No. 789,857. PATENTED MAY 16, 1905.

G. HONEGGER.

DIRECT ACTING STEAM PUMP.

APPLICATION FILED MAY 12, 1904.

3 SHEETS—SHEET 1.

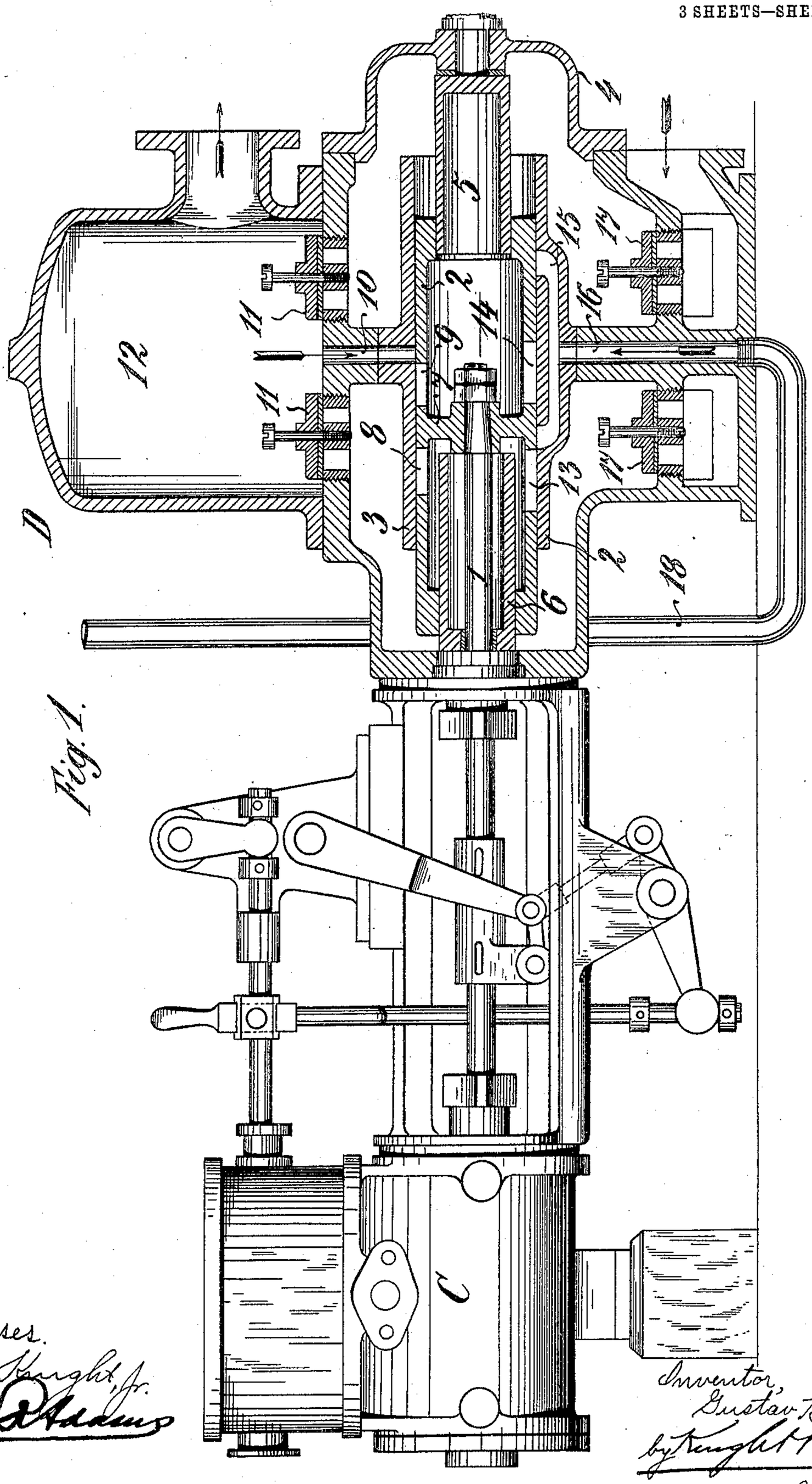


Fig. 1.

