(No Model.)

# E. I. HOWARD.

## AIR INJECTOR FOR STEAM PUMPS.

No. 367,524. Patented Aug. 2, 1887.

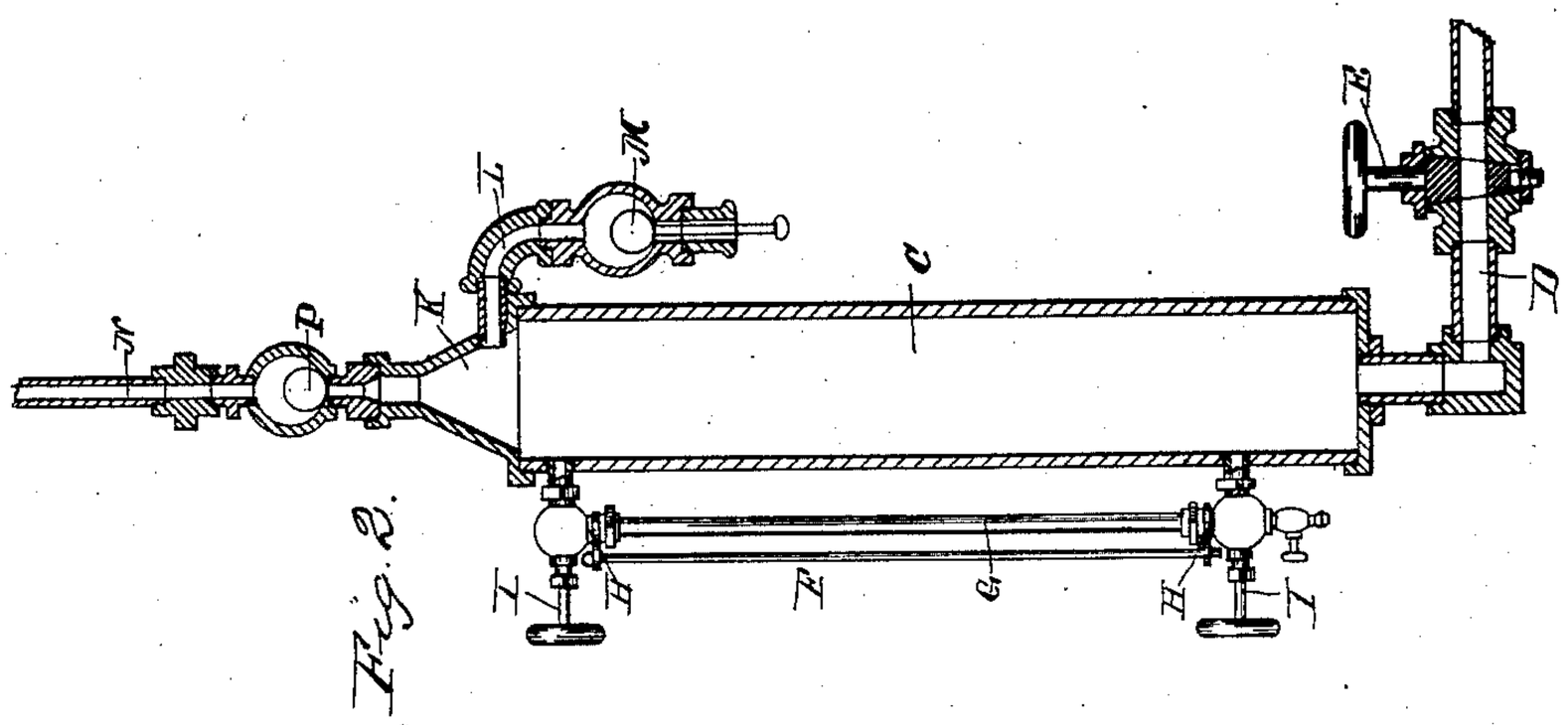


Fig. 2.




Fig. 1.

Witnesses
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# UNITED STATES PATENT OFFICE.

EDMUND I. HOWARD, OF JACKSONVILLE, FLORIDA, ASSIGNORS OF ONE-HALF TO J. A. CLOUD, OF PHILADELPHIA, PENNSYLVANIA.

## AIR-INJECTOR FOR STEAM-PUMPS.

SPECIFICATION forming part of Letters Patent No. 367,524, dated August 2, 1887.

Application filed October 11, 1886. Serial No. 215,933. (No model.)

*To all whom it may concern:*

Be it known that I, EDMUND I. HOWARD, a citizen of the United States, residing at Jacksonville, in the county of Duval and State of Florida, have invented a new and useful Improvement in Air-Injectors for Steam-Pumps, of which the following is a specification.

My invention relates to an improvement in air-injectors for steam-pumps; and it consists in the peculiar construction and combination of devices that will be more fully set forth hereinafter, and particularly pointed out in the claim.

