

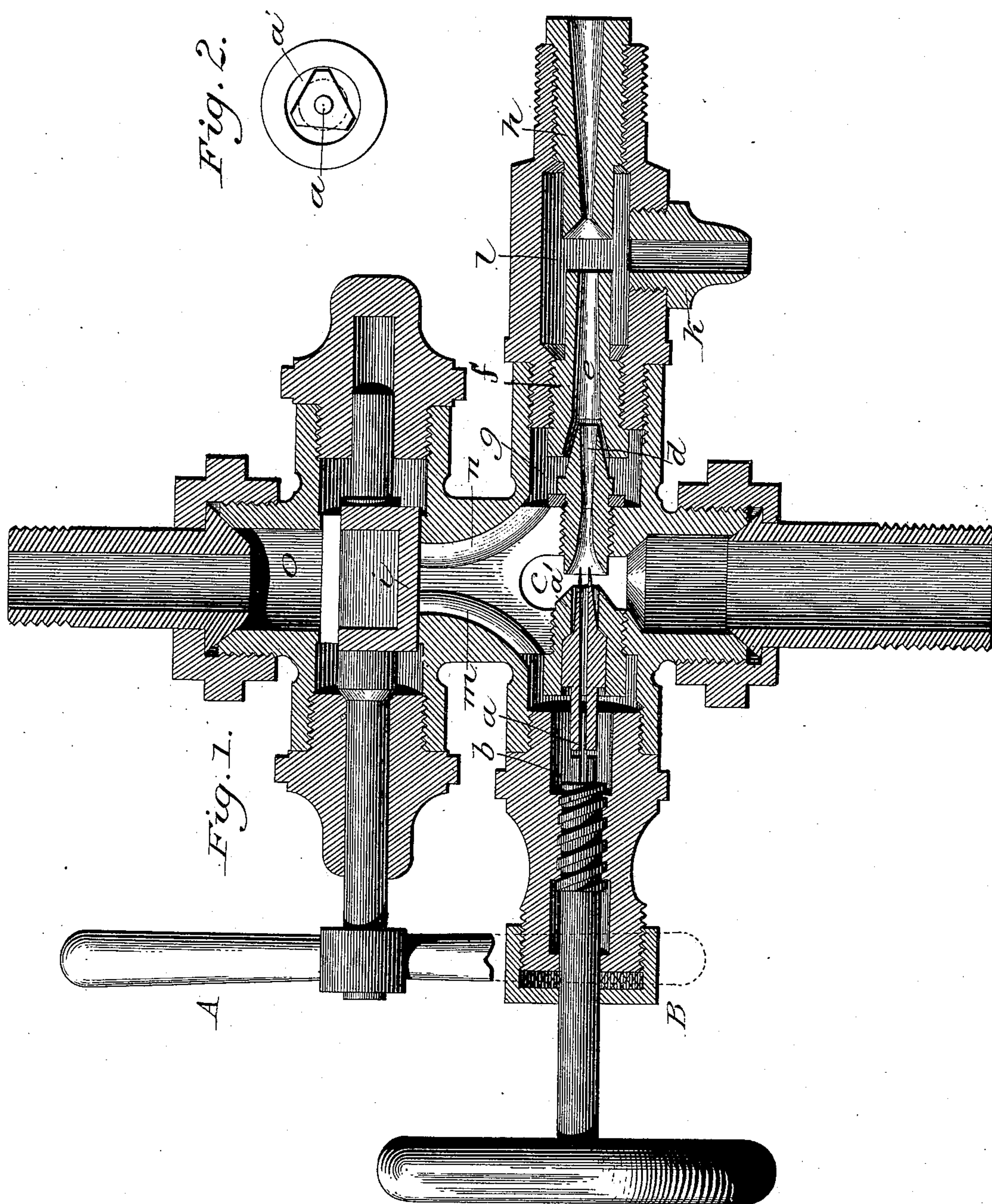
(Model.)

S. W. MORELAND.

INJECTOR.

No. 333,534.

Patented Jan. 5, 1886.



Witnesses:

Ernest Brett

Charles M. Wright

Inventor:

Silas W. Moreland



# UNITED STATES PATENT OFFICE.

SILAS W. MORELAND, OF GENEVA, OHIO.

