

(No Model.)

2 Sheets—Sheet 1.

H. N. GALE.
STEAM ENGINE.

No. 398,143.

Patented Feb. 19, 1889.

Fig. 2

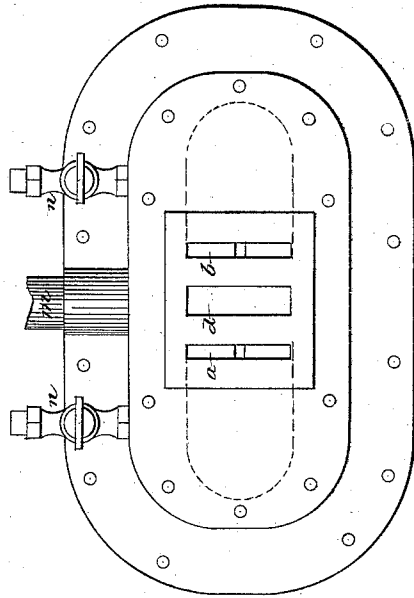
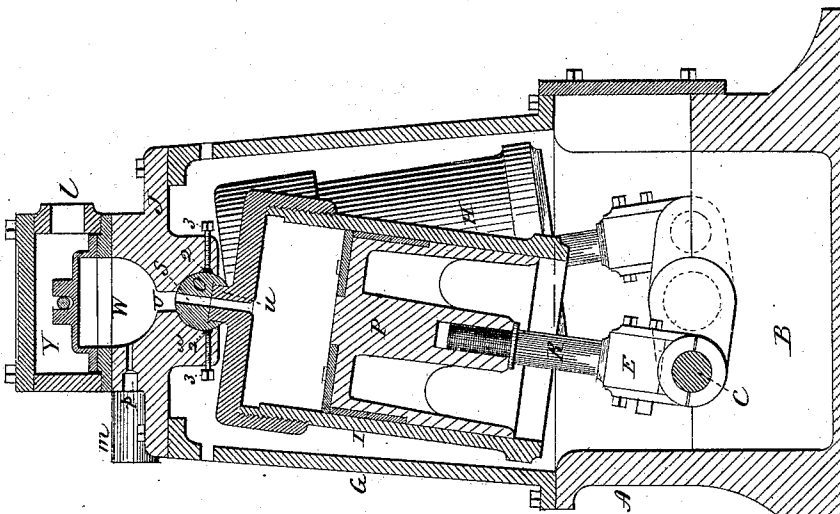


Fig. 1



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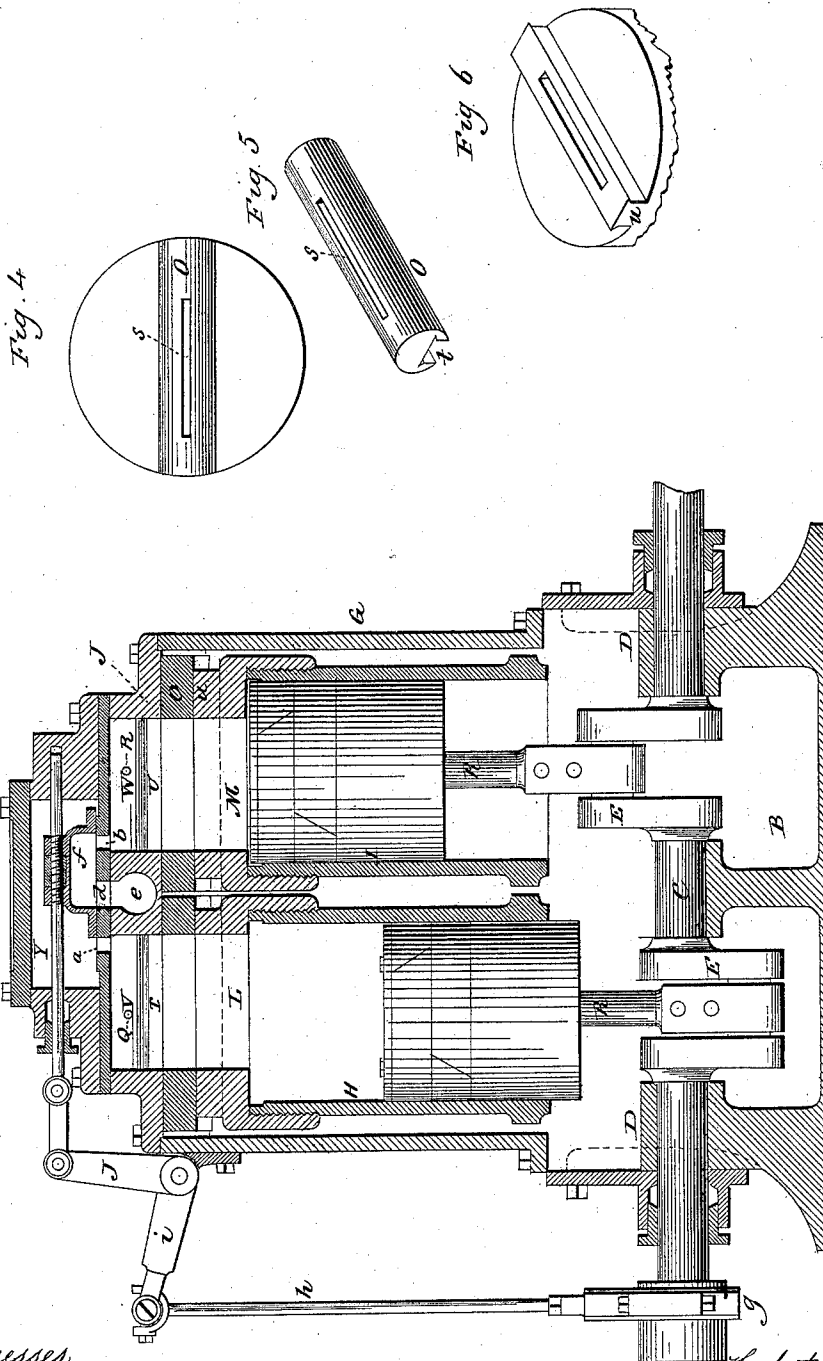
John C. ...

