

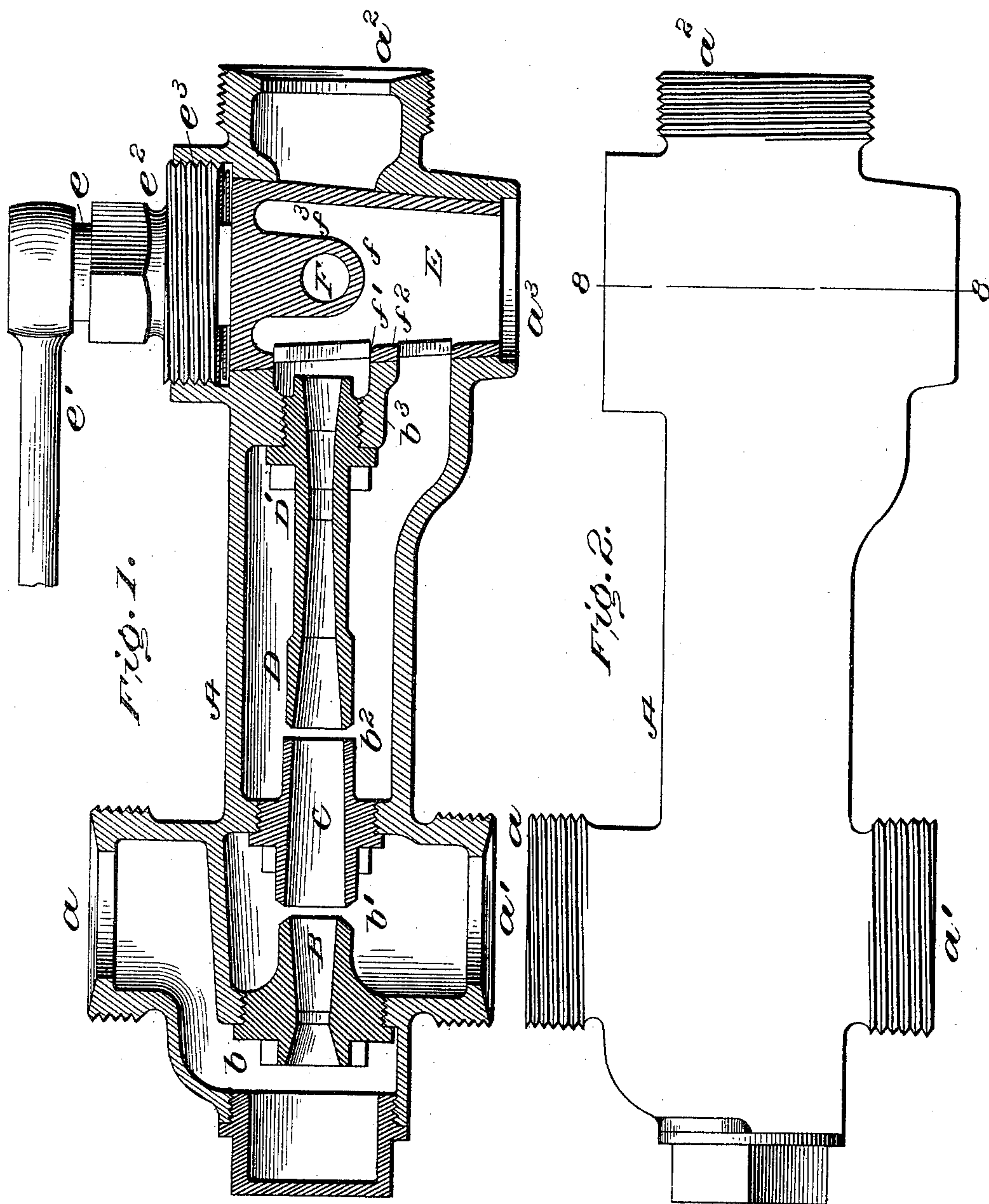
(Model.)

2 Sheets—Sheet 1.

F. STICKER.
STEAM INJECTOR.

No. 600,453.

Patented Mar. 8, 1898.