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3 SHEETS—SHEET 2.

Fig. 2.

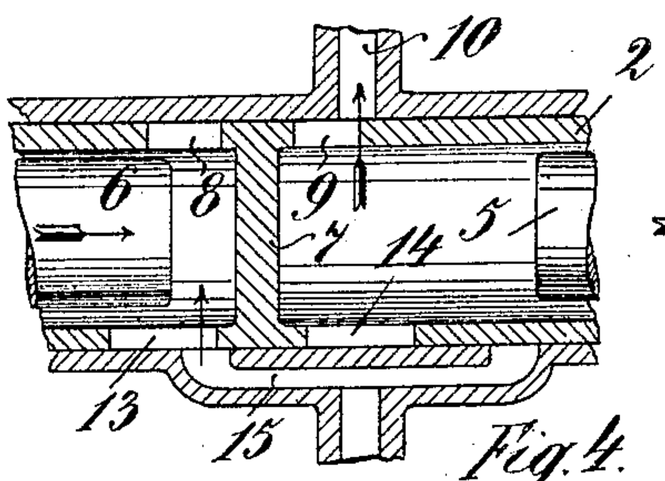



Fig. 3.

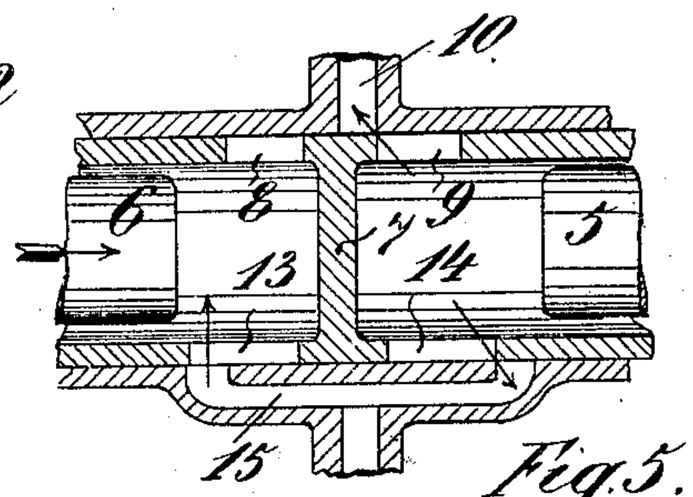



Fig. 4.

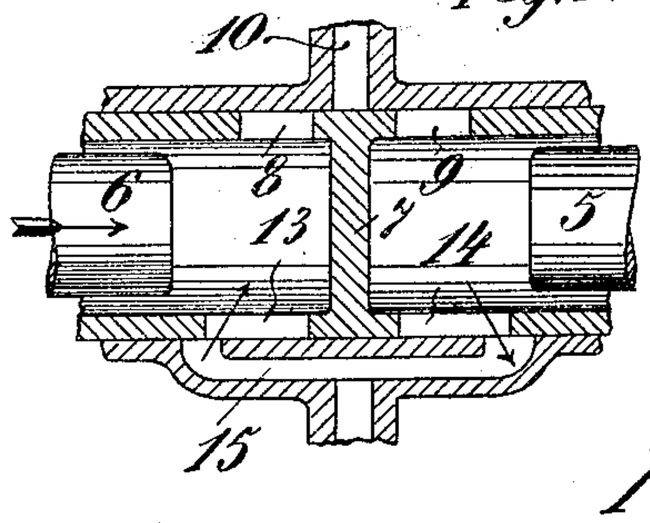



Fig. 5.

