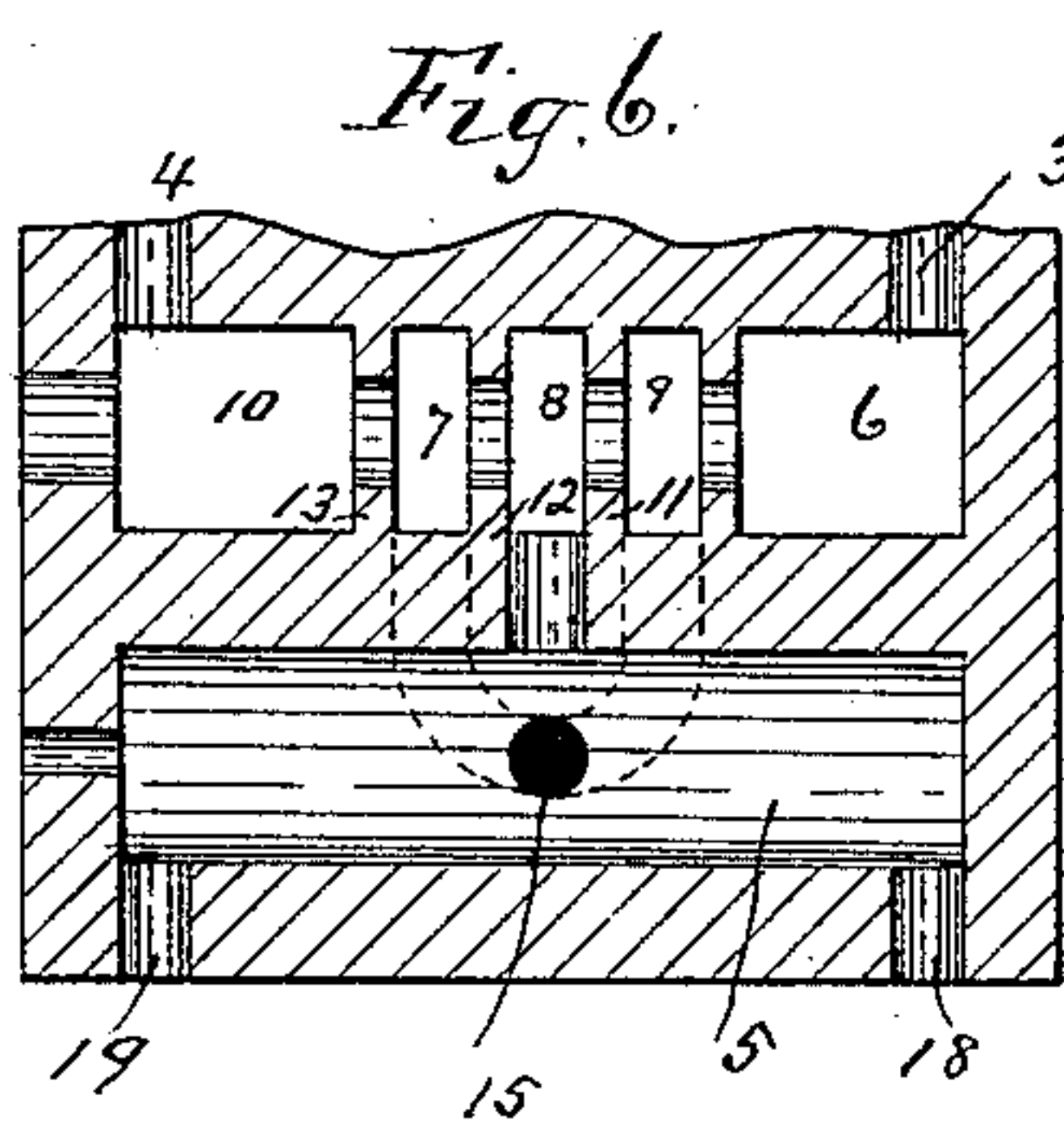
