No. 886,849.

PATENTED MAY 5, 1908.

W. R. PARK.

INJECTOR.

APPLICATION FILED JUNE 11, 1907.

2 SHEETS—SHEET 1.