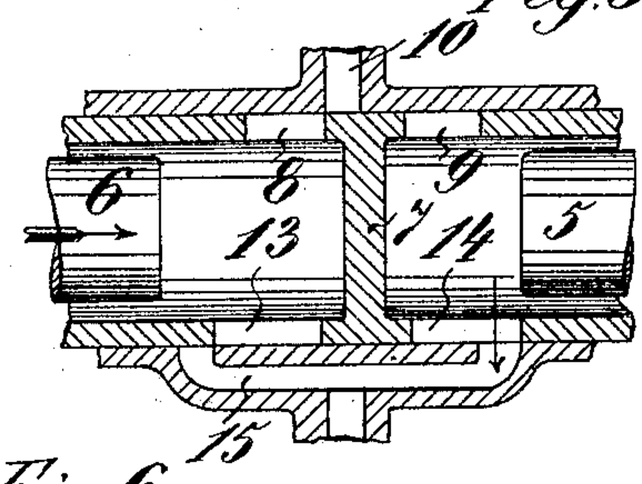



Fig. 6.

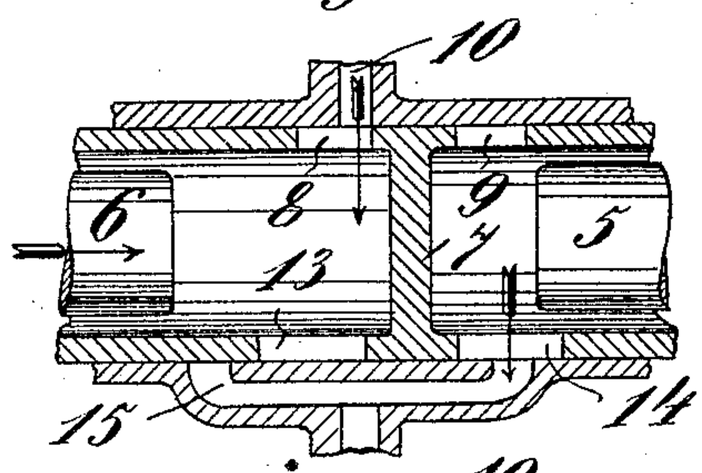
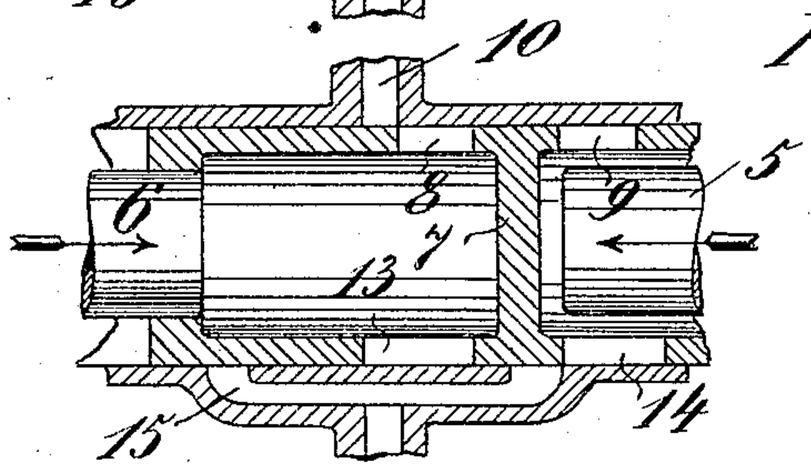



Fig. 7.

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3 SHEETS—SHEET 3.

Fig. 8.

