

C. GIBBS.
STEAM ENGINE.

No. 356,934.

Patented Feb. 1, 1887.

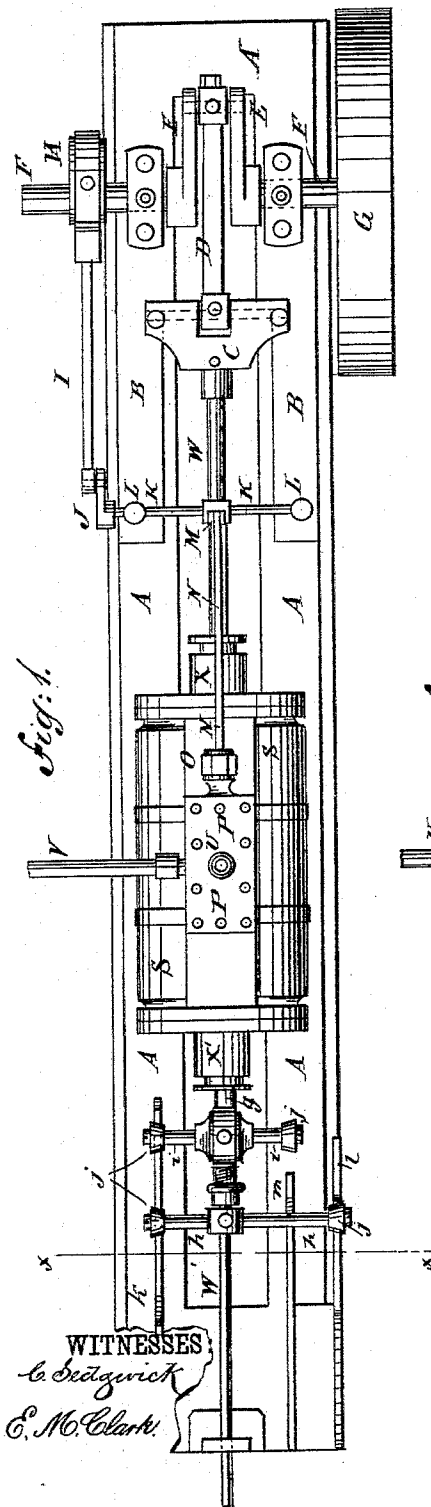


Fig. 1.

WITNESSES
C. Sedgwick
E. M. Clark

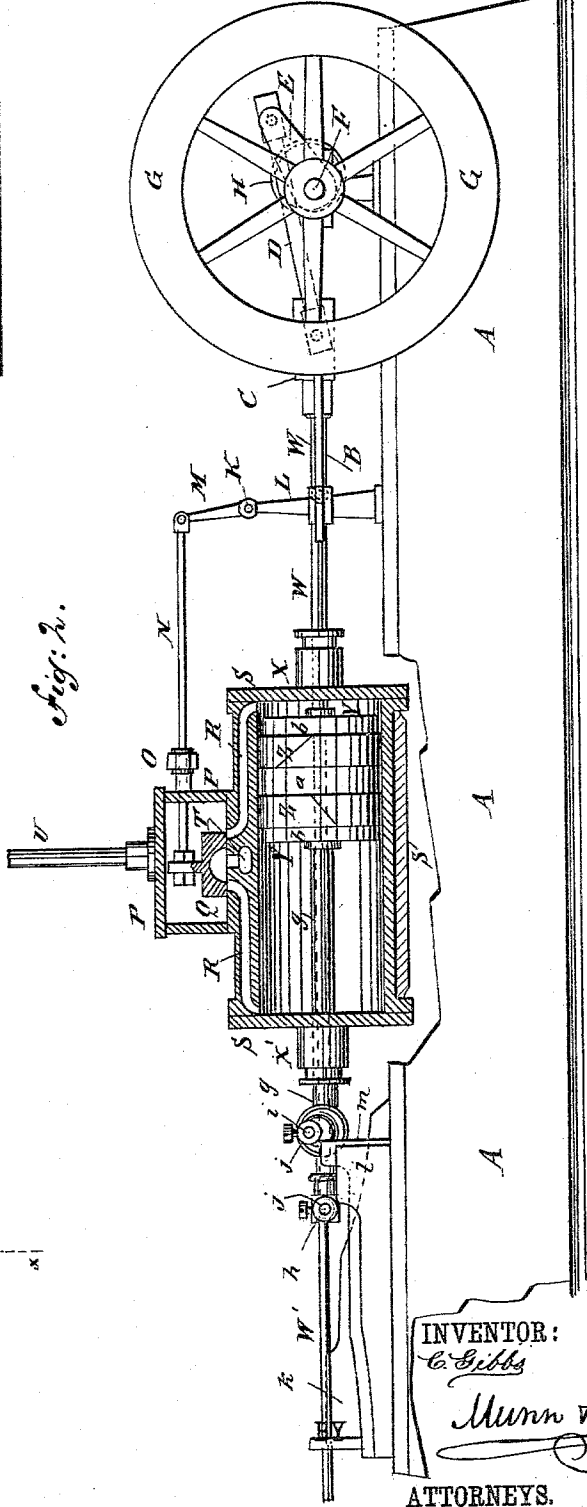


Fig. 2.

