E. HAMER, J. METCALFE & E. DAVIES.

Injector.

No. 221,059. **Patented Oct. 28, 1879.**

Fig. 6.

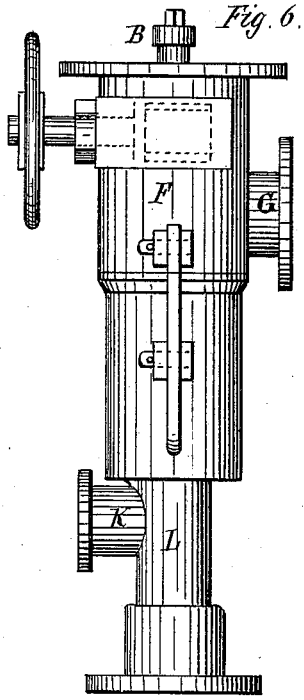


Fig. 8.

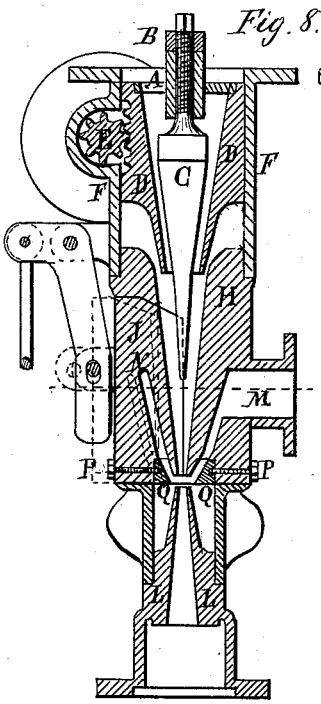


Fig. 7.

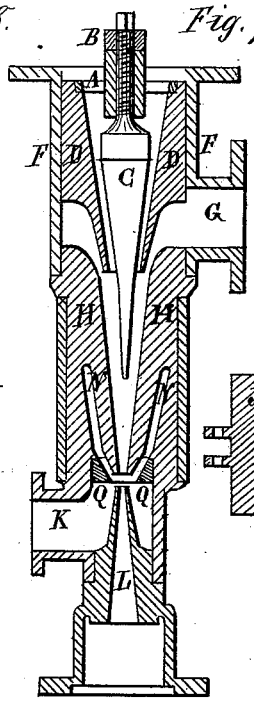


Fig. 9.

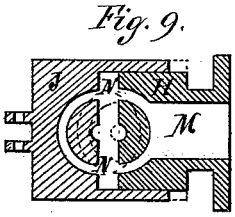


Fig. 1.

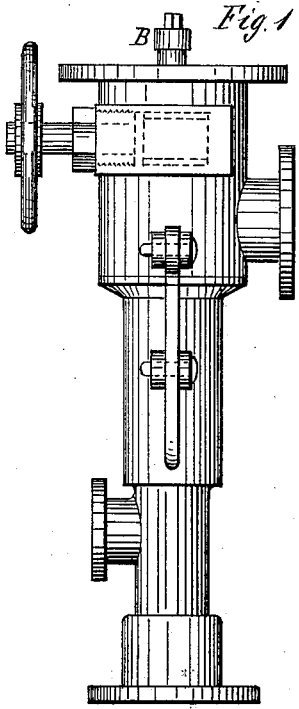


Fig. 3.

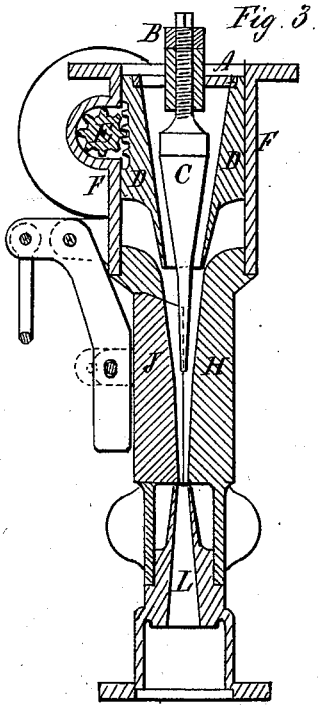


Fig. 2.