Witnesses

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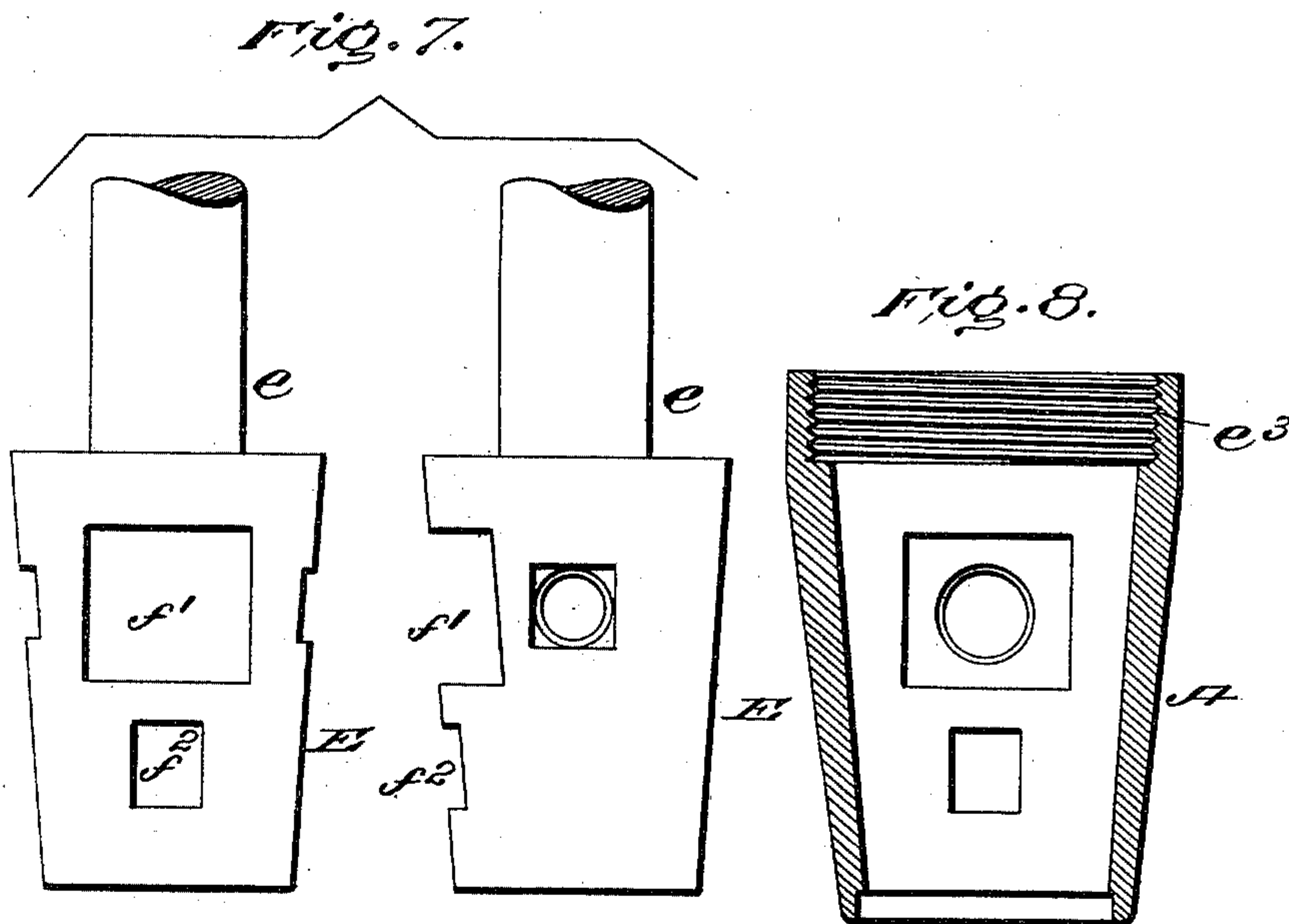
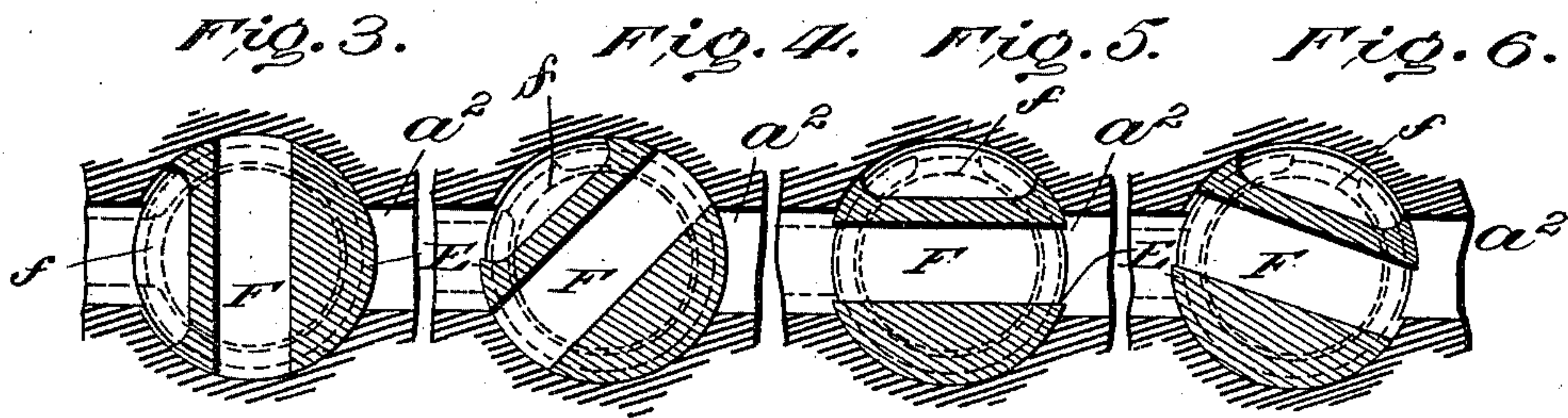
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2 Sheets—Sheet 2.

