2 Sheets—Sheet 1.

D. MINICH & G. F. GODLEY.

Injector for Steam-Boilers.

No. 210,954. **Patented Dec. 17, 1878.**

Fig. 1

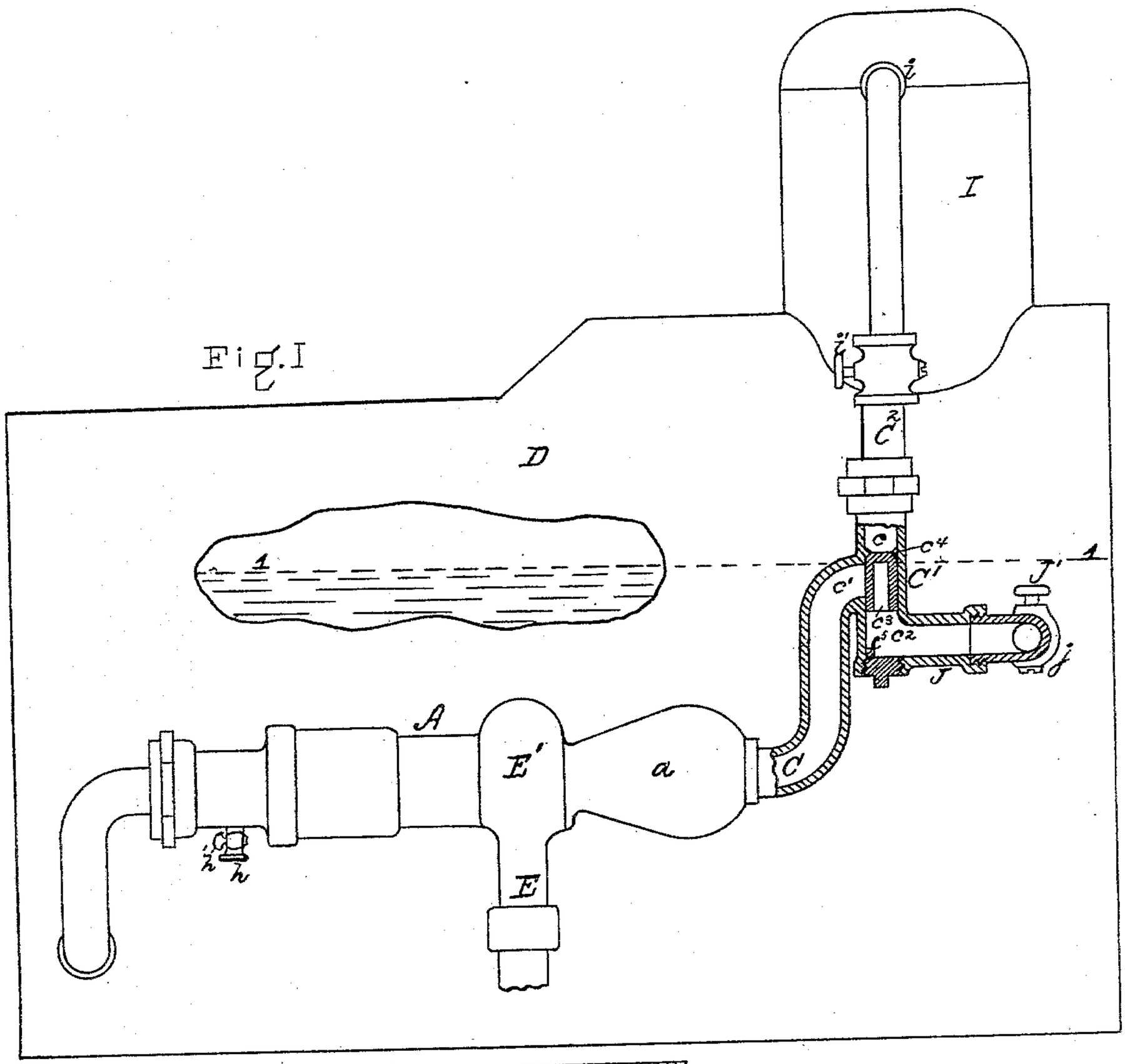
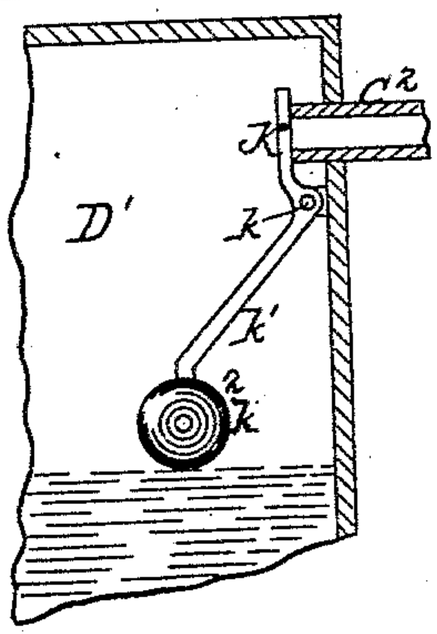


