

(No Model.)

P. T. COFFIELD.  
STEAM ENGINE.

No. 437,097.

Patented Sept. 23, 1890.

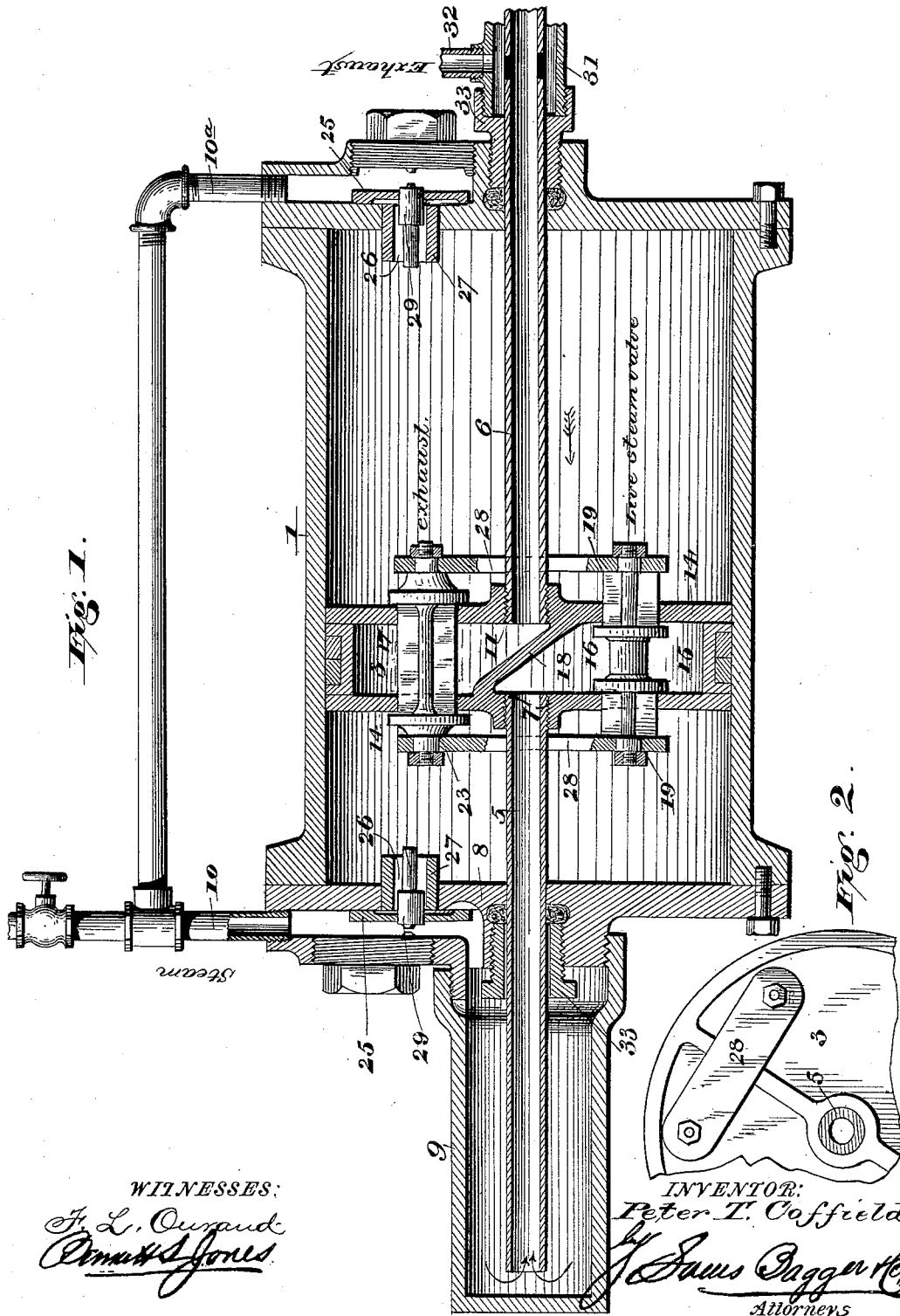


Fig. 1.

Fig. 2.

WITNESSES:

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# UNITED STATES PATENT OFFICE.

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## STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 437,097, dated September 23, 1890.

Application filed February 13, 1890. Serial No. 340,314. (No model.)

*To all whom it may concern:*

Be it known that I, PETER T. COFFIELD, a citizen of the United States, and a resident of New Carlisle, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in steam-engines, and is designed principally for use in connection with pumping mechanism, although it is equally applicable to all other purposes for which steam-engines are generally used.

The object of my invention is to provide a steam-engine which shall be simple and economical in construction and reliable and efficient in operation, and in which the ordinary connecting-rods and eccentrics are dispensed with and the valves operated directly by the movement of the piston by which they are carried.

The invention consists, essentially, of a hollow piston divided into two compartments or chambers, one of which is for the live steam and the other for the exhaust. The piston-rod is hollow and connects, respectively, on each side of the piston with the live-steam and exhaust compartments thereof. The piston-rod supplying live steam projects through the end of the cylinder into a steam-chest, which receives steam from any suitable supply, while the piston-rod forming the exhaust projects through the opposite cylinder-head and connects with an exhaust-pipe. It may also form the piston-rod of a steam-pump or be connected by an ordinary pitman to the crank and main shaft of any machinery to be operated. The said piston is provided with supply and exhaust valves, which pass through the live-steam and exhaust compartments thereof, projecting on each side of the same and connected together so as to move in unison. The arrangement of these valves is such that the supply and exhaust are established alternately on opposite sides of the piston, and are actuated by coming in contact with reciprocating valves in the cylinder-heads com-

municating with the steam-supply, as hereinafter more fully described.