## INJECTOR.

SPECIFICATION forming part of Letters Patent No. 333,534, dated January 5, 1886.

Application filed February 24, 1885. Serial No. 156,928. (Model.)

*To all whom it may concern:*

Be it known that I, SILAS W. MORELAND, of Geneva, in the county of Ashtabula and State of Ohio, have invented a new and Improved Injector, (being an improvement of the injector for which Letters Patent were issued to me by the United States on the 26th day of August, 1884,) of which the following is a full, clear, and exact description.

My invention consists of an improved construction of injectors for utilizing an auxiliary steam-jet to re-enforce and accelerate the effect of a primary jet, so as to render the injector more effective with any pressure of the steam and more reliable with varying pressures; and it is also designed to provide, by the improvements herein described, convenient devices in combination with the said injector described in said Letters Patent for the introduction of the steam into the primary and auxiliary nozzles, for regulating the quantity of water delivered by the injector at will, and facilitating the regular and efficient action of the injector at the overflow by a simple and cheap arrangement of construction, all as hereinafter described.

Reference is to be had to the accompanying drawings, forming part of this specification.

Figure 1 is a sectional elevation of my injector. Fig. 2 is a transverse sectional elevation of nozzle *a* through the enlargement of the nozzle within the enlarged part of nozzle *a'*.

In the first place I have a nozzle, *a*, through the bore of which a jet of steam discharges from the steam-space *b* into the water-chamber *c*, into which the water is drawn by the steam-jet, which condenses by the water surrounding it, and from which a jet of water is established through the passage of another nozzle, *d*, placed in line with nozzle *a*, and discharging from the water-space *c* into throat *e* of another nozzle, *f*, also placed in line with nozzles *a* and *d*, and receiving an annular jet of steam from the space *g*, and surrounding the water-jet, which is thereby greatly accelerated and delivered through nozzle *f* with great force across the open space in chamber *l* into the pipe *h* leading to the boiler.

Steam is supplied to chambers *b* and *g* successively by means of a rotating valve, *i*,

located in chamber *o*, arranged laterally with relation to the axis of all the parts above named.

Steam-passages *m* and *n* are provided, by which chamber *b* is connected by passage *m* with a port under valve *i*, and chamber *g* connected by passage *n* with a port under valve *i*, opening at a little distance obliquely from the former port and separated from it by an oblique bridge under the valve, the former port being a little in advance of the latter, whereby, as the valve is rotated, steam is first admitted by passage *m* to chamber *b*, and when the jet of water is established, as above described, steam is admitted by the latter port through passage *n* to chamber *g* and nozzle *f*, as described.

The stem of valve *i* is provided with a handle, *A*, and is held in line in chamber *o* by boxes in the caps at the ends of the chamber, and is provided with a conical bearing adapted to a concave seat in the cap next to handle *A*, and is held and packed in its seat by the pressure of steam in the box at the opposite end of the stem. The handle *A* is attached to the stem in such a position that when the handle is turned to a horizontal position the port connected with passage *m* is opened, admitting steam into chamber *b* and nozzle *a*, and when the jet of water appears at overflow *k* the handle is revolved until it comes into contact with stuffing-box *B*, when steam is admitted by passage *n* into chamber *g* and nozzle *f*. The jet of steam from nozzle *a* is thus re-enforced powerfully by the annular jet of steam entering nozzle *f* around the point of nozzle *d*, engaging the water and forcing it forward with such strong and steady action as to insure constant operation of the injector under all variations in the pressure of the steam.

By the arrangement of all the nozzles in line with each other and with the delivery-pipe *h*, the momentum of the swift jet of water impelled through the nozzle is fully utilized, and the action is more certain and effective than when the auxiliary jet is arranged laterally to the primary jet and the line of motion of the water abruptly and repeatedly changed.

