# W. Swayne.

## Piston.

No. 76268 Patented Mar. 31, 1868.

Fig. 1.

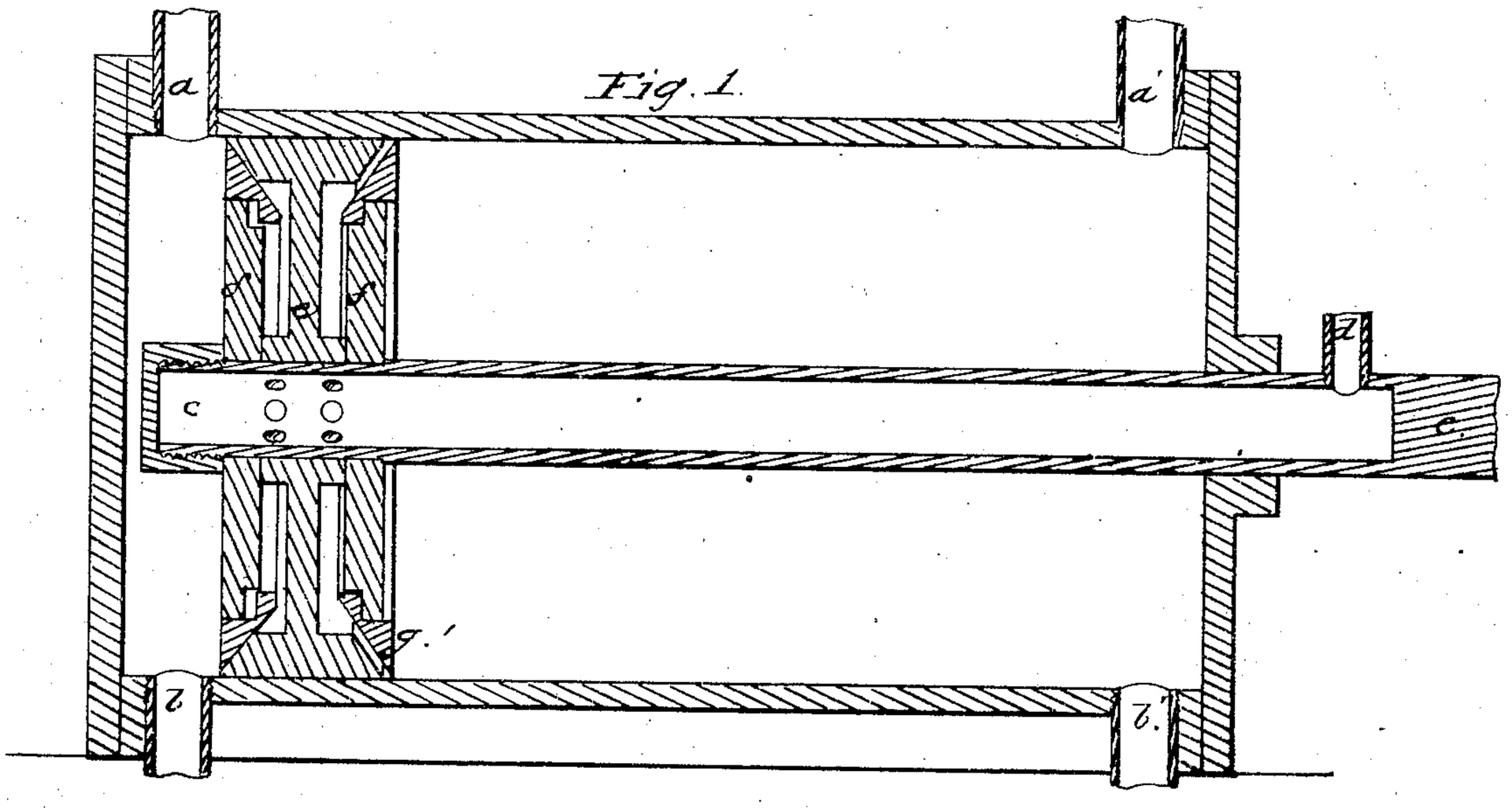



Fig. 3.