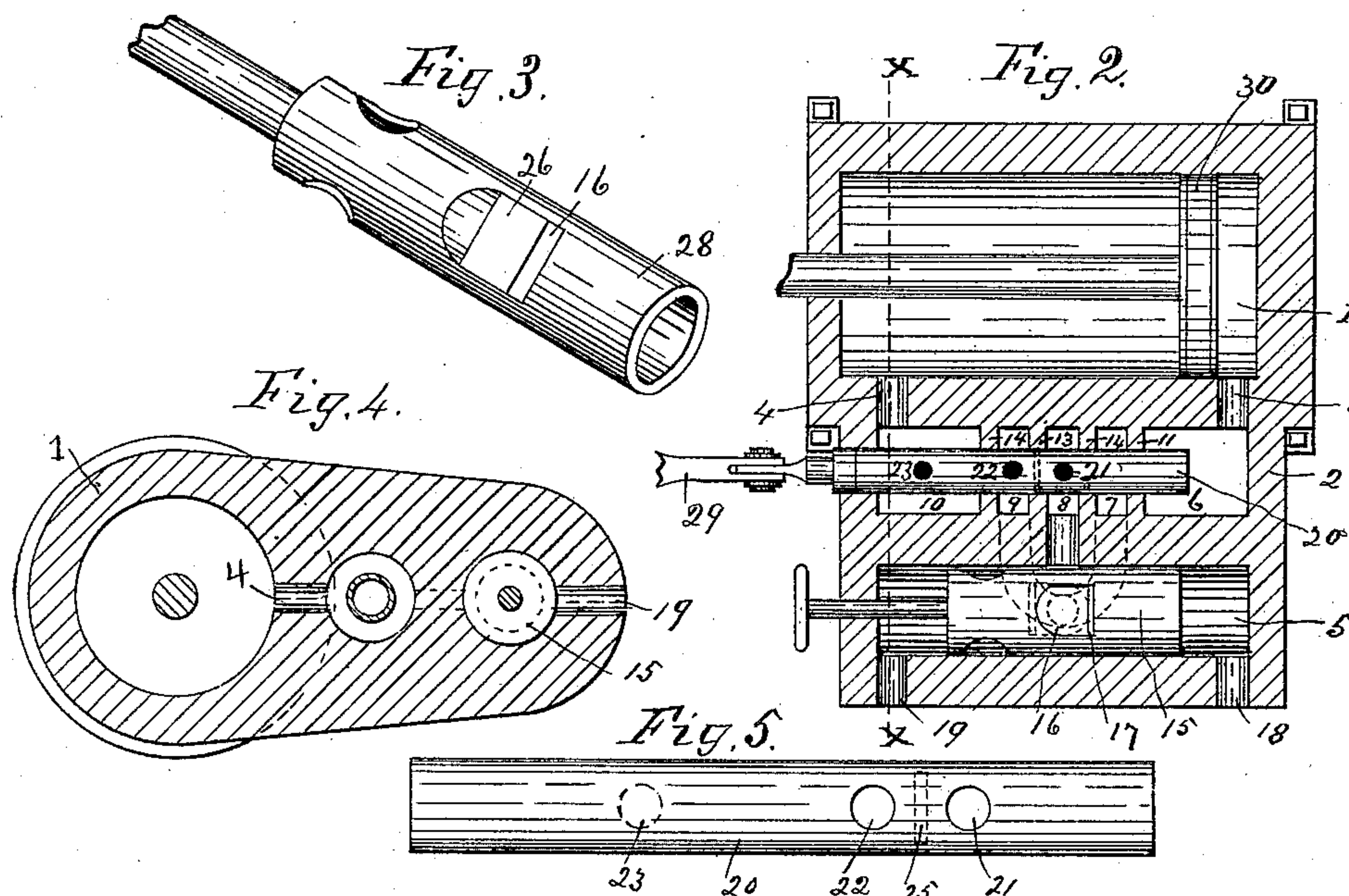