INVENTOR:
C. Gibbs
Munn & Co
 ATTORNEYS.

(No Model.)

2 Sheets—Sheet 2.

C. GIBBS.
STEAM ENGINE.

No. 356,934.

Patented Feb. 1, 1887.

Fig: 3.

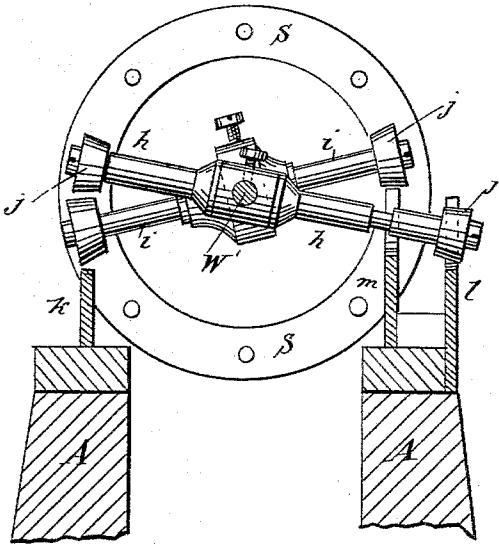


Fig: 5.

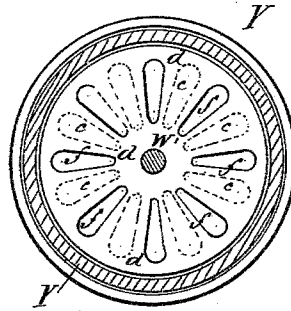
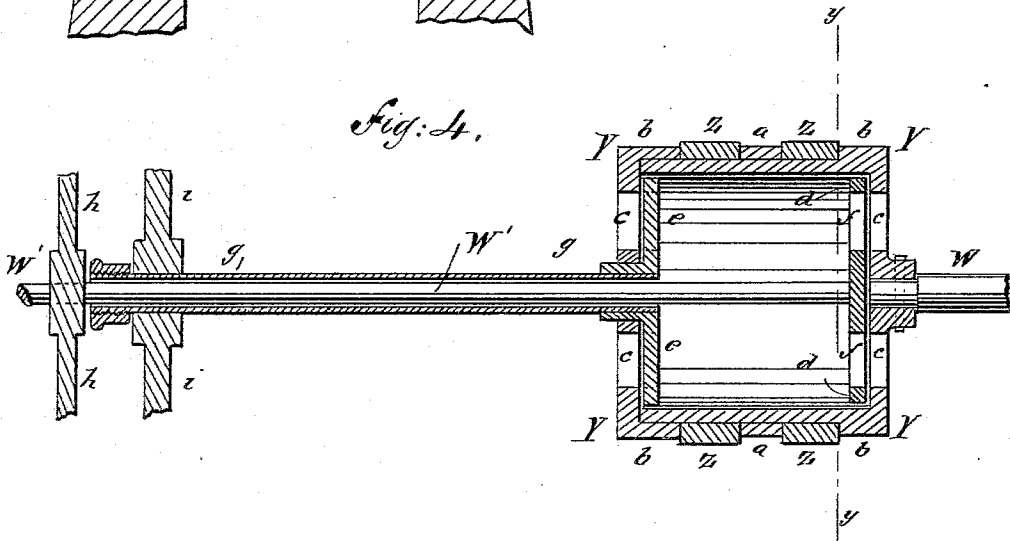


Fig: 4.



WITNESSES:

Chas. Nias.
C. Sedgwick

INVENTOR:

C. Gibbs

BY

Munn & Co.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

CHARLES GIBBS, OF NEW YORK, N. Y.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 356,934, dated February 1, 1887.

Application filed May 22, 1886. Serial No. 202,976. (No model.)

To all whom it may concern:

Be it known that I, CHARLES GIBBS, of the city, county, and State of New York, have invented a new and useful Improvement in Steam, Air, and Gas Engines, of which the following is a full, clear, and exact description.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of an engine to which my improvement has been applied, part being broken away. Fig. 2 is a side elevation of the same, partly in section and part being broken away. Fig. 3 is a sectional end elevation of the same, taken through the line *xx*, Fig. 1. Fig. 4 is a sectional plan view of the piston and piston-rods, and showing in section the middle parts of the cross-bars. Fig. 5 is a sectional end elevation of the piston, taken through the line *yy*, Fig. 4.

The object of this invention is to provide steam, air, and gas engines constructed in such a manner as to lessen the amount of fluid required to work the engines and to cushion the pistons as they approach the ends of their strokes, and thus lessen the strain upon the cylinders.