Nozzle *a* is constructed, as represented in



the drawings, upon the stem inclosed in stuffing-box B, steam-chamber *b*, and nozzle *a'*, and is operated by a screw described on the stem; and the steam from chamber *b* enters the nozzle *a* by a transverse hole through the stem communicating with the bore of the nozzle at a convenient point within chamber *b*, as shown in the drawings; and within the bore of nozzle *a'*, next to the steam-chamber *b*, the stem of the nozzle *a* is enlarged and nearly triangular in its transverse section, each of the vertices of the section being rounded at its point of contact with the circular sides of the bore of nozzle *a'*, which incloses and serves as a guide to the stem; and the stem is reduced at the right of said enlargement to a conical form, forming a valve adapted to a concave seat in nozzle *a'*, and when said valve is drawn back by the screw upon the stem the steam flows along the three sides of the stem in the spaces between the sides of the stem, triangular in its transverse section, and the circular bore of nozzle *a'* and through the valve formed as aforesaid; and the point of nozzle *a* is tapered, as represented in the drawings, by means of which the opening of the valve is increased by drawing back the nozzle, and the quantity of steam discharged through the valve into chamber *c* and the quantity of water drawn and forced through the injector graduated at will. The valve must be closed when the injector is started and until its operation is fully established, and then, while it continues closed, the operation of the injector is perfect under all pressures of steam without further adjustment, and whenever an increase of the capacity of the injector becomes necessary for the supply of a greater quantity of water to the boiler, the valve may be opened sufficiently to supply the necessary increase of water.

The throat of nozzle *h* is made a little less in diameter than the bore of nozzle *f* next the overflow, for the purpose of concentrating the force of the jet of water passing into pipe *h* and preventing the return of water through the overflow.

The velocity and force given to the moving water after the re-enforcement by the auxiliary jet is so great that it becomes necessary to close the overflow, and the operation of the injector is rendered very convenient and simple.

The improvements claimed herein consist of the ports *a a'*, valve *i*, and overflow *k*, arranged and combined with parts of the injector described in the aforesaid Letters Patent, as hereinafter claimed.

I am aware that each one of the improvements or devices above described, considered separately, may not be new, and may have been used in other forms of construction and combination. I therefore do not claim the above-described devices, broadly; but

I claim—

1. In an injector-nozzle, *a*, provided with a transverse opening through it communicating with the bore of the nozzle and steam-chamber *b*, combined with fixed nozzle *a'*, and constructed with a triangular guide and conical valve at the end of the triangular section adapted to a concave seat in nozzle *a'*, the point of nozzle *a* tapering and extending through nozzle *a'* into water-chamber *c* and entering within the throat of nozzle *d*, nozzle *a'* also extending into chamber *c*, but not into nozzle *d*, nozzles *a* and *a'* combined with water-chamber *c*, nozzle *d*, steam-chamber *g*, nozzle *f*, into the throat *e* of which the point of nozzle *d* enters, chamber *l*, tube *h*, and overflow *k*, and nozzles *a*, *d*, and *f* and tube *h*, aligned in a straight line with each other and inclosed in a case provided with suitable connections for steam and water pipes, and all arranged, constructed, and operating as set forth.

2. In an injector, steam-chamber *o*, provided with a cap at each end of the chamber, and within and combined with said chamber valve *i*, provided with handle A upon a stem held in line in boxes in said caps, and a conical bearing adapted to a concave seat in the cap at the end of chamber *o*, next to handle A, said chamber *o* also provided with ports under valve *i*, and passages *m* and *n*, communicating with steam-chambers *b* and *g*, combined with steam-nozzles *a*, *d*, and *f*, tube *h*, and overflow *k*, all arranged, combined, constructed, and operating as set forth.

SILAS W. MORELAND.

Witnesses:

R. C. EWING,  
O. C. PINNEY.

Correction in Letters Patent No. 333,534.

It is hereby certified that in Letters Patent No. 333,534, granted January 5, 1886, upon the application of Silas W. Moreland, of Geneva, Ohio, for an improvement in "Injectors," an error appears in the printed specification requiring correction as follows: In line 50, page 2, the word "necessary" should be stricken out and the word *unnecessary* inserted instead; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 26th day of January, A. D. 1886.

[SEAL.]

H. L. MULDROW,  
*Acting Secretary of the Interior.*

Countersigned:

M. V. MONTGOMERY,  
*Commissioner of Patents.*