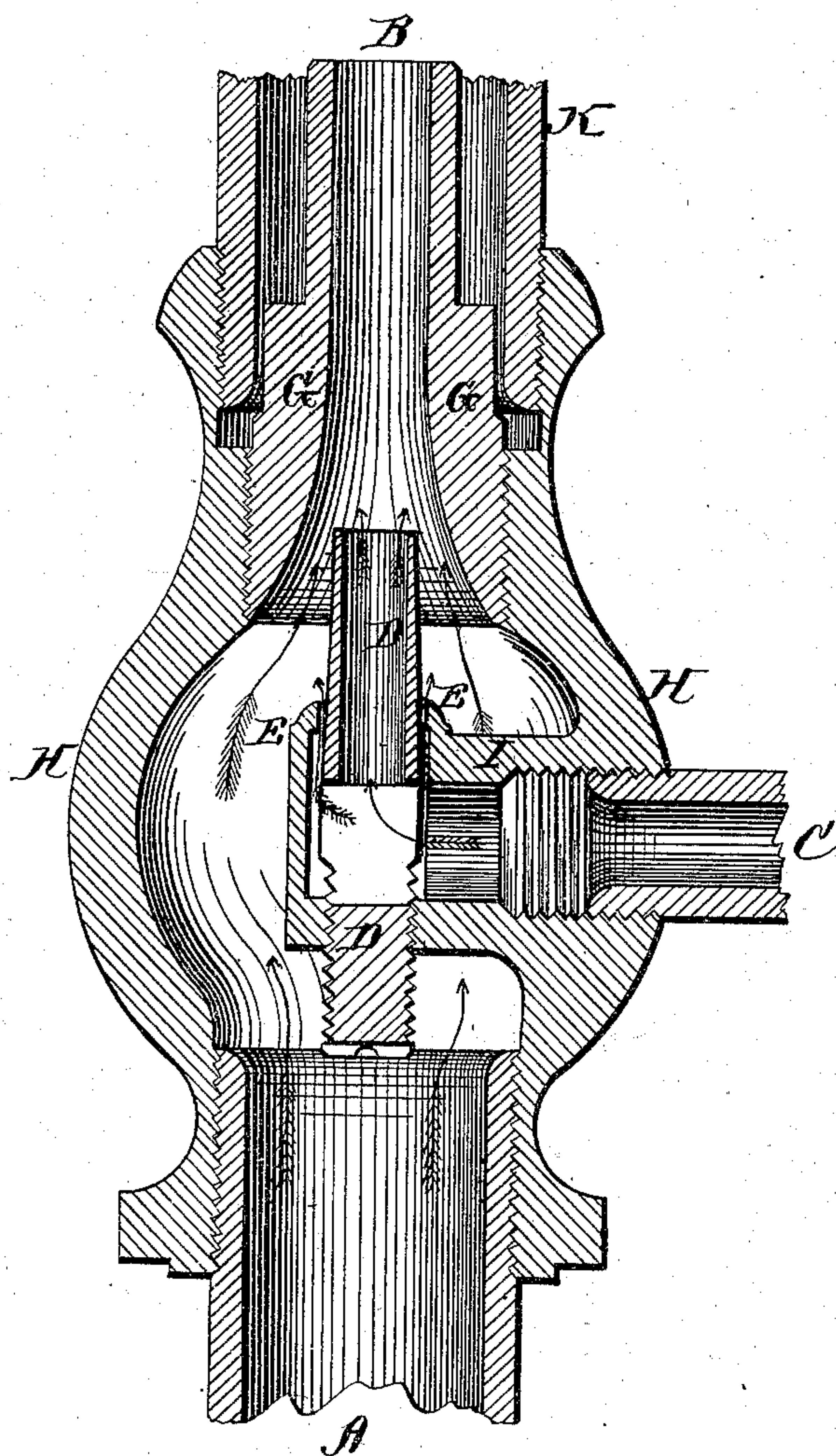


S. & J. BENSON.
Steam Injectors.

No. 137,651.

Patented April 8, 1873.



Witness:
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UNITED STATES PATENT OFFICE.

SAMUEL BENSON AND JAMES BENSON, OF CENTRALIA, ILLINOIS.

IMPROVEMENT IN STEAM-INJECTORS.

Specification forming part of Letters Patent No. **137,651**, dated April 8, 1873; application filed February 21, 1873.

To all whom it may concern:

Be it known that we, SAMUEL BENSON and JAMES BENSON, of Centralia, in the county of Marion and in the State of Illinois, have invented certain new and useful Improvements in Steam-Injectors; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing and to the letters of reference marked thereon making a part of this specification.