The invention consists in the construction and combination of various parts of the engine, as will be hereinafter fully described, and then claimed.

A is the bed or foundation for the engine, and B are the ways upon which the piston-rod cross-head C slides. To the cross-head C is hinged the end of the connecting-rod D, the other end of which is pivoted to the crank E of the crank-shaft F. To the crank-shaft F is attached a large fly-wheel, G, which serves also as a pulley to receive a driving-belt.

To the crank-shaft F is also attached an eccentric, H, the eccentric-rod I of which is pivoted to an arm, J, formed upon or attached to the short shaft K. The shaft K rocks in bearings in standards L, attached to the ways B or foundation A, and to it is attached or upon it is formed an arm, M, to which is pivoted the end of the valve-rod N. The valve-rod N passes through a stuffing-box, O, in the end of the valve-chest P, and is attached to the slide-valve Q, by the movement of which the inlet-ports R are successively uncovered to admit

the fluid to the cylinder S, and are successively connected with the exhaust-port T. With the valve-chest P is connected the inlet-pipe U, and with the exhaust-port T is connected the outlet-pipe V.

As thus far described there is nothing new in the construction.

To the cross-head C is attached the end of the piston-rod W, which passes through a stuffing-box, X, in the forward head of the cylinder S, and to it, within the said cylinder, is attached the piston Y. The piston Y is made about one-third or one-half the interior length of the cylinder S, and is provided near its end with packing-rings Z, which are kept apart by a band, *a*, of a less thickness than the said rings, placed between them upon the said piston. The packing-rings Z are kept in place upon the piston S by shoulders or bands *b*, formed upon or attached to the ends of the said piston.

In the ends of the piston Y are formed oblong radiating slots *c*, as shown in dotted lines in Fig. 5, or other shaped apertures, to serve as valve-openings, which openings are covered and uncovered by the valves *d e*, placed against the inner sides of the said ends and provided with openings *f*, corresponding in shape, size, and position with the openings *c* in the piston ends. The forward valve, *d*, is attached to a rod, W', and the rear valve, *e*, is attached to the end of a tubular rod, *g*, placed upon the said rod W' and passing through the stuffing-boxes in the rear ends of the piston Y and cylinder S, so that the forward valve, *d*, will be opened and closed by slightly rocking the said rod W', and the rear valve, *e*, will be opened and closed by slightly rocking the tubular rod *g*.

To the rear part of the rod W' and to the rear end of the tubular rod *g* are attached, respectively, cross-bars *h i*, which have small friction-rollers *j*, pivoted to their ends to roll along the cams *k l m*. The cam *k* is placed on one side of the rods W' *g*, and in such a position as to operate one end of the cross-bars *h i* as the piston Y approaches the end of its rear movement, to close the forward valve, *d*, and open the rear valve, *e*. The cams *l m* are placed upon the other side of the rods W' *g* and at different distances therefrom, and are so ar-

ranged that the rear valve, *e*, will be closed and the forward valve, *d*, will be opened as the piston Y approaches the end of its forward movement.

5 When the piston Y is moving to the rearward, the valve *d* is opened and the valve *e* is closed, so that the live steam will enter the said piston Y through the open valve *d*, and will press against the closed valve *e* in driving the
 10 said piston. As the piston Y approaches the end of its rearward movement the valve *d* is closed, cutting off the live steam, and the valve *e* is opened, so that the piston Y will cushion itself upon the steam within it and the small
 15 quantity of exhaust-steam remaining in the rear end of the cylinder S, and so that the expansion of the steam will tend to start the piston in the reverse direction. When the live steam begins to enter the rear end of the cylinder S, the piston
 20 Y is already full of steam, so that amount of steam will be saved at each stroke of the piston. As the piston Y approaches the end of its forward movement the rear valve, *e*, is closed, shutting out the live steam, and the forward valve, *d*, is opened, so that the said piston will cushion itself upon the steam within
 25 it and the small quantity of exhaust-steam left in the forward end of the cylinder S, and so on, as long as the engine is operated.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an engine, the chambered or hollow piston having in its ends valves, the valve in one end arranged to remain closed and the valve in the other end arranged to remain open during each stroke or movement of the piston, substantially as and for the purpose set forth.

2. In an engine, the combination, with cylinder S, the piston-rod W, and the hollow piston Y, having apertured ends, of the valves *d e*, the rod W', the tubular rod *g*, placed upon the said rod W' and connected with the rear valve, *e*, the cross-bars *h i*, attached, respectively, to the rod W' and the tubular rod *g*, and the cams *k l m*, engaging with the said cross-bars, substantially as herein shown and described, whereby the said valve will be opened and closed to admit live steam into the said piston through its opposite ends successively, as set forth.

CHARLES GIBBS.

Witnesses:

JAMES T. GRAHAM,
 C. SEDGWICK.