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STEAM INJECTOR.

No. 600,453.

Patented Mar. 8, 1898.



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UNITED STATES PATENT OFFICE.

FRANCIS STICKER, OF NEW YORK, N. Y., ASSIGNOR TO JULIUS C. DRUCKLIEB AND CHARLES A. DRUCKLIEB, OF SAME PLACE.

STEAM-INJECTOR.

SPECIFICATION forming part of Letters Patent No. 600,453, dated March 8, 1898.

Application filed July 29, 1897. Serial No. 646,354. (Model.)

To all whom it may concern:

Be it known that I, FRANCIS STICKER, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Steam-Injectors; and I 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 appertains to make and use the same.

This invention contemplates certain new and useful improvements in steam-injectors, and relates to that class known as "single-jet," in which only one jet of steam is required to operate the injector. Heretofore the starting of injectors of this class has been very unsatisfactory on account of the manipulation of several valves, some automatic, others positive, and some combined positive and automatic. In other cases movable nozzles or other movable parts out of sight of the operator are employed, while in a very large number spill-holes in the tubes are required. All these features tend to make an injector uncertain in operation, costly, and liable to readily get out of order. By my invention I seek to overcome all these objections.

The primary object of the present invention is to provide a single-jet injector which shall be positive in operation and devoid of all automatic check-valves, spill-holes, sliding nozzles, and the like, and in which the injector has to only overcome atmospheric pressure in starting, thus insuring an almost instant starting and lifting of very hot water.

A further object is to reduce the number of parts to a minimum, so as to minimize the danger of the injector getting out of order.

A further object is to so construct the injector that it can be used as a "lifter" or "non-lifter" and capable of starting without regard to whether the steam or water be first admitted, and also to provide for reducing the column of steam and water without breaking the latter and at the same time avoid drawing in air.

The invention will be hereinafter fully set forth, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical longitudinal sectional view of my

improved injector. Fig. 2 is a side elevation thereof. Figs. 3, 4, 5, and 6 show different positions of the single operating-cock, parts being broken away and others in section. Fig. 7 shows different views of the cock in side elevation. Fig. 8 is a cross-sectional view on line 8 8, Fig. 2, showing the cock-seat.

Referring to the drawings, A designates the casing or casting; a , the steam-inlet; a' , the water-inlet; a^2 , the outlet leading to the boiler, and a^3 the overflow-outlet.

B is the steam-inlet tube, which extends into the steam-chamber b and water-chamber b' .

C is the lifting-tube extending into chamber b' and overflow-chamber b^2 . In line with this tube is the combined combining-tube D and delivery-tube D', mounted near one end in a wall b^3 of casing A. It will be noted that no spill-holes are formed in tubes D D', all supplementary overflow occurring between the adjacent ends of tubes C and D and falling into chamber b^2 .