Fig. 4



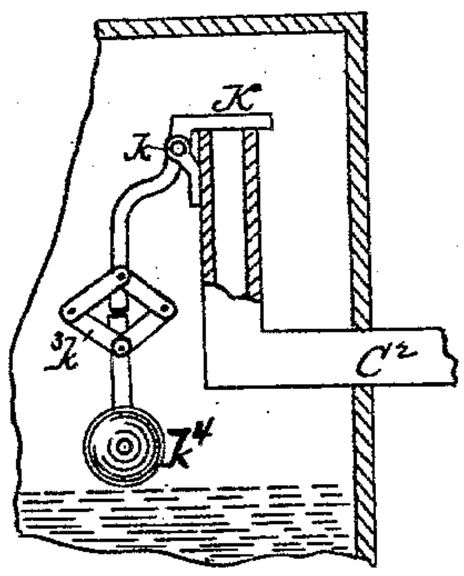


Fig. 5

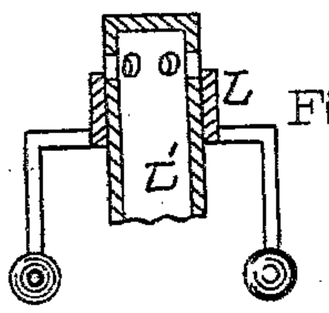


Fig. 6

WITNESSES:

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Geo W. Scouler

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Daniel Minich

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2 Sheets—Sheet 2.

D. MINICH & G. F. GODLEY.

Injector for Steam-Boilers.

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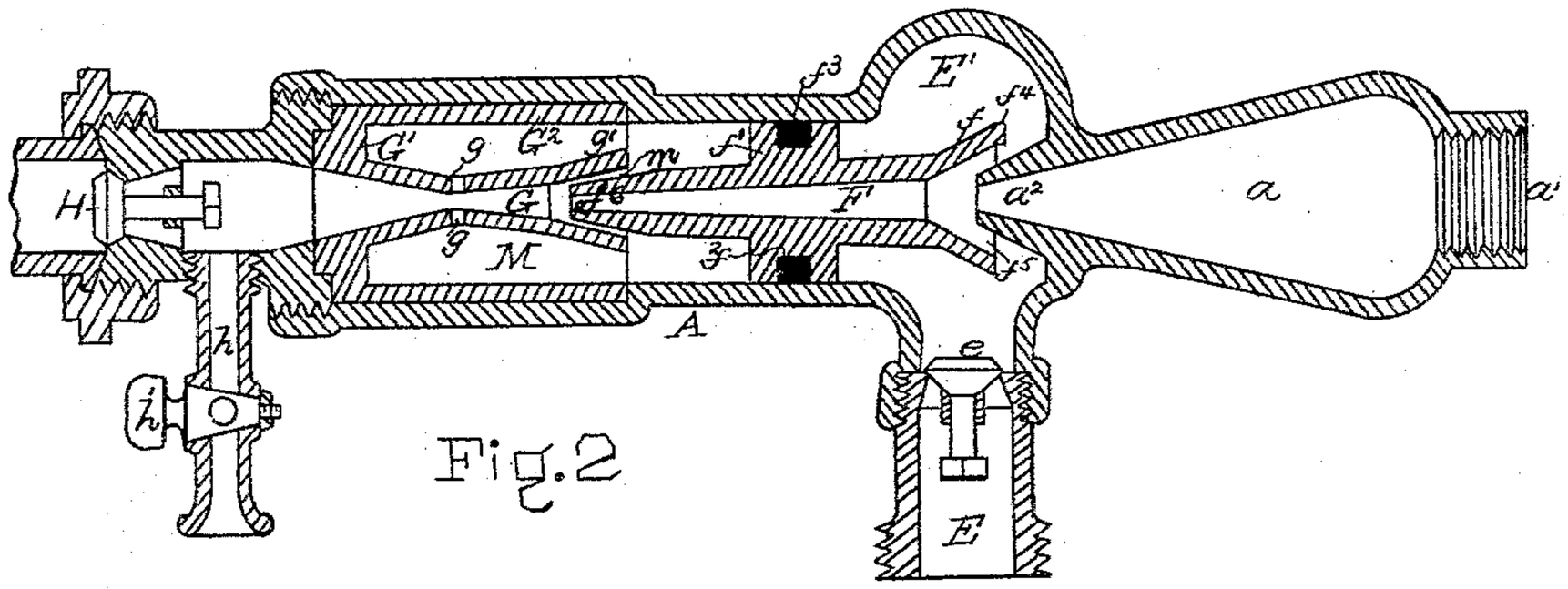