The object of my invention is to provide an apparatus for continually supplying air to the air-chamber of a steam-pump while the latter is in operation, and thus prevent the air in the air-chamber from being exhausted; and this object I attain by the construction hereinafter described, and illustracted in the accompanying drawings, in which—

Figure 1 is a perspective view of a portion of a steam-pump with my air-injector attached thereto. Fig. 2 is a vertical sectional view of the air-injector.

A represents the cylinder of a steam-pump, such as are in use for forcing the water into reservoirs, and B represents the air-chamber.

C represents a vertical cylinder, which forms the body or main portion of my air-injector, and is provided at its lower end with a pipe, D, which is connected to the cylinder of the steam-pump. This pipe D is provided with a stop-cock, E, whereby communication may be established between the cylinders A and C or cut off at will. On one side of the cylinder A is located a water-gage, F, of the usual construction, comprising a transparent vertical glass tube, G, connected at its upper and lower ends with the cylinder by means of ferrules H, and thereby communicating at both ends with the cylinder C. The usual stop-cocks, I, are provided for the water-gage, whereby communication between the glass tube and the cylinder may be cut off in the event that the glass tube shall break, and also to enable the glass tube to be blown through in order to clear it. The upper end of the cylinder C is provided with a conical cap, K.

L represents an inlet-pipe, which extends from one side of the cap K, and is provided with an upwardly-opening check-valve, M, the function of which is to admit air to the cylinder C and prevent the air from being discharged therefrom. From the upper end of the cap K extends a pipe, N, the upper end of which is connected to the air-chamber B of the steam-pump, near the lower end of the said air-chamber. This pipe is provided with a stop-cock, O, to cut off communication between the cylinder C and the air-chamber B, when desired.

P represents a check-valve, which is arranged in the pipe N immediately above the cap K. The function of this check-valve is to permit air to be forced from the cylinder C into the air-chamber B, and to prevent the air from returning into the cylinder C.

The operation of my invention is as follows: At the drawing or suction stroke of the pump-piston a vacuum is produced in the cylinder C to a greater or less extent, according to whether the stop-cock E is fully open or partly closed. As soon as the vacuum is formed in the cylinder C the check-valve M is opened by the external pressure of the air, and the air rushes in through the pipe L and fills the cylinder C. On the return or forcing stroke of the pump-piston the check-valve M closes and water is forced from the pump-cylinder through the pipe D into the lower portion of the cylinder C, thereby compressing the air in the said cylinder and forcing it upwardly toward the check-valve P and through the pipe N into the air-chamber.

From the foregoing it is obvious that the air-chamber will be continuously supplied with air under pressure during the operation of the pump, and thus prevent water from being forced from the pump-cylinder into the air-chamber. By means of the stop-cock E the quantity of air which is forced into the air-chamber may be regulated at will.

It will be observed that the escape-pipe N communicates with the conical cap K at the extreme upper end of the cylinder C, and that the shape of the conical cap is such that all the air in the cylinder will be forced therefrom through the cap K and past the valve R into the pipe N at each forcing-stroke of the pump-piston, thus entirely exhausting the air from the cylinder.

I am aware that it has been heretofore proposed to provide a vertical cylinder with a stop cock for communication with a pump-barrel, an air-inlet valve, and an outlet-valve for communicating with an air-chamber, and this, broadly, I disclaim. Such devices, however, have been heretofore provided with discharge-valve pipes extending from one side of the cylinder at a point nearly but not quite at the upper end thereof. Such construction is disadvantageous, for the reason that it does not admit of all the air being discharged from the cylinder at each forcing-stroke of the pump-piston, but, on the contrary, causes a small portion of the air to be confined below the top of the cylinder and above the inner end of the valved discharge-pipe. The air thus confined in the upper end of the cylinder becomes heated and expanded by the pressure of the water in the cylinder, and will not pass to the air-chamber of the pump, thereby destroying, in a very great measure, the efficiency of the apparatus. I remedy this defect by providing the conical eduction-cap K at the extreme upper end of the cylinder, and by connecting the valved discharge-pipe N to the extreme upper end of the cap, thus facilitating the escape of the air from the cylinder, and preventing any portion thereof, however apparently inconsiderable, from becoming confined and heated in the cylinder.

I have one of my improved air-injectors in successful operation on a steam-pump of large capacity in the city of Jacksonville, Florida, and have demonstrated by actual test the truth of the foregoing statements.

Having thus described my invention, I claim—

The air-injector for the air-chambers of pumps, comprising the cylinder C, provided with the pipe D, to admit water under pressure from the pump cylinder, the conical eduction-cap K at the extreme upper end of the cylinder, and the valved pipe N, extending from the extreme upper end of the cap, to communicate with the air-chamber of the pump, and the air-inlet pipe L, communicating with the cylinder C, below the apex of the eduction-cone, and having the check-valve M, substantially as described.

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

EDMUND I. HOWARD.

Witnesses:
C. BUCKMAN,
W. L. BETTES.