E is a single cock located vertically in casing A between the delivery-tube and the outlet to the boiler and in line with the overflow-opening, which latter, in fact, is filled by the said cock, the overflow being through the cock itself. This cock is rounded and tapered throughout its length, and from its upper end projects a rod e , to which an operating-handle e' is secured. This rod projects through a stuffing-box e^2 , which engages an interiorly-threaded recess e^3 and serves to hold the cock firmly in place, but yet allow of the turning thereof either to the right or to the left by the manipulation of handle e' . The cock is hollow—that is, it has an inner chamber f open at its lower end through the bottom of the cock. In one side of the latter is an upper port f' , while beneath it is a smaller port f^2 . The former, when in line with the delivery-tube, establishes a direct passage to the atmosphere for the primary overflow, while the supplemental overflow or spill between the tubes C and D has a direct passage-way through port f^2 . This makes three ports within cock E. A fourth port F extends transversely through cock E at right angles to the ports f' f^2 . It is made in the lower portion

of a depending web f^3 within the chamber of the cock. When the latter is turned so as to cut off all overflow, this port F will be in line with the delivery-tube and the outlet to the boiler; but until this occurs the latter outlet is closed by the cock—that is, the boiler-pressure is prevented from entering the injector by the closed wall of the cock. In this way no check-valve is necessary in order to provide against the back pressure from the boiler. This one cock controls the starting and working of the injector, and in addition regulates the latter. The transverse port F is preferably tapered throughout its length, forming substantially an additional tube or “elongation,” so to speak, of the delivery-tube D. This enhances the working qualities of the injector in relation to pressure and resistance. This port has absolutely no communication with any of the other ports of the cock nor with the chamber thereof, its sole office being to direct the established jet of steam and water from the delivery-tube to the boiler. There being no opening from the delivery-tube or boiler-passage to the boiler until the jet is fully established, the full force of the jet enters the outlet to the boiler as soon as the connection is established through the port F. This renders the use of all check-valves unnecessary, as the cock acts in that capacity; but this is only possible where there is absolutely no connection between the delivery-tube and outlet to the boiler until the jet is fully established, and at the same time there must be no connection whatsoever possible between the delivery-tube and outlet to the boiler with the overflow-opening, since such communication would render the working of the injector impossible, as the boiler-pressure would then have a chance to flow into the atmosphere, and the steam and water from the delivery-tube likewise flowing into the atmosphere the pressure thereof would be greatly reduced, lessening the motive power necessary to resist any boiler-pressure.

It will be seen that none of the tubes has any spill-holes, which are usually employed to relieve the injector of too large an amount of water or steam during starting. I am enabled to dispense with these spill-holes on account of the free starting against atmospheric pressure through the main overflow-opening leading from the delivery-tube as well as from the supplementary overflow in chamber b^3 , which occurs between the lifting and combining tubes.

The operation is as follows: With the cock in the position shown in Figs. 1 and 3 steam upon being admitted will pass through the several tubes and through port f' out through the lower end of the cock to the atmosphere, and part thereof spilling between the lifting and combining tubes will pass to the atmosphere through port f^2 of the cock. This escape of the steam creates a vacuum in the water-chamber, lifting water thereinto, and upon meeting with the steam the latter will

be condensed and contracted enough to pass through the smallest cross-sectional area of the bore of the delivery-tube without spilling into chamber b^2 . The cock will now be turned to close the supplementary overflow through port f^2 (see Fig. 4) and thus avoid drawing in air, and as the jet is now fully established and forceful enough to force against boiler-pressure the cock will be further turned to close all opening to the atmosphere through port f' and, slowly opening up communication with the outlet to the boiler through port F thereof, will assume the position shown in Fig. 5, allowing of the free passage-way of the column of steam and water to the boiler. To reduce the supply to the boiler, the operator can move the cock still farther, so that the port F thereof will be in the position shown in Fig. 6.

The advantages of my invention are apparent. It will be noted that the single cock controls the entire operation of the machine. As there is absolutely free outlet from both points of overflows to the atmosphere in starting the injector it makes no difference how quick the steam is admitted or how hot the water or how great the lift the starting must be instantaneous, as there is no pressure to overcome save that of the atmosphere. The closing of the two overflow-ports is gradual, one after the other, and at no time is there any communication between the outlet to the boiler and the overflow. The feed of the machine is regulated by simply turning the cock (see Fig. 6) farther around to close some of the opening to the boiler, thereby simply reducing the size of the column leaving the injector and increasing the pressure. The working is not disturbed thereby, and in this way there being a certain amount of spill the tank may be heated to avoid freezing. This shows the large excess of overpressure obtained by the peculiar arrangement and construction, the established column being able to force against the boiler-pressure with half or more reduced area and at the same time spilling into the atmosphere without drawing in any air. This is possible only by the total separation of overflow and boiler-pressure.