Fig. 2

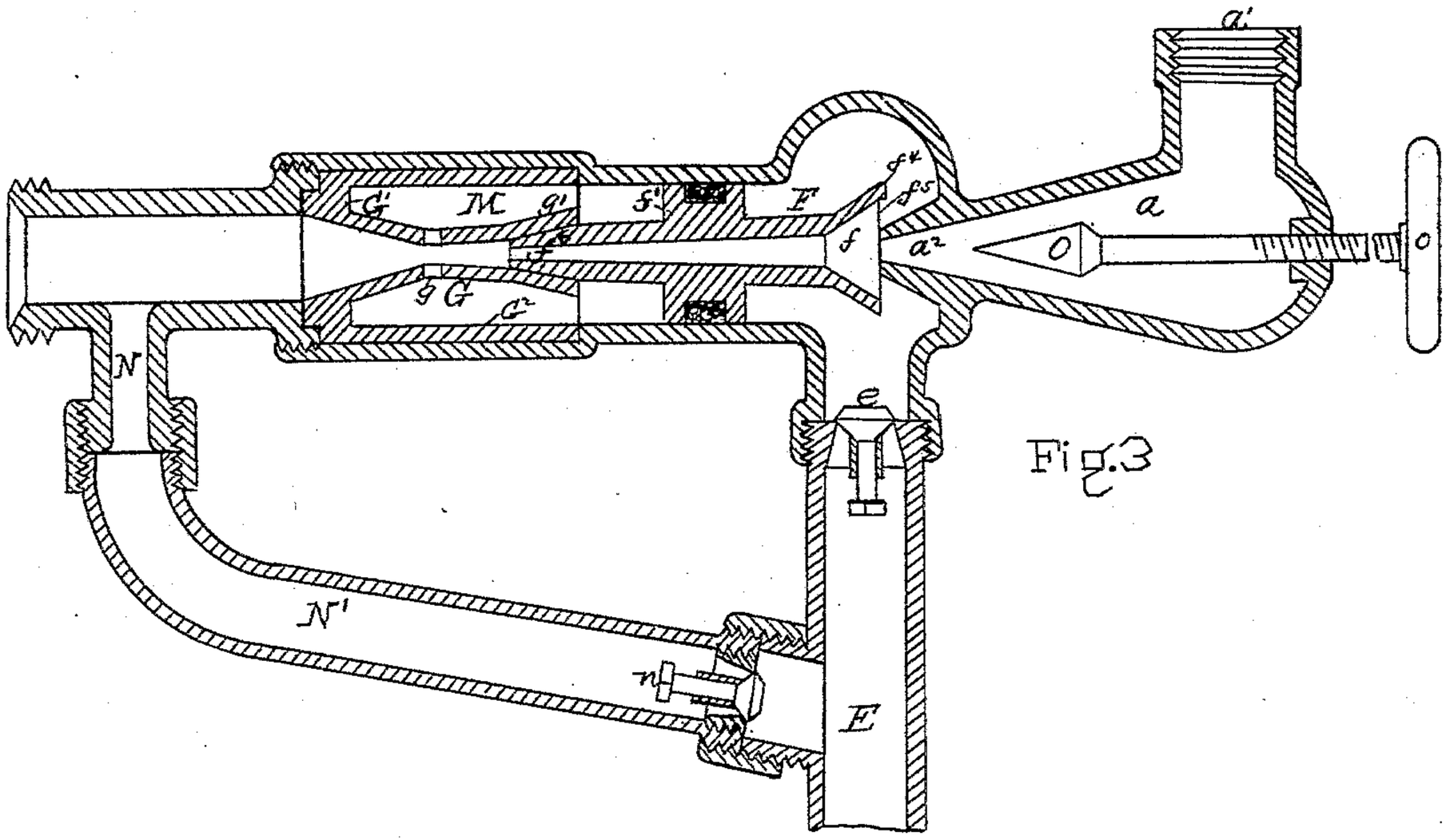

Fig. 3

WITNESSES.