The invention thus briefly outlined in the above description will now be described with reference to the accompanying drawings, in which—

Figure 1 represents a longitudinal sectional elevation of a steam-engine constructed according to my invention. Fig. 2 is an end view of the steam-piston, showing the valves arranged nearer or closer to each other than in the preceding figure, this being the preferred form of construction.

In the said drawings, the reference-numeral 1 designates the steam-cylinder, and 3 the piston. The piston-rod is hollow and is composed of two sections 5 and 6, the section 5 communicating with the steam-supply and connected to piston 3 by screw-joint 7. The free end of this piston-rod 5 projects through the cylinder-head 8 and reciprocates within steam-chest 9, secured to said cylinder-head. To this steam-chest is connected steam-pipe 10 from any suitable source or generators. Piston-rod or section 6, through which the exhaust takes place, is connected with piston 3 by screw-joint 11, similar to section 5. This rod extends through the opposite cylinder-head into the pump-cylinder, where it is connected with the piston. It is obvious, however, that instead of being connected with this piston it may be connected with the pitman and crank of a driving-shaft.

The piston 3 is hollow, being composed of the heads 14 and intermediate annular wall 15, and may be provided with any suitable packing. This piston is divided into two chambers or compartments 16 and 17 by means of the partition 18, the compartment 16 being for the live steam and compartment 17 for the exhaust. These compartments communicate, respectively, with piston-rods 5 and 6. Each of the piston-heads is provided with two openings forming, respectively, the entrance and exit for the steam.

The numeral 19 designates the live-steam valve, having the valve-stem 20, located in the supply-compartment 16, and provided with wings 19<sup>a</sup>. This valve works inwardly and alternately opens and closes the commu-

nication with the cylinder on opposite sides of the piston as the valve-stem is reciprocated.

The numeral 21 designates the exhaust device, located in the exhaust-compartment. This consists of the wings 22 and the valves 23 23. These valves work outwardly or oppositely to valve 19 and are connected thereto by means of connecting-rods 28, so as to move in unison. By this means it will be seen that as the supply-valve is opened on one side of the piston the exhaust on the same side is closed and open on the other side.

Each cylinder-head is provided with an inwardly-projecting sleeve 27, having a bore or opening communicating with the steam-pipes 10 and 10<sup>a</sup>. These openings are closed by means of valves 25, connected with valve-stems 29, which are provided with wings 26.

Secured to piston-rod 6, intermediate of the steam and pump cylinders, is a fitting or sleeve 31, carrying an exhaust-pipe 32, communicating with said piston.

The reference-numerals 33 33 designate ordinary glands or stuffing-boxes for the piston-rods.

The operation is as follows: The parts being in the position shown in Fig. 1, steam is admitted from pipe 10 to the steam-chest, and from thence passes through piston-rod 5 to supply-compartment 16 of the piston, and from thence through the valve opening into the cylinder at the right of the piston, as indicated by the arrow. This will cause the piston to be moved to the other end of the cylinder, when the exhaust-valve will strike the valve-stem 29, opening valve 25 and allowing steam from the supply-pipes to enter the cylinder. At about the same time the exhaust-valve in the piston will strike the end of the sleeve 27 and cause the piston-valves to be shifted. The object of valves 25 is to properly seat the piston-valves in case they become balanced. As soon as this is effected the said valves are closed by the steam-pressure. This movement of the exhaust-valve, by means of the connecting bars or rods 28, actuates valve 19, opening the port on the opposite side and closing that previously open. Live steam will now be admitted through this port and the exhaust will be through exhaust-port in the opposite end or side of the piston, through exhaust-compartment 17 and hollow piston-rod 6, until

the piston reaches the end of its return-stroke, when the operation will be reversed. The operation will be continuous and the piston be reciprocated back and forth in the cylinder as long as the steam-supply is kept up, as will be obvious to those skilled in the art.

From the above description it will be seen that my invention possesses many advantages over the slide and rotary valves actuated by link motion or eccentrics, as now generally employed. The valves all being inclosed within the cylinder, there is less liability of their being damaged or injured, and, being positively actuated by the movement of the piston, they are more reliable in use and not so apt to get out of order as the ordinary valves and their actuating mechanism. There is much less friction, whereby the wear of the parts is greatly diminished, thus insuring uniformity and smoothness of action.

As before stated, the valves in Fig. 1 are shown farther apart than they are when in use, this being done for the purpose of more clearly illustrating their construction and operation. In practice they will be located as shown in Fig. 2.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination, with the cylinder 1 and hollow piston-rods 5 and 6, of the piston 3, divided into steam supply and exhaust compartments 16 17 by partition 18 and having steam-ports therein, the valve 19 in compartment 16, the valves 23 in compartment 17, the rods 28, connecting said valves, and the wing-valves 25 in the cylinder-heads, provided with the plunger-valves 29, substantially as described.

2. The combination, with the cylinder 1, steam-supply pipes 10 and 10<sup>a</sup>, steam-chest 9, and hollow piston-rods 5 6, of the piston 3, having compartments 16 17, valves 19 and 23 in said compartments 16 and 17, respectively, rods 28, connecting said valves, and slides and valves 25, provided with plunger-valves 29, substantially as described.

In testimony that I claim the foregoing as my own I have hereunto affixed my signature in presence of two witnesses.

PETER T. COFFIELD.

Witnesses:

RANDOLPH COLEMAN.  
E. S. WALLACE.