By locating the supplementary-overflow port in the lower part of the cock the injector is thoroughly drained of all spill between the lifting and combining tubes and all danger of the water accumulating in the overflow-chamber and freezing therein is avoided; also, it will be noted that both overflows are independent in starting and the overflow through the lower port not having the force of that at the upper port is undisturbed by the latter. The total exclusion of all atmosphere when the injector is working, all ports being positively closed, precludes all danger of the column breaking and allows the injector to work hot water and effect a high lift. Should the injector break for lack of water in tank, the simple turning of cock when water appears again will reestablish the column.

I have produced an injector which is extremely simple in construction, inexpensive, and not liable to become clogged with lime or sediment and one that will not readily get out of order. A single cock controls the two overflows, the primary and supplemental, and simultaneously with their being closed communication is established between the delivery-tube and the boiler-passage. This cock provides for free access to the atmosphere in starting the injector and the total exclusion of all air when the injector is working. It may be turned to the right or to the left, as preferred by the operator, no stops being employed to limit the movement in either direction.

I claim as my invention—

1. A single-jet injector having primary and supplemental overflows leading direct to the atmosphere in starting the injector, and a single chambered cock for closing both of said overflows as the column of steam and water is established, and having a separate port for opening up communication to the boiler, substantially as set forth.

2. A single-jet injector having primary and supplemental overflows leading direct to the atmosphere in starting the injector, and a single cock having two ports so arranged that said supplemental overflow will be first closed, and then said primary overflow, and a third port for opening up communication to the boiler, substantially as set forth.

3. A steam-injector having a single series of tubes, a boiler-outlet and primary and supplemental overflows, and a hollow cock open at one end and having ports for successively closing said overflows, and also having a third port extending transversely therethrough designed to register with said tubes and boiler-outlet when said overflows have been successively closed, substantially as set forth.

4. In a single-jet injector having primary and supplemental overflows, a single chambered cock having separate ports forming an outlet for said overflows, substantially as set forth.

5. In a single-jet injector having primary and supplemental overflows, one above the other, and a single-chambered cock having upper and lower ports designed to register with said overflows, substantially as set forth.

6. In a single-jet injector having primary and supplemental overflows and boiler-outlet, and a cock having two ports designed to register with said overflows, and a third port designed to register with said boiler-outlet when said overflows are closed, as set forth.

7. The herein-described injector having a

casing formed with a vertical opening and primary and supplemental overflows, and a single cock fitted in said opening, said cock being hollow and open at its lower end and provided with separate ports for said overflows, as set forth.

8. The herein-described injector having a casing formed with a vertical opening and upper and lower overflows, and a single cock fitted in said opening, said cock being hollow and open at its lower end and provided with upper and lower ports for said overflows, substantially as set forth.

9. The herein-described injector having a casing formed with a vertical opening, a boiler-outlet, and primary and supplemental overflows, and a cock fitted in said opening, said cock being hollow and open at its lower end and formed with ports designed to register with said overflows, and having a transverse port designed to register with said boiler-outlet when said overflows are closed, substantially as set forth.

10. The herein-described injector comprising the casing having an overflow-chamber, a vertical opening, and a single series of tubes, a cock fitted in said opening having an interior chamber, ports opening therein designed to register with said tubes and overflow-chamber and a port transverse to said former ports, also designed to register with said tubes, substantially as set forth.

11. An injector having a single series of tubes, and an overflow-chamber having an outlet beneath said tubes, and a hollow cock having upper and lower ports designed to register with said tubes and the outlet for said overflow-chamber, substantially as set forth.

12. The combination with the casing having a vertical opening, an outlet to the boiler at right angles thereto, and an overflow-chamber having an outlet, and a series of tubes in line with said boiler-outlet, of a cock fitted in said opening formed with an interior chamber open at its lower end and having upper and lower ports designed to register with said tubes and outlet of said overflow-chamber and a transverse port designed to register with said tubes and boiler-outlet, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

FRANCIS STICKER.

Witnesses:

JULIUS C. DRUCKLIEB,
ADAM H. CURROR.