Our invention relates to that class of directing steam-pumps or steam water-drivers known as injectors; and the nature of our invention consists in the construction and arrangement of an injector or steam-pump with adjustable water-nozzle and one or more adjustable steam-nozzles, which injector may be applied to any of the common uses to which the ordinary cylinder and piston lift and force pumps may be used, or by locating them at suitable intervals along the line of pipe between the water-supply and point of discharge, water may be forced to any point required.

In order to enable others skilled in the art to which our invention appertains to make and use the same, we will now proceed to describe its construction and operation, referring to the annexed drawing, which represents a vertical section of our invention.

H represents the chamber; A, the suction-pipe; K, the discharge-pipe; and G, the contracted and adjustable water-nozzle. C represents the steam-pipe terminating in the nozzle-holder I, and D and E are the adjustable steam-nozzles. The chamber H is a plain casting of suitable metal, into the side of which the steam-pipe or nozzle-holder I is cast or otherwise secured. The top and bottom ends of the chamber are threaded for the reception of the standard sizes of steam or gas pipe; or these ends may be provided with suitable flanges, or other form of couplings, to connect with the various pipes to which the pump may be attached. The upper or contracted water-nozzle G is screwed into the neck of the chamber H, thus permitting of a vertical movement to allow its adjustment with reference to its height above the steam-nozzles D and E. The steam-nozzle E is formed in the steam-pipe and nozzle-holder I. The movable

nozzle D is bored to the required size and depth. Near its lower end it is perforated through its sides in a line with the steam-passage C to admit the steam passing into it and from there upward, as indicated by the bent and straight short arrows. The lower end of the nozzle D is made tapering, the large end downward, and tapering upward to the opening of the nozzle E, thus admitting of the partial opening and closing of the nozzle E.

These nozzles may be multiplied as often as may be deemed necessary, according to the volume and height of the column of water to be raised, by widening the base of the nozzle-holder I, and then preparing the next or movable nozzle so as to receive another nozzle inside it, with suitable passages for steam, and so on.

The operation is as follows: The pump being placed in position, and the proper connections being made between the steam-boiler and pump and the water-supply and point of delivery, steam is admitted into the pipe C. The steam rushes through the pipe and out at the openings E E and D, as indicated by the short arrows, driving the air out of the chamber and pipes, and is immediately followed by the water, the course of which is represented by the long arrows. The water now comes in contact with the upward current of steam at E, which accelerates its motion toward the opening of the nozzle D. Here it receives additional impetus, and is driven forcibly into the tapering nozzle G, and thence outward into the pipe K; thence again to its point of final discharge. If the resistance be too great for one pump to perform the required service, others may be added at proper intervals, the discharge-pipe of the lower one forming the suction-pipe of the next higher, and so on, each pump being connected with steam communication to the boiler.

As will be seen, the water-nozzle and steam-nozzle are adjustable to each other with reference to the nature of the work to be accomplished.

When the water-supply and point of discharge are in close proximity, it requires comparatively little force to project the water. The upper or water nozzle may be raised, allowing free ingress of water, as the steam-

opening may be more than necessary for economical use, and as the choking off by the throttle would deaden the steam, and so cause its more ready absorption by the water, in order to secure sharp quick action of the initial pressure. The nozzle D is now raised, which closes the nozzle E to the required size.

In cases where the opposite of this is to be dealt with, the water-nozzle is lowered to the proper point, thus affording a lateral brace to resist the action of the downward pressure of the water-column, bringing the water close in and over the upward action of the steam, at the same time restricting the inflow of the water to the actual capacity to deliver, thus preventing the gurgling and churning of the water around the nozzle, which absorbs steam without benefit and impairs the suction, and, as a necessary result, gorges the pump, the steam accumulating around the nozzle driving the water down the suction-pipe, and thus breaking the stream. This difficulty we find to be practically obviated by this adjustment of the upper nozzle in connection with the adjustment of the opening of the steam-nozzle, whereby an equilibrium is established that can only be definitely reached by actual adjustment when the pump is put up, so varied are the conditions under which they are operated.

The economical operation of a pump in many cases is a matter of prime necessity, when fuel is scarce, boiler capacity limited, and the duty required is large; hence it is evident that no arbitrary adjustment can meet all cases.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In an injector or steam-pump of the class herein referred to, the combination of an adjustable water-nozzle and one or more adjustable steam-nozzles, for the purposes set forth.

2. The chamber H, having pipes A, K, and C, and nozzle-holder I, in combination with the stationary steam-nozzle E, one or more adjustable steam-nozzles, D, and an adjustable water-nozzle, G, all substantially as and for the purposes herein set forth.

In testimony that we claim the foregoing we have hereunto set our hands this 28th day of January, 1873.

SAMUEL BENSON.
JAS. BENSON.

Witnesses:

SAML. STORER,
GEORGE HEPPERT.