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STEAM ENGINE.

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UNITED STATES PATENT OFFICE.

HERBERT N. GALE, OF BRISTOL, CONNECTICUT, ASSIGNOR OF ONE-HALF TO
FRED A. DENNETT, OF SHEBOYGAN, WISCONSIN.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 398,143, dated February 19, 1889.

Application filed July 16, 1888. Serial No. 280,075. (No model.)

To all whom it may concern:

Be it known that I, HERBERT N. GALE, of Bristol, in the county of Hartford and State of Connecticut, have invented an Improvement in Steam-Engines; and I do hereby declare the following, when taken in connection with accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a vertical central section through one cylinder; Fig. 2, a top view, the steam-chest removed, showing the ports; Fig. 3, a longitudinal central section; Fig. 4, a top view of one of the cylinder-heads, showing the cylindrical rocker thereon; Fig. 5, a perspective view of the rocker detached; Fig. 6, a perspective view of the head, showing the rib to receive the removable rocker.

This invention relates to an improvement in that class of single-acting engines in which the cylinder is hung upon trunnions or pivots, so as to oscillate under the combined action of the reciprocating piston and the crank of the driving-shaft, the object of the invention being to practically suspend the cylinder from the end opposite to that through which the piston works, and so that the axis of oscillation will be beyond the extreme end of the cylinder, and whereby engines of an extremely cheap construction, and of which the parts are interchangeable, are readily produced; and the invention consists in the construction, as hereinafter described, and more particularly recited in the claims.

A represents the base, constructed to form a chamber, B, in which lubricating material may be placed in quantity, and so that the driving-shaft C may pass through the chamber. The driving-shaft is supported in bearings D, and provided with two cranks E F oppositely turned—that is, one crank turned from the shaft diametrically opposite the other crank.

Upon the base a casing, G, rests, which casing forms an inclosure for the two cylinders H I. The casing G is closed at its upper end by a cap, J. The cylinders H I are open at their lower end, but at their upper end are closed by a head, respectively, L M. The cyl-

inders are screw-threaded upon the outside at the head end, and the heads are constructed with a corresponding flange internally screw-threaded, so that the heads may be screwed onto the cylinder as a cap.

The head of each cylinder is constructed upon its outer side with a cylindrical rib, O, diametrically across the head and in a plane parallel with the plane of the driving-shaft, as seen in Figs. 1 and 4. The cap J is constructed with seats upon its inner surface, of a shape corresponding to the cylindrical rib O, and so as to more than half encircle the said rib, as seen in Fig. 1. The sides of the casing are removable, and so that the cylinder may be set into the casing through the side, the ribs O on the heads passing into the seats formed in the cap J, and so that so introduced the said rib forms a rocker upon which the cylinder may oscillate, each independent of the other. Within each cylinder a piston, P, is arranged to work in the usual manner, and from which a rigid rod, R, connects the said pistons with the respective cranks E F. The passage S for the admission of steam is made diametrically through the cylindrical rib O, and in a plane with the axis of the cylinder, as seen in Figs. 1 and 4.

In the cap an opening, T, is formed above the rib or rocker of the cylinder H, and a like opening, U, above the rocker of the other cylinder I. These openings in length correspond to the steam-passages through the rocker, but in width are so much greater as to leave the passage S always open to the opening U, irrespective of the position of the cylinder. The said openings T U lead from steam-passages, respectively V W, in the cap.

Above the cap is the steam-chest Y, of common construction. From the steam-chest Y a port, a, leads to the steam-passage V, and thence to the cylinder H, and upon the opposite side a like port, b, leads to the passage W, and thence to the other cylinder. Between the two ports a b is the exhaust-port d, which communicates with the exhaust-passage e for the escape of steam. The steam-valve f is a common D-shaped slide-valve arranged to operate over the steam-ports a b and the exhaust-port in the usual manner for a double-acting engine. It receives a recip-

cating motion from an eccentric, *g*, on the driving-shaft, through a connecting-rod, *h*, and intermediate bell-crank lever, *i j*, and so that the slide-valve is moved to admit steam, say, first through the port *a* to the cylinder H, and exhaust through the port *b* from the cylinder I, as clearly indicated in Fig. 3. Then upon the other extreme movement of the valve the position of the valve with relation to the ports will be reversed, and the exhaust will occur from the cylinder H, while the steam will enter the cylinder I, and so that the pistons will be alternately acted upon.