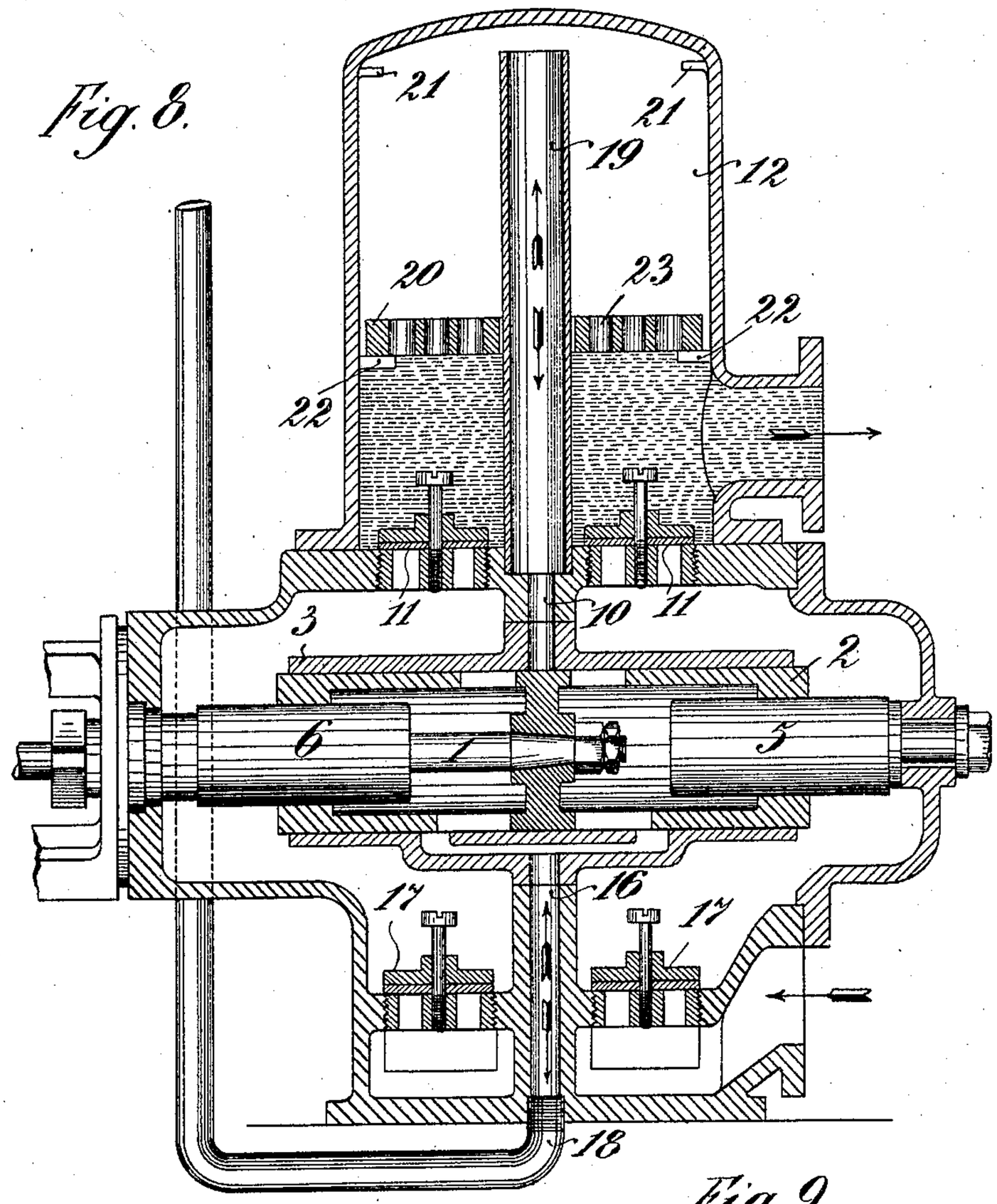
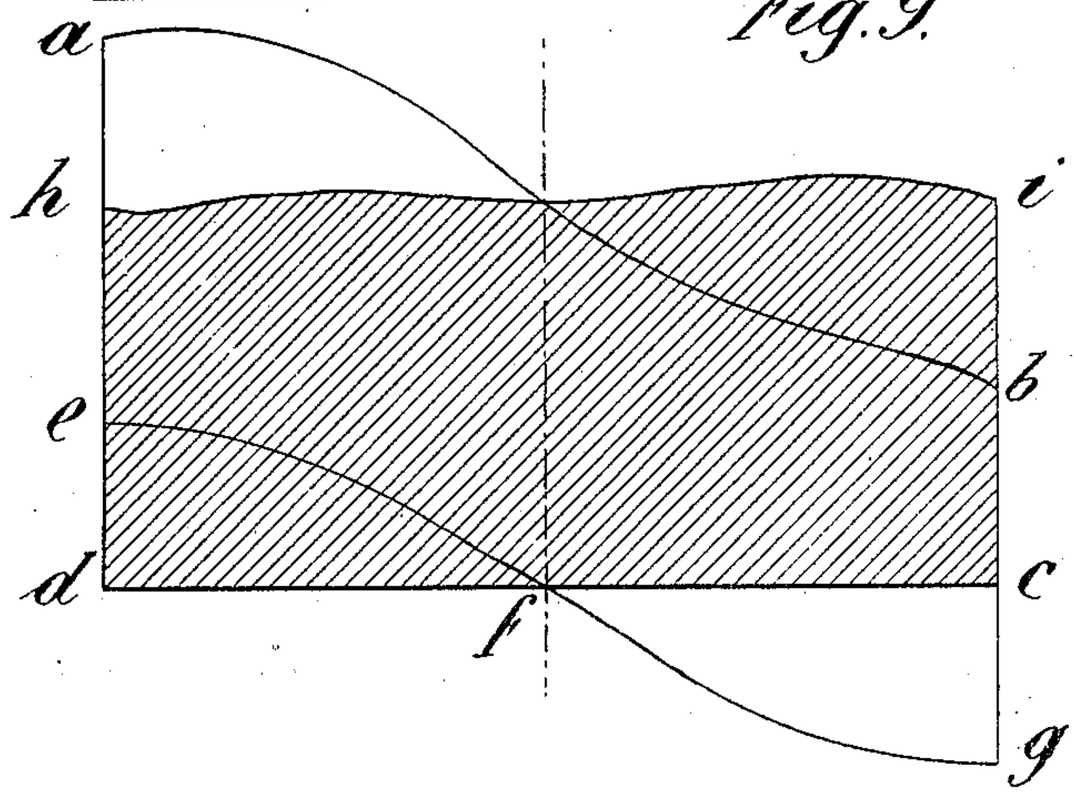



