

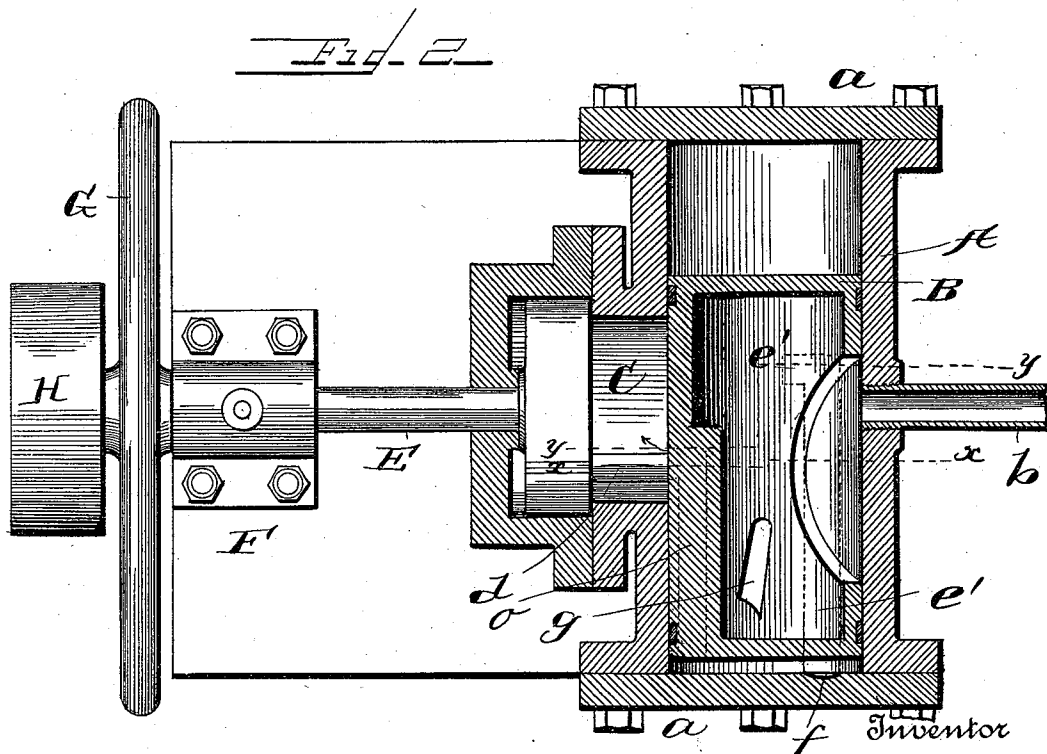
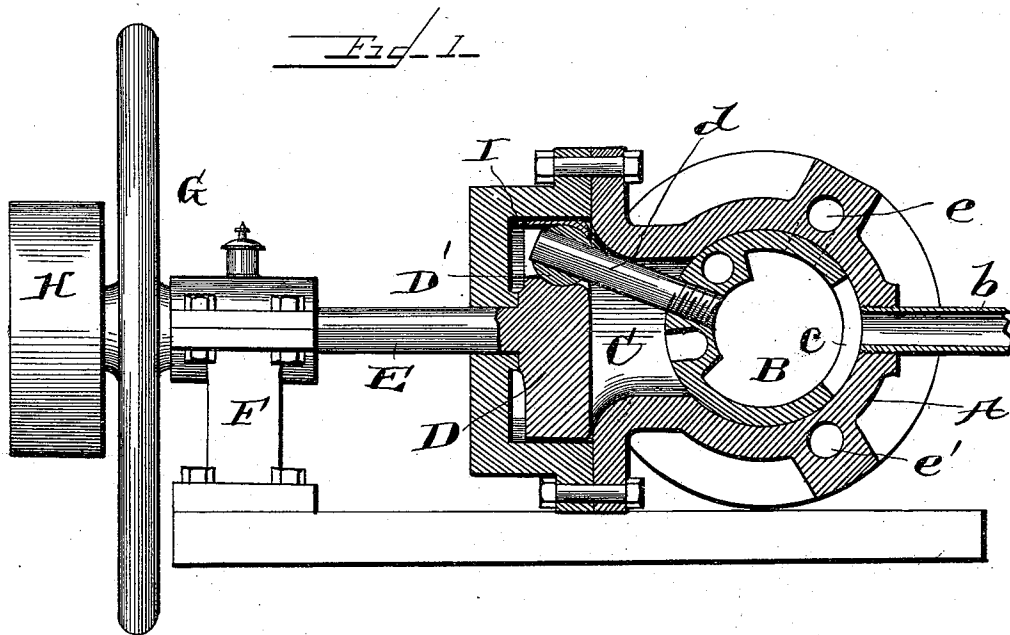
(No Model.)

2 Sheets—Sheet 1.

H. W. NIPHER.
STEAM ENGINE.

No. 505,991.

Patented Oct. 3, 1893.