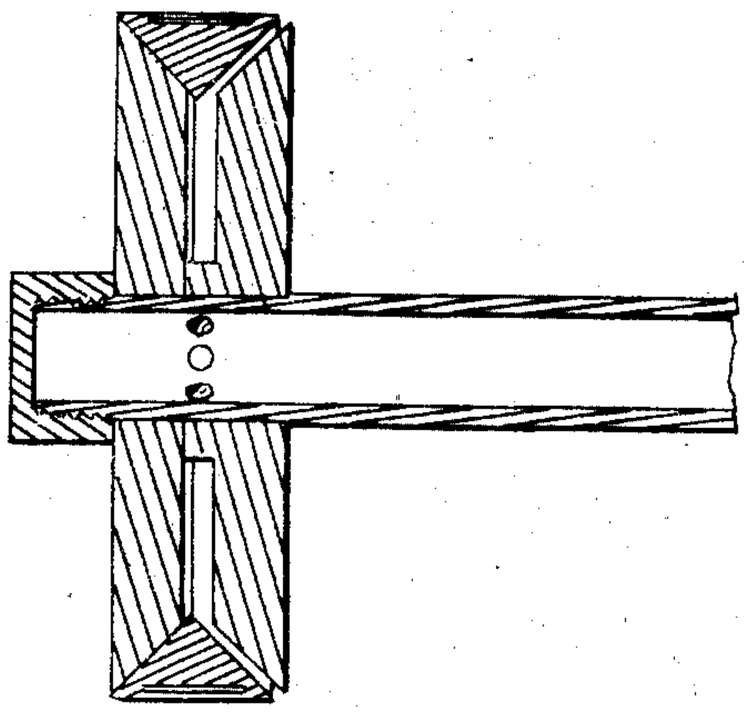
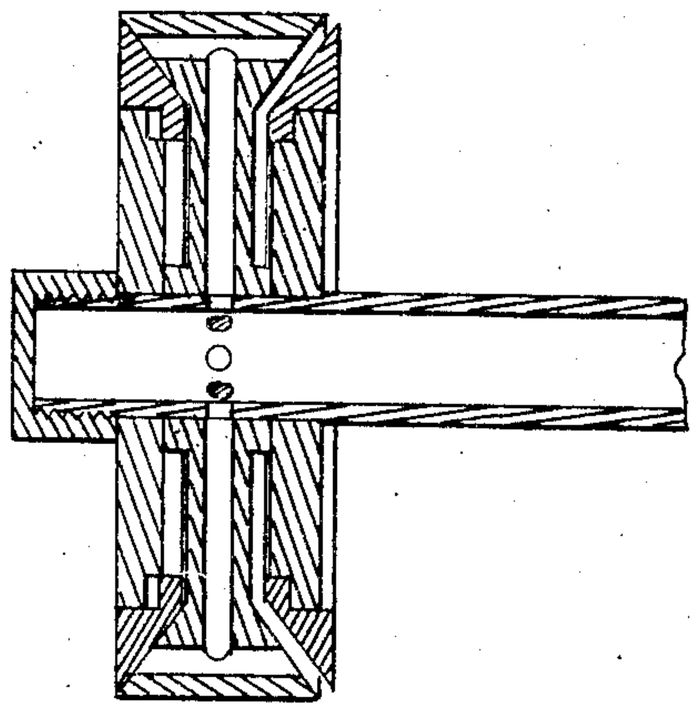


Fig. 2.



Witnesses; J. F. B. Cowles
John F. Halsted.

Wager Swayne

# United States Patent Office.

WAGER SWAYNE, OF THE UNITED STATES ARMY.

*Letters Patent No.* 76,268, *dated March* 31, 1868.

## IMPROVEMENT IN PISTONS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, WAGER SWAYNE, of the United States Army, have invented certain Improvements in Hot-Air-Engine Pistons; and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification, is a description of my invention sufficient to enable those skilled in the art to practise it.