It will be observed that the ports from the steam-chest are at right angles to the steam-passage to the cylinder; hence the intermediate passages, V W, which are provided to give a free steam-way from the steam-chest to the cylinder. The particular shape of these passages is immaterial, it only being essential that they shall be sufficient to permit the steam to alternately enter the cylinders and escape therefrom. Steam is admitted to the steam-chamber through an opening, *l*, in the usual manner, and the exhaust is also taken away from the exhaust-chamber in the usual manner, *m*, Figs. 1 and 2, representing this outlet.

For the escape of the water of condensation suitable cocks, *n*, are provided in the escape-passages *p* from the steam-passages W. (See Figs. 1 and 2.) These cocks are operated in the usual manner for the cylinder-cocks of other engines.

In the construction of the rocker O it may be made as an integral part of the cylinder-head; but I prefer to make the rocker separate or detachable from the head, and this I do by constructing the cylindrical rocker O, as seen in Fig. 5, with a longitudinal dovetail-shaped groove, *t*, on the under side, and construct the head with a rib, *u*, diametrically across the head, as seen in Fig. 6, corresponding in shape to the groove *t* of the rocker, so that the rocker may be set onto the rib *u*, as seen in Fig. 1, and be there held by the dovetail shape of the groove and rib, as if the groove and rib were an integral part of the cap. This construction is preferable, because there must necessarily be more or less wear upon the rocker, and its renewal or repair is more easily effected by making it removable than if it were a permanent part of the head. Again, it is necessary that the rocker shall be of a true cylindrical shape, in order to work freely in its bearing, and this cylindrical shape is more easily obtained by making the rocker removable from the cylinder-head than if made an integral part of it. The cap is constructed with a projection, *w*, upon its under side, in which the seat for the rocker is formed, and as this seat more than half encircles the rocker it is easily shaped to correspond to the rocker by means of a corresponding cylindrical reamer.

To take up any play which may arise from the wear of the rocker or its seat, I construct

the seat with longitudinal grooves, in which gibs 2 are introduced to bear against the rocker below the plane of its axis and combine therewith set-screws 3, by which the gibs may be adjusted to bring the rocker to a bearing, should there be sufficient wear to permit play between the rocker and its seat. The admission of steam first to one cylinder and then to the other accordingly applies force to the pistons, tending to drive them from the cylinder, which force is communicated to the driving-shaft through the respective cranks in the usual manner for this class of engines.

The chamber B is supplied with lubricating material, so that the cranks will dip therein at each throw, and thus supply the requisite lubrication to the engine. This, however, is a common and well-known expedient.

This construction of engine permits the parts to be readily made interchangeable, is extremely simple, and enables the production of a practical engine at a very small cost.

I have represented the engine as provided with two cylinders with diametrically-opposite turned cranks on the driving-shaft; but it will be understood that, as in other construction of single-acting engines, more cylinders may be employed, if desirable.

I claim—

1. In a piston steam-engine, the cylinder-head opposite the crank end constructed with a cylindrical rocker or rib diametrically across its outside, combined with a stationary seat in shape corresponding to said rib and so as to support said cylinder by said rib, gibs 2 2, arranged longitudinally in said seat and so as to bear upon said rocker or rib below its axis, and set-screws arranged to bear upon said gibs, substantially as and for the purpose described.

2. In a piston steam-engine consisting of two or more single-acting cylinders, the pistons from the respective cylinders connecting directly to oppositely-turned cranks on the driving-shaft, the head of each cylinder opposite the crank end constructed with a cylindrical rocker diametrically across it and in a plane parallel with the driving-shaft, each of said rockers constructed with a longitudinal steam-passage leading into its cylinder, a steam-chest constructed with inlet and exhaust ports in a plane at right angles to the plane of the said passage through said rockers, and a passage between said ports corresponding to and communicating with said passage through the rockers, and a valve arranged to work upon said ports, substantially as described, and whereby steam is first admitted to one cylinder while exhausting from another, and vice versa.

3. In a piston steam-engine consisting of two or more single-acting cylinders, the pistons from the respective cylinders connecting directly to oppositely-turned cranks on the driving-shaft, the head of each cylinder opposite the crank end constructed with a cy-

lindrical rocker diametrically across it and in
a plane parallel with the driving-shaft, each
of said rockers constructed with a longitudi-
nal steam-passage leading into its cylinder,
5 a steam-chest with two ports, from one of
which a passage leads to the said passage
through the rocker of one cylinder, and from
the other port a passage leads to the steam-
passage through the rocker of the other cyl-

inder, with an escape-cock, *n*, from each of 10.
the passages between the ports and the rock-
ers, substantially as and for the purpose de-
scribed.

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