Witnesses

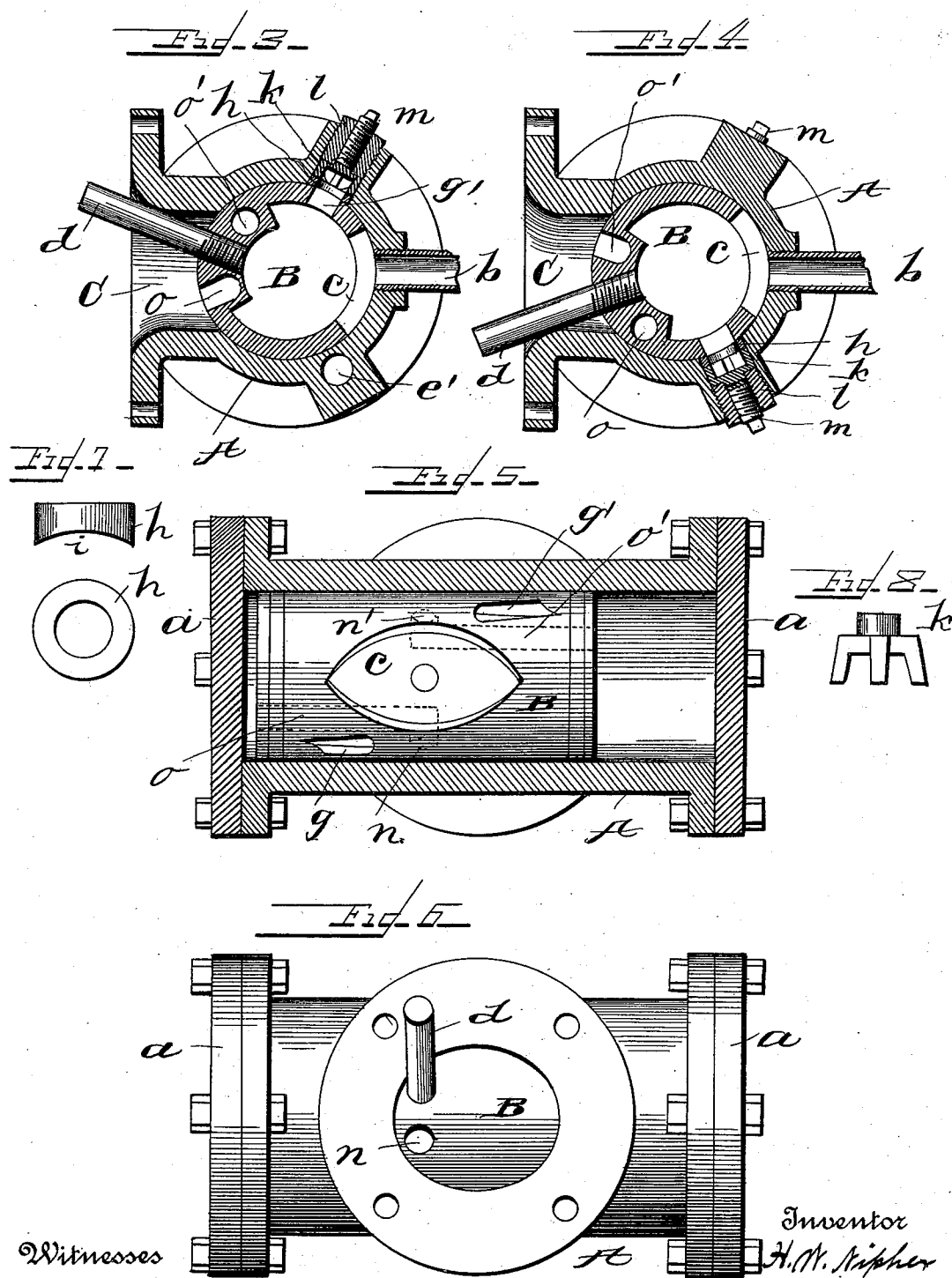
J. A. Pauerschnitt,
W. Parker Reinold.

H. W. Nipher
By D. E. Reinold
Attorney

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Witnesses
G. A. Fandenschmidt,
W. Parker Remond.

Inventor
H. W. Nipher
By D. E. Reinold.
Attorney

UNITED STATES PATENT OFFICE.

HENRY W. NIPHER, OF LEBANON, PENNSYLVANIA, ASSIGNOR OF ONE-HALF
TO WILLIAM M. DERR AND JOHN S. SNAVELY, OF SAME PLACE.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 505,991, dated October 3, 1893.

Application filed July 3, 1893. Serial No. 479,475. (No model.)

To all whom it may concern:

Be it known that I, HENRY W. NIPHER, a citizen of the United States, residing at Lebanon, in the county of Lebanon and State of Pennsylvania, 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 invention relates to steam engines and has especial reference to that class of engines in which the piston constitutes the steam chest, and in its longitudinal reciprocation in the cylinder has imparted to the piston an axial or oscillatory motion whereby the piston also serves as a valve, controlling the induction and eduction ports of the engine.

The invention will be fully disclosed in the following specification and claims.