In caloric or hot-air engines much difficulty is experienced with their pistons and cylinders, consequent upon the friction between said parts. The dry heat of the motor evaporates and chars oil or other greasy material applied for lubrication; hence hot-air engines have usually been constructed with single-acting upright cylinders, open at the top, and the pistons have been made as long plungers, packed at the top, generally with a cupped leather packing, the bodies of such long pistons being filled with some slow conductor of heat, so as, in a measure, to insulate the piston-packings from the high temperatures to which the bottoms of such pistons are subjected. It is, however, an object to make use of double-acting cylinders and higher temperatures, the latter involving high-pressures. With double-acting cylinders, the heat and pressure come alternately against both ends of the piston; hence recourse must be had to some means for reducing the temperature of the cylinder and piston, and for lubricating the frictional surfaces of both with material which will not leave a residuum.

My invention consists in such a construction of a piston for use in the cylinders of hot-air engines as will automatically discharge an annular film or stream of water upon the surface of the cylinder, and in double-acting cylinders upon either side of the piston alternately, on the exhaust side of the piston, at each movement thereof. This operates to reduce the temperature of the piston and cylinder, the water absorbing the heat therefrom, and conducting it off through the exhaust-passages with the exhaust-current of hot air, gases, and steam evolved from the water, the water serving also to cleanse the cylinder, at each stroke of the piston, from any of the products of combustion that may be deposited therein. The drawing shows, in

Figure 1, a sectional elevation of a horizontal double-acting cylinder, containing a piston constructed so as to embody my invention, and to operate as before set forth.

Figures 2 and 3 are sectional elevations of modified forms of my improved piston, so constructed as to have the same mode of operation as that shown in fig. 1.

The cylinder is provided with inlet-passages *a a′* and exhaust-passages *b b′*, through which the motor enters and escapes, the times of each entrance and egress being controlled by suitable valves, not shown, as they and the means by which they are operated form no part of my present invention. The piston-rod *c* is made tubular, and at *d*, or wherever convenient, is a nipple, to which a jointed tube or a flexible hose is to be attached, to conduct the supply of water which is to be discharged through the piston, as before described. In fig. 1, the body of the piston is made up of a central part, *e*, and two heads, *f f*, arranged as shown, so as to receive and retain the annular valves *g g′*, which are so fitted as to have, under the forces brought to bear upon them, a slight range of motion in the direction of the axis of the cylinder. The water enters the piston under a head or pressure sufficient to move outward the valve *g* or *g′*, which is on the exhaust side of the piston, thus overcoming any "back pressure" which tends to keep the water-valve on its seat.

Suppose the motor flowing through inlet *a*, with inlet *a′* and outlet *b* closed, and outlet *b′* open, then the pressure of the motor, which is superior to the pressure of the water in the piston, will close the valve *g*, and the pressure of the water in the piston, which is greater than the back pressure in the cylinder on the exhaust side of the piston, will open valve *g′*, so that, as the piston moves toward *a′* and *b′*, the water, flowing through the piston-rod and head, will force valve *g′* off from its seat in the piston-head, and will keep it off therefrom till inlet *a′* opens, and the valves controlling the other inlet and outlets change their position. While valve *g′* is off from its seat, as shown in fig. 1, there is an annular opening all around the piston, through which water escapes to lubricate and cool the cylinder through one stroke of the piston, which is also kept cool by the circulation of water through it. When inlet *a′* and outlet *b* open, and inlet *a* and outlet *b′* close, then the superior pressure of the motor overcomes the pressure of the water on valve *g′*, which consequently closes, and as the pressure of the water within the piston on valve *g* is superior to the "back pressure" against said valve, it opens, so that during the return stroke of the piston toward *a* and *b*, the cylinder is lubricated and cooled by the water which escapes from the piston past valve *g*.

In single-acting cylinders, a piston having but one water-valve, operating as described, may be employed. In fig. 2, the water-passages in the piston-head are varied slightly from those shown in fig. 1. In fig. 3, the piston-head is made in two parts, enclosing a ring, which acts as a double valve, discharging water first on one side and then on the other of the piston, but always on the exhaust side.

In all the figures, the mode of operation of the piston and of the water-current is precisely the same, and the drawings show the construction and its modification so clearly as to render unnecessary any further description.

I claim a piston, constructed substantially as described, so as to operate automatically, during nearly the whole movement of the piston by its motor, to discharge water against the inner surface of the cylinder on the exhaust side of the piston, for the purposes specified.

WAGER SWAYNE.

Witnesses:

J. B. CROSBY,

JOHN J. HALSTED.