Fig. 9.

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# UNITED STATES PATENT OFFICE.

GUSTAV HONEGGER, OF BERLIN, GERMANY.

## DIRECT-ACTING STEAM-PUMP.

SPECIFICATION forming part of Letters Patent No. 789,857, dated May 16, 1905.

Application filed May 12, 1904. Serial No. 207,672.

*To all whom it may concern:*

Be it known that I, GUSTAV HONEGGER, engineer, a citizen of Switzerland, residing at 56 Gerichtstrasse, Berlin, Germany, have invented certain new and useful Improvements in Direct-Acting Steam-Pumps, of which the following is a specification.

The present invention relates to a new or improved direct-acting steam-pump working with expansion which differs from the steam-pumps hitherto known by the fact that the pumping-piston itself serves to produce the necessary equalization of pressure, so that the use of special apparatus for this purpose is unnecessary and the construction of the pump is simplified and its cost reduced. The space occupied by the engine is also reduced and the efficiency of the latter is increased.

The invention is illustrated in the annexed drawings, in which—

Figure 1 is an elevation of one form of the pump, partly in section. Figs. 2 to 7 show the piston in different positions. Fig. 8 represents another form of the pumping apparatus in longitudinal section. Fig. 9 is a curve diagram.

In Fig. 1, C is the engine; D, the pumping apparatus. Since the invention relates chiefly to the latter, the construction of the engine need not be described in detail in this specification. The construction of the pump is as follows: The outer circumference of the tubular-plunger piston 2, fixed to the piston-rod 1, is in contact with the cylinder 3, and the inner circumference thereof is in contact with the tubular trunks 5 and 6, fixed to the casing 4. The plunger-piston is divided into two compartments by the wall 7. These two compartments are alternately placed in communication with the duct 10 and air-drum 12 by the ports 8 and 9, respectively, and with the suction-pipe 18 and an open water-tank or the like by the ports 13 and 14 and ducts 15 and 16. The pump sucks in liquid through the valves 17 and forces the said liquid through the valves 11 into the drum 12, whence it passes to the pressure or delivery conduit.