In the accompanying drawings, which form part of this specification, Figure 1 represents a vertical transverse section through the engine cylinder, the piston and the exhaust steam-chest, and a side elevation of the shaft, its pedestal, the balance wheel and pulley; Fig. 2 a plan view, showing the cylinder, piston and exhaust-steam chest in longitudinal horizontal section; Fig. 3 a transverse section on the line $x-x$ Fig. 2; Fig. 4 a like view on the line $y-y$ same figure; Fig. 5 a longitudinal section through the cylinder showing the piston in side elevation, and also the induction ports, the piston being in the same position as in Fig. 2; Fig. 6 a side view of the cylinder detached from the exhaust-steam-chest, showing the piston, the wrist-pin and one of the eduction-ports; Fig. 7 a side and a top plan view of the induction-port packing ring on an enlarged scale, and Fig. 8 a side view of the spider which rests upon the packing ring as shown in Figs. 3 and 4.

Reference being had to the drawings and the letters thereon, A indicates the cylinder, provided with the usual heads a , and steam pipe b , connected to the cylinder in its longitudinal center and communicating with a steam generator, not shown. B, the piston, which is hollow, and when the steam controlling valve is open is in communication with the generator, and filled with steam under

full boiler pressure, and at the same temperature through an elliptical opening c , in one side of the piston, thus constituting a live steam chest for the engine. The piston is provided on the side opposite the opening c and in the longitudinal and horizontal center with a wrist-pin d , which extends through the opening C in the side of the cylinder and engages the crank D of the shaft E , by means of a ball and socket joint D' , which imparts to the piston an axial or oscillatory motion as it reciprocates in the cylinder, thus controlling the supply and exhaust of the engine without the use of a supplemental valve, the piston being in itself the valve of the engine. The shaft E is supported near its outer end in a pedestal F and is provided with a balance wheel G , and with a suitable driving pulley H , from which power is transmitted to the machinery to be driven in the usual manner.

In the wall of the cylinder and on opposite sides of the horizontal center of the cylinder, and on the side to which the steam supply pipe b is connected, are live steam passages e e' which extend to the opposite ends of the cylinder and through which the motor fluid is supplied to move the piston. One of these passages e' is shown in dotted lines in Fig. 2, and in the head a of the cylinder adjacent to the end of the passages e e' , are cavities f to facilitate the admission of the motor fluid to start the piston, one of which cavities is also shown in said Fig. 2.

In the wall of the piston B on opposite sides of the elliptical opening c and on opposite sides of the longitudinal center are the steam induction ports g g' which control the admission of steam to the passages e e' alternately as the ports register with said passages, and said ports are packed by an annular ring h , the inner or concave end i of which rests against the piston, as shown in Figs. 3 and 4, and upon the outer end of said ring rests a spider h which is held in place by a hollow screw l , and adjusted to compensate wear by a screw m which engages the inner screw thread of the screw l . On the opposite side of the piston, on opposite sides of the wrist-pin d and in the longitudinal center of the piston, are exhaust or eduction ports n n' , which communicate with passages o o' in the

piston and conduct the exhaust-steam alternately from the opposite ends of the cylinder to the exhaust steam-chest I, from which it is conducted in any approved manner.

5 The engine being constructed substantially as described, the operation is as follows:—The piston being at the end of the cylinder, shown in Figs. 2 and 5, steam is admitted to the port *g'* and passage *e'* to drive the piston toward
10 the opposite end of the cylinder and as the piston travels, it is turned on its axis by the wrist-pin *d* engaging the crank D and the ball and socket joint D' cuts off steam gradually and the steam in the end of the cylinder toward which the piston is traveling is exhausted
15 through the passage *o'* into the exhaust steam-chest I. By the time the piston has completed its stroke it will have been turned on its axis to bring the port *g* to register with the passage *e* and steam will be admitted to said opposite end of the cylinder and the exhaust steam pass out through the passage *o* into the exhaust steam-chest I; and in this stroke of the piston it is turned upon its axis by the
20 crank and intermediate connections as in the former stroke.

The point of cut-off is regulated by setting the piston in proper relation to the crank and the ball and socket joint and connecting the
30 wrist-pin thereto.

Having thus fully described my invention, what I claim is—

1. A steam engine having a hollow reciprocating piston in open communication with the

motor fluid supply pipe and provided with
35 eduction ports in the wall of the piston and on opposite sides of the supply opening and extending to the ends thereof, in combination with passages in the wall and extending to the ends of the cylinder.

2. A steam engine having a hollow piston provided with an elliptical opening on one side, induction ports on opposite sides and ends of said opening and exhaust ports and passages, in combination with supply pas-
40 sages in the wall of the cylinder, and means for oscillating the piston in its stroke.

3. A steam engine having a hollow piston provided with an elliptical opening and induction ports in combination with a packing
50 for said induction ports consisting of an annular ring, a spider and means for adjusting the packing to compensate wear.

4. A steam engine consisting of a cylinder provided with supply passages in the wall
55 thereof, a hollow piston in constant communication with the supply pipe and provided with eduction ports and exhaust passages and a wrist-pin, in combination with a shaft having a crank to which said wrist-pin is con-
60 nected to impart an oscillatory motion to the piston in its stroke.

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

HENRY W. NIPHER.

Witnesses:

J. H. BASSLER,
A. B. SNAVELY.