Geo. E. Johnson

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UNITED STATES PATENT OFFICE.

DANIEL MINICH AND GEORGE F. GODLEY, OF PHILADELPHIA, PA.

IMPROVEMENT IN INJECTORS FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. **210,954,** dated December 17, 1878; application filed January 18, 1878.

To all whom it may concern:

Be it known that we, DANIEL MINICH and GEORGE F. GODLEY, of Philadelphia, in the county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Injectors for Steam-Boilers; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification, in which—

Figure 1 is a side elevation of the injector and its connection with the boiler. Fig. 2 is a vertical longitudinal section of the injector. Fig. 3 is a vertical longitudinal section of the modification. Figs. 4, 5, and 6 are detail views, illustrating various mechanisms for sealing and unsealing the steam-supply pipe.

The object of our invention is to provide an improved automatic injector for feeding water to steam-boilers.

Our invention consists in providing the steam-supply pipe with two boiler-connections, one of which is placed at the dome or upper part of the boiler, and the other at or near a defined water-line. Said steam-pipe is also provided with a float-valve to seal and unseal the said pipe, to stop or allow the flow of steam therethrough, to automatically operate the injector by the rise and fall of the water within the boiler from a defined water-line.

Our invention also consists in an improved device whereby the supply of water to the injector is automatically regulated to suit the capacity of the steam-jet.

Referring to the accompanying drawing, A represents the body of the injector having the steam-nozzle a, which has a threaded opening, a^1, for the attachment of the steam-supply pipe C, which forms the connection between the injector and the boiler D. E is the water-inlet, terminating in the chamber E′, into which projects the conical nipple a^2, forming a continuation of the steam-nozzle a. Said water-inlet E is provided with a check-valve, e, which opens upwardly. F is a sliding bridge, spanning the water-chamber E′, as shown. Said bridge is provided with a diverging end, f, annular flange f^1, which is grooved, as shown at f^2, to receive the packing f^3. Said bridge terminates in a conical-shaped extremity, f^4, which enters a similarly-shaped cavity in the discharging-tube G. The latter is formed with an annular ring, G^1, and flange G^2. Said tube is also formed with outlet-openings g g. H is the check-valve, and h an outlet-opening provided with a stop-cock h'.

The steam-supply pipe C is connected to a union, C^1, having the exit-openings c c^1 c^2. Within said union is placed a hollow sliding float-valve, c^3, which finds its seat at c^4. From the exit-opening c proceeds a pipe, C^2, which has a connection with the dome I of the boiler at i, and is provided with the valve i'. From the exit-opening c^2 proceeds a pipe, J, which connects with the boiler at or below a defined water-level, as shown at j, and is furnished with a valve, J′. The operation of this part of our invention is as follows: To start the injector, the valve J′ being closed, and the float-valve c^3 being down and resting upon the rib c^5 in the union C^1, so as to uncover the exit-opening c^1, the bibb-cock h' being also opened, the steam-valve i' is now opened, the dry steam from the boiler passes into the pipe C^2 and flows unchecked through the apertures c and c^1 into the pipe C, and thence to and through the injector, and passing out through the bibb-cock h' carries with it the air in the injector, thereby creating a vacuum therein, which is filled by the water entering through the inlet E, which rises in the chamber E′ until it flows into the bridge F through the annular space f^5 between the conical nipple a^2 and the flaring end f of said bridge.

As soon as the water begins to flow from the bibb-cock h' the same is closed, and the valve J′ is now opened. If now the water within the boiler is not to the defined water-level 1 1, the flow of steam through the pipes C^2 and C still continues and feeds the water into the boiler until the water is raised to the line 1 1. As it gradually approaches this defined water-line the water in the boiler flows through the valve J′ into the pipe J, and passes beneath and into the hollow float-valve c^3, raising the same toward the seat c^4. The connection of the pipe J with the boiler may be at any point from the defined water-level to the bottom of the boiler, the result in all cases being the same. In practice I prefer to place said connection about six inches from said water-line.

When the water within the boiler reaches the line 1 1 the water in the pipe C^2 must also be relatively at the same height in the union C^1, and the valve c^3 having reached the seat c^4 seals the openings c and c^1, and stops the flow of steam therethrough, and the injector ceases working, the water in the inlet-chamber E′ being retained therein by means of the valve c, which now drops back upon its seat for that purpose.