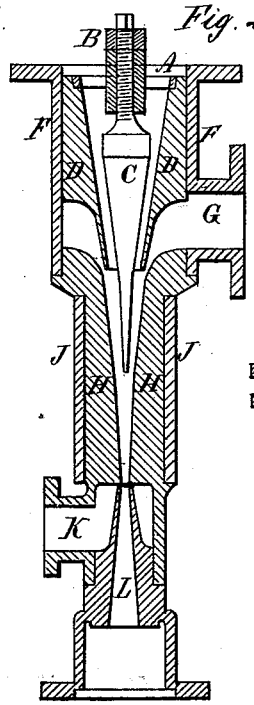


Fig. 5.

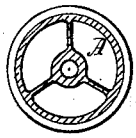
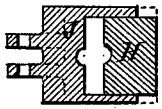


Fig. 4.



Witnesses
W. L. L. Leonard
Henri Guillaume

Inventors
Edward Hamer
James Metcalfe
Edward Davies
per Henry Orth atty

UNITED STATES PATENT OFFICE.

EDWARD HAMER AND JAMES METCALFE, OF ABERYSTWYTH, COUNTY OF CARDIGAN, AND EDWARD DAVIES, OF LLANDINAM, COUNTY OF MONTGOMERY, KINGDOM OF GREAT BRITAIN.

IMPROVEMENT IN INJECTORS.

Specification forming part of Letters Patent No. **221,059**, dated October 28, 1879; application filed May 18, 1878; patented in England, October 29, 1877.

To all whom it may concern:

Be it known that we, EDWARD HAMER and JAMES METCALFE, both of Aberystwyth, in the county of Cardigan, and EDWARD DAVIES, of Llandinam, in the county of Montgomery, in the Kingdom of Great Britain, have invented new and useful Improvements in Apparatus for Feeding Locomotive and other Steam Boilers or Generators, called "Injectors," for which we have obtained Letters Patent in England bearing date the 29th of October, 1877, and numbered 4,014, applicable also for raising and forcing liquids for other purposes; and we, the said EDWARD HAMER and JAMES METCALFE and EDWARD DAVIES, do hereby declare the nature of the said invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement thereof—that is to say:

This invention has reference to further improvements upon the apparatus and injector for which Letters Patent No. 591 were granted to us in England bearing date 14th February, 1876; and it consists of an improved form of injector for feeding boilers or for raising or forcing liquids.

The improvements in the injector consist in forming that part known as the "combining-cone" (wherein the steam and water are brought into contact) in such a manner that its area and capacity may be easily and rapidly increased or diminished for facility in starting. For this purpose we construct that portion of the piece in which the combining-cone is formed in two parts capable of sliding laterally toward and from each other in a direction transverse to the axis of the cone, and so to increase or diminish the area of the nozzle of the cone. Connected to the sliding part of the piece in which the combining-cone is formed is a lever actuated by a handle or hand-wheel and screw or other suitable mechanism, so that the attendant may have it entirely under control, and so facilitate the starting of the injector.

When ready for starting the sliding part is drawn backward to give an increased free section to that part of the cone. The exhaust-steam and water are then admitted and pass through the combining-cone. As soon as this is effected the sliding part is forced forward by the lever, and forms a complete cone of the proper size for the continuous working of the injector with exhaust-steam.

In steam-engines provided with injectors of this class we usually provide the exhaust or blast pipe with a perforated plate adapted to be rotated upon a second perforated plate, the perforations in both being arranged to register with each other when in proper position, and of sufficient area to permit the whole of the exhaust steam to escape.

When the injector is at work one of the perforated plates is made to revolve or slide upon the other in order to diminish the area of the holes to an extent corresponding to the quantity of the exhaust-steam used by the injector.