The action of the apparatus is as follows: When the plunger-piston 2 reaches one of its end positions, as shown in Fig. 1, it closes the channels 10 and 15, so that, on the one hand, the plunger ceases to act as a balance device or equalizer, and, on the other hand, the stroke is limited by the liquid inclosed in the left-hand compartment by the passage of the plunger-piston over the fixed trunk 6. After the reversal of the piston the right-hand compartment thereof is placed in communication with the air-drum, and thus opposes the movement of the piston-rod, and the lower or left-hand compartment of the plunger-piston is placed in communication with the suction-pipe 18. During the further movement of the plunger-piston toward the right, Fig. 2, the liquid contained in the right-hand compartment is forced through the ports 9 and 10 into the drum 12, overcoming the pressure in the latter, and the left-hand compartment of the plunger-piston still remains in communication with the suction-pipe 18. When the plunger-piston reaches the position shown in Fig. 3, it closes the channel 10, so that the counterbalancing effect ceases and the right-hand chamber of the piston, which has previously acted as a resistance to the movement of the piston, is placed in communication with the suction-pipe by the port 14 and channels 15 and 16. When the plunger-piston has reached the central position, (shown in Fig. 4,) both compartments thereof are cut off from the air-drum, but are still in communication with the suction-pipe. This condition continues till the piston reaches the position shown in Fig. 5, when the right-hand compartment is still in communication with the suction-pipe 18; but the left-hand compartment is cut off from the latter. The left-hand compartment then communicates with the air-drum. Whereas, however, during the first half of the stroke the compressed air opposes the movement of the piston-rod, it assists the said movement during the second half of the stroke—that is to say, when the piston has moved beyond the position shown in Fig. 5, as may be seen in Fig. 7. When the plunger-piston reaches the end position on the right, the channels 10 and 16 are again cut off from both compartments of the plunger, and the action is thereupon repeated in the opposite direction.

In the form of construction shown in Fig.

8 the channel 10 communicates with a vertical pipe 19, so that the compressed air inclosed in the pressure air-drum is used for balancing the pressure and not the column of liquid under pressure. The effect is the same, the only difference being that it is not liquid which enters the compartments of the piston from the air-drum but compressed air. For the purpose of maintaining in the air-drum the necessary quantity of air—that is to say, of replacing the air which is lost by leakage or by being carried away with the water—air is pumped into the drum at intervals, and a float 20, the upward-and-downward movement of which is limited by stops 21 and 22, is provided to prevent the air in the drum from being carried away with the water. The said float must be provided with holes 23 like a sieve in order to allow of the passage of the air. In this manner the water in the air-drum is separated from the air-chamber at all levels and the agitation of the water during the pumping is prevented.

In the diagram shown in Fig. 9 the surface *a b c d* represents the expansion, the surface *d e f* and *f g c* the resistance, and the surface *h i c d* the pressure.

The piston can easily be removed from the cylinder, since for this purpose it is only necessary to remove the cylinder-cover.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. In a direct-acting steam-pump of the class described, the combination of a pump-cylinder, a pair of trunks extending into the cylinder and a tubular piston having its outer circumference in contact with the pump-cylinder and having its inner circumference in contact with said trunks, said piston being provided with a central partition dividing the piston into two pressure-equalizing chambers.

2. In a direct-acting steam-pump of the class described, the combination with the cylinder, of a compression-drum communicating with the cylinder, a suction-pipe communicating with the cylinder, a tubular piston provided with a central partition dividing the piston into two chambers, and channels in the piston providing alternate communication of the piston-chambers with said compression-drum and said suction-pipe to cause fluid to be sucked into the chambers and to cause the fluid in the drum to act alternately as a resistance and a driving force to the stroke of the piston.

3. In a direct-acting steam-pump of the class described, the combination with the cylinder, of a compression-drum communicating with the cylinder, a suction-pipe communicating with the cylinder, a tubular piston provided with a central partition dividing the piston into two chambers, channels in the piston providing alternate communication of the piston-chambers with said drum and said suction-pipe, and a pipe communicating with one of said channels and with the drum.

The foregoing specification signed at Berlin this 23d day of April, 1904.

GUSTAV HONEGGER.

In presence of—
WOLDEMAR HAUPT,
HENRY HASPER.