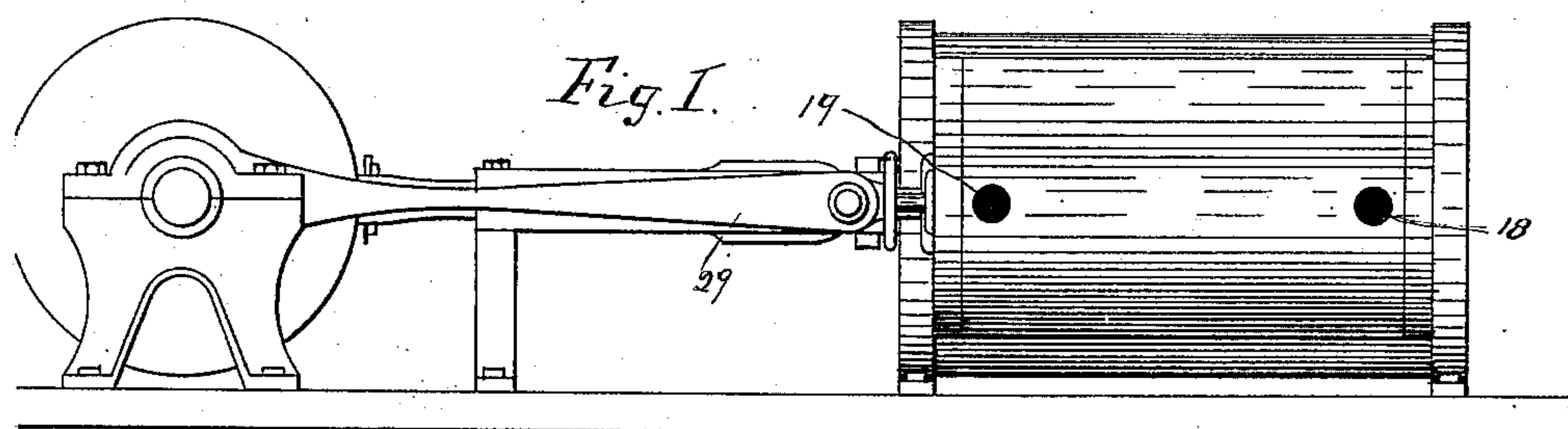
(No Model.)