As soon as the water in the boiler boils down beneath the line 1 1 the water in the union C^1 falls. The valve c^3 is thereby lowered and unseals the openings c and c^1 for the passage of the steam to the injector, and the operation of feeding is resumed.

The union C^1, with its exit-openings c and c^1, must always be so arranged that the valve c^3 will, when raised to close said openings, find its seat at a line corresponding to the height of the defined water-line within the boiler.

Instead of the hollow float-valve c^3, I may employ the float-valve K, as shown in Fig. 4, pivoted at k to one of the sides of the union C, near the exit-opening of the steam-supply pipe C^2. The union C is made large enough to receive the valve K, and allow its float to have the required range of motion to open and shut said valve. The latter is provided with an arm, k^1, and float k^2. The rise and fall of the water within the union C raises and lowers the valve K, to seal and unseal the end of the pipe C^2, and stops or allows the escape of steam therethrough.

Figs. 5 and 6 show different ways in which the float-valve K may be arranged within the union C to seal and unseal the pipe C^2. In the former the float-valve K is pivoted directly to the pipe C^2, as shown, and is provided with a lazy-tongs, k^3, in lieu of the rigid arm k^1. Said lazy-tongs connection allows the foaming of the water within the boiler, which produces a wave-like action in the union C, to lower and raise the float k^4, attached thereto, without disturbing the position of the valve K, for allowing the escape of steam to the injector when the water in the boiler and union C is below the defined water-line.

In Fig. 6 the float-valve L is made telescopic with the perforated steam-supply pipe L′, the results in all cases being the same.

If at any time the amount of water fed through the inlet E should be in excess of the quantity required by the steam issuing from the nipple a^2, it will pass through the bridge F and tube G, and thence through the openings g g in said tube G into the chamber M, wherein it meets the annular flange or packing-ring f^1 of the bridge F, and causes the latter to slide forward toward the nipple a^2, thereby contracting the area of the annular space f^5, and thus diminishing the supply of water, the bridge F being thus slid toward the nipple a^2 until the requisite flow of water is obtained. The ribs f^4, formed on the flaring end f, prevent the said bridge from being slid up to the nipple a^2, so as to entirely close said opening. If now the water-supply be diminished or the flow of steam be increased, the water in the chamber M will be drawn out therefrom through the aperture m, which has been formed by the conical end f^6 of the bridge F receding from the flaring end g' of the tube G by the sliding of the bridge F toward the nipple a^2. As the water in the chamber M is carried away, as described, a vacuum is created therein by the steam passing through the injector, and the said bridge F slides back again toward the tube G and away from the nipple a^2, enlarging the aperture f^5, and thereby increasing the flow of water through the same. Thus the amount of water fed to the bridge F is always automatically regulated to suit the capacity of the steam-jet.

I do not claim, broadly, the aforesaid automatic adjustment, but the specific improvements described, whereby the said adjustment is more readily effected.

Fig. 3 shows a modification of my injector, in which N is an overflow, which communicates by means of the pipe n' with the water-supply pipe E, and is provided with a check-valve, n, which opens toward the pipe E, so that while the overflow-water may open and pass through said valve into the tube E, no water in the latter can pass into the pipe n'.

O is a plug having a threaded rod projecting therefrom, and passing through the end of the injector, and provided with a wheel or handle, o, for adjusting the said plug to stop the injector, or decrease or increase the flow of steam.

What we claim as our invention is—

1. An injector provided with a steam-supply pipe having two connections with the boiler, one of which is placed at the dome or upper part of the boiler, and the other at or near the height of a defined water-line, said pipe being provided with a float-valve to seal and unseal the same, to stop or allow the flow of steam therethrough, to automatically operate the injector by the rise and fall of the water within the boiler from the defined water-line, substantially as set forth.

2. The combination of the injector A, the pipe C^2, and float-valve c^3, and connecting-pipes C and J, all arranged substantially as and for the purpose set forth.

3. In combination with the conical nipple a^2, the sliding bridge F, located directly over the water-inlet, and formed with a packing-ring, f^1, flaring end f, conical end f^6, and the ribs f^4, and the stationary or fixed tube G, provided with a chamber, M, and flaring end g', and openings g g, as and for the purpose set forth.

In testimony that we claim the foregoing we have hereunto set our hands this 17th day of January, 1878.

DANIEL MINICH.
GEORGE F. GODLEY.

Witnesses:
GEO. E. C. JOHNSON,
GEO. W. SCOULER.