Figures 1, 2, 3, 4, and 5 show various views, in elevation and section, of our improved injector.

A is the exhaust-steam inlet, the shape and position of the openings being shown on Fig. 5. B is a nut for adjusting the spindle C so as to regulate the size of the steam-opening through the steam-cone D. The position of this steam-cone can also be regulated by the pinion E, Fig. 3, working into teeth on the outside of the cone D. F is the outer casing, having at the top a flange to receive the steam-pipe, and on one side the feed-water inlet G. Below this casing is the combining-cone, made in two parts, H and J. (Shown also in horizontal section, Fig. 4.) The part H is screwed to the casing F, and is formed so as to receive the slide J.

In manufacturing that portion of the piece in which the combining-cone is formed, the two pieces H and J are first carefully fitted to each other, and then, having been firmly secured, the combining-cone or chamber is bored by suitable boring-bits. The movable part J is actuated by the lever shown on Fig. 1, and is represented on Fig. 4 as drawn backward, so as to leave an opening, the closed position being represented by dotted lines, and in Fig. 3 the part J is represented as closed, its drawn-back position being represented by the dotted lines.

At the lower part of the combining-cone is the overflow-opening K, and screwed into the

lower end of the combining-cone is the discharge-cone L, with flange for connecting it to feed-pipe of boiler.

It must be understood that the details of construction may be varied, the important feature being the construction of that portion in which the combining-cone is formed in separate parts capable of sliding laterally toward and from each other, and although in the arrangements we have shown in the drawings above referred to only one of the parts by which the combining-cone is formed is shown to be movable, it will be readily seen that two or more such parts could, in a similar manner, be made movable.

Another arrangement of our improved injector, constructed to allow of the admission of a further quantity of exhaust-steam around the lower end of the combining-cone, is shown in the other figures.

Fig. 6 is an elevation; Figs. 7 and 8, vertical sections taken at right angles to each other, and Fig. 9 is a horizontal section through the combining-cone.

In these views many of the parts are similar in construction and position to those already described, the additional parts being the inlet M for the additional exhaust-steam, the circular chamber N, formed round the combining-cone, the split cone Q Q, made in two pieces and forming the extra combining-cone, and the screws P P, one of which is inserted in each half of the split cone. By this arrangement the body of steam and water passing from the combining-cone is superheated, and passes through the discharge-cone and into the boiler at an increased temperature.

Having now particularly described and ascertained the nature of our said invention and how the same may be carried into practical operation, we would have it understood that what we claim, and desire to secure by Letters Patent, is—

1. In an injector for steam-engines, a two-part combining-cone, whereby the sectional area of the steam and water passage of said cone may be enlarged or contracted independently of the spindle, substantially as described.

2. The two-part combining-cone, consisting of the stationary part H and the laterally-movable part J, in combination with the casing F and a hand-lever or equivalent device, substantially as described, for the purpose set forth.

3. In an injector for steam-engines, the combination of a discharging-cone with a laterally-adjustable combining-cone, substantially as described, for the purpose specified.

4. In combination, the laterally-adjustable cone H J and the vertically-adjustable cone D, substantially as described, for the purpose specified.

5. In an injector for steam-engines, the vertically and independently adjustable steam-cone and spindle, the laterally-adjustable combining-cone, and the discharging-cone, all combined, constructed, and operating substantially as described, for the purpose specified.

6. In an injector for steam-engines, the combination of a vertically-adjustable spindle, C, a vertically-adjustable steam-cone, D, a laterally-adjustable steam-cone, J H, a discharging-cone, L, the steam-inlet A, water-branch G, and the usual overflow-pipe, all combined, constructed, and operating substantially as described and shown.

EDW. HAMER.
JAMES METCALFE.
EDWARD DAVIES.

In presence of—
CHARLES BARLOW,
F. C. BARLOW.