2 Sheets—Sheet 1.

Z. O. GRABIEL.
REVERSING VALVE FOR ENGINES.

No. 429,852.

Patented June 10, 1890.



Witnesses

C. T. Bell

C. C. Oliver

Inventor

Zephaniah O. Grabel

By

Attorney,

C. D. Campbell

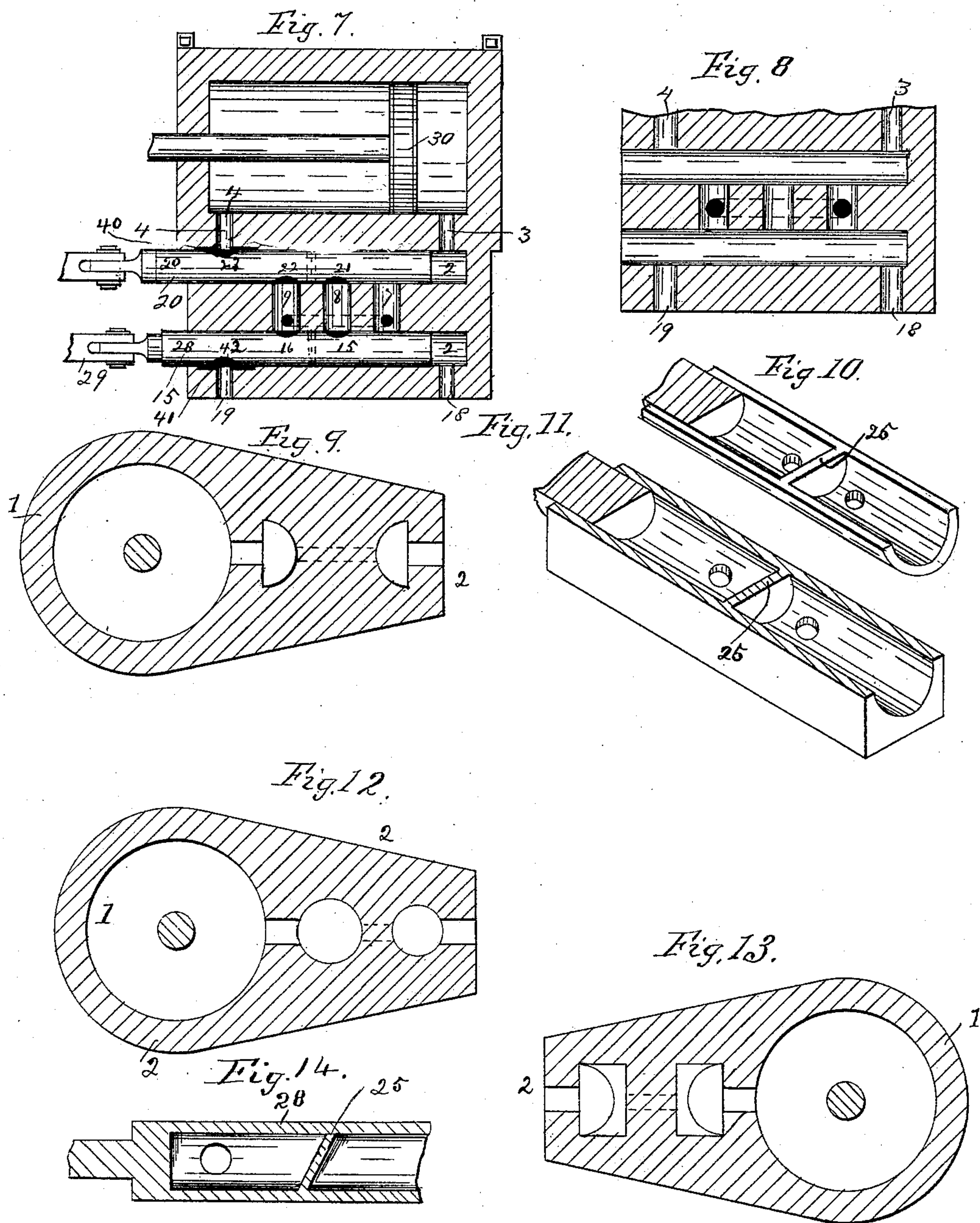
(No Model.)

2 Sheets—Sheet 2.

Z. O. GRABIEL.
REVERSING VALVE FOR ENGINES.

No. 429,852.

Patented June 10, 1890.



Witnesses:
C. J. Belt.
C. C. Oliver

Inventor:
Zephairah O. Grabel
By C. D. Campbell.
Atty.

UNITED STATES PATENT OFFICE.

ZEPHANIAH O. GRABIEL, OF LIMA, OHIO.

REVERSING-VALVE FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 429,852, dated June 10, 1890.

Application filed September 10, 1888. Serial No. 285,089. (No model.)

To all whom it may concern:

Be it known that I, ZEPHANIAH O. GRABIEL, a citizen of the United States, and a resident of Lima, in the county of Logan and State of Ohio, have invented a new and useful Improvement in Reversing-Valves for Steam-Engines, of which the following is a specification.

My invention is intended to do away with the link-motion for reversing-engines and reverse by a system of valves instead.

Figure 1 is a side view of the exterior; Fig. 2, a top sectional view of interior of cylinder, showing auxiliary chambers and valves. Fig. 3 is a perspective view of reversing-valve; Fig. 4, an end sectional view showing cylinder slide chamber and valves; Fig. 5, a top view of slide-valve that feeds and exhausts the cylinder; Fig. 6, a detached top sectional view of a modification with which revolving valve 28 is used; Fig. 7, a top sectional view with slide-valves; Fig. 8, a sectional view; Fig. 9, an end view showing modification of chambers; Fig. 10, a perspective of semicircular open-faced valves that fit therein; Fig. 11, a similar valve with square instead of round back to fit in square chambers in Fig. 13; Fig. 12, an end view of Fig. 7. Fig. 13 is a modification; Fig. 14, a longitudinal sectional view of valve 28.

The construction and operation of my device are as follows:

Alongside of the cylinder 1 and cast in the same piece is a projection having therein the passage-way 2, which opens into the cylinder near each end, as shown at 3 and 4. Alongside of passage 2 and connected with it is a chamber 5. The two passages 2 and 5 are connected by the openings 7 8 9, the openings 7 and 9 opening into a ring-groove 42, surrounding the opening 8. (See Fig. 7.) The side of the passage 2 is cut away at 40 and the side of the passage 5 cut away at 41 to allow steam to escape from holes in sides of valves 20 and 28, and thence find exit beyond. The valve 20, operated by the eccentric-shaft 29, plays back and forth in the passage 2, and has a diaphragm 25 across it near its center and holes 22 and 23 on the side of the diaphragm next the driving-shaft 29 and hole 21 on the other side of the diaphragm.

(See Figs. 7 and 5.) The end of valve 20 next the shaft is closed and the other end open. A similar valve 28, operated by hand at the will of the operator, plays in passage 5, which passage has ports 18 19 near its ends for entrance and exit of steam.

In operation, when the piston-head has reached the end of its stroke and has just started back, as shown in Fig. 7, steam is admitted through port 18 into chamber 5 and valve 28, and passes thence out through hole 15 and opening 8 into valve 20 by way of port 21, and thence out the open end of valve 20 through port 3 into the cylinder behind the piston-head, which it will drive before it. The exhaust-steam will then escape through ports 4 and 23 into the other port of valve 20, and thence through port 22, opening 7, and port 17 into the other end of valve 28, and thence through ports 43, and 19 to the outside. When the piston has reached the other end of its stroke and started back the eccentric on the main shaft, by means of arm 29 the valve 22 is shifted or moved along until port 22 is opposite opening 7. The live steam is thus shut off from the open end of valve 20 and admitted through opening 8 and port 22 into the other end of the valve, whence it escapes into the cylinder behind the piston-head through ports 4 and 23, driving the piston in the other direction, the exhaust-steam passing out by way of passage 3, port 21, opening 7, and port 16 into chamber 5 and out at port 19. At each movement of the piston-head the valve 20 is thus shifted, alternately admitting the live steam to the different ends of the cylinder behind the piston-head and alternately allowing the exhaust to escape at the other end from in front of the piston-head. When it is desired to reverse the engine, the valve 28 is pushed in until the port 15 is opposite opening 7 and port 16 opposite opening 8, so that steam admitted through port 5 will pass through port 15 into opening 7, and thence around or through the ring-groove into opening 9 and into pipe 20 by way of port 22, and thence to the cylinder by ports 23, and 4. The exhaust-steam escapes from the other end of the cylinder by ports 3 and 21, opening 8, and ports 16, 42, and 19.

Instead of the holes 15 16 21 22 23 being in the sides of the valves, they may be placed on the top and bottom, and the chamber 2 enlarged, as shown in Figs. 2 and 4; but I 5 prefer the form shown in Fig. 7 and described above. The diaphragm in pipe 28 can also be placed obliquely across the pipe 28, as shown in Figs. 3 and 14, and the pipes, instead of being made round, as shown in Fig. 10 7, may be semicircular, square, or other forms, as shown in Figs. 10 and 11, and the chamber 5 being made of same shape.

I claim—

1. The combination, with the valve 20, divided by a transverse diaphragm and having 15 ports 21 22 23 and the passages 7 8 9, of the valve 28, for reversing the direction of the steam, as and for the purpose set forth.

2. The combination, with the steam-chamber having ports 3 4 and the passages 7 8 9 20 and ring-groove 42 and valves 28, of the valve 20, having ports 15 and 16, for reversing the engine, as and for the purpose set forth.

3. The combination, with the cylinder having ports 3 and 4, the passages 7 8 9, and ring-groove 42, of the valve 20, operated by an eccentric for regulating the delivery of the steam alternately at the different ends of the cylinder, as and for the purpose set forth. 25

ZEPHANIAH O. GRABIEL.

Witnesses:

S. A. KNIGHT,
E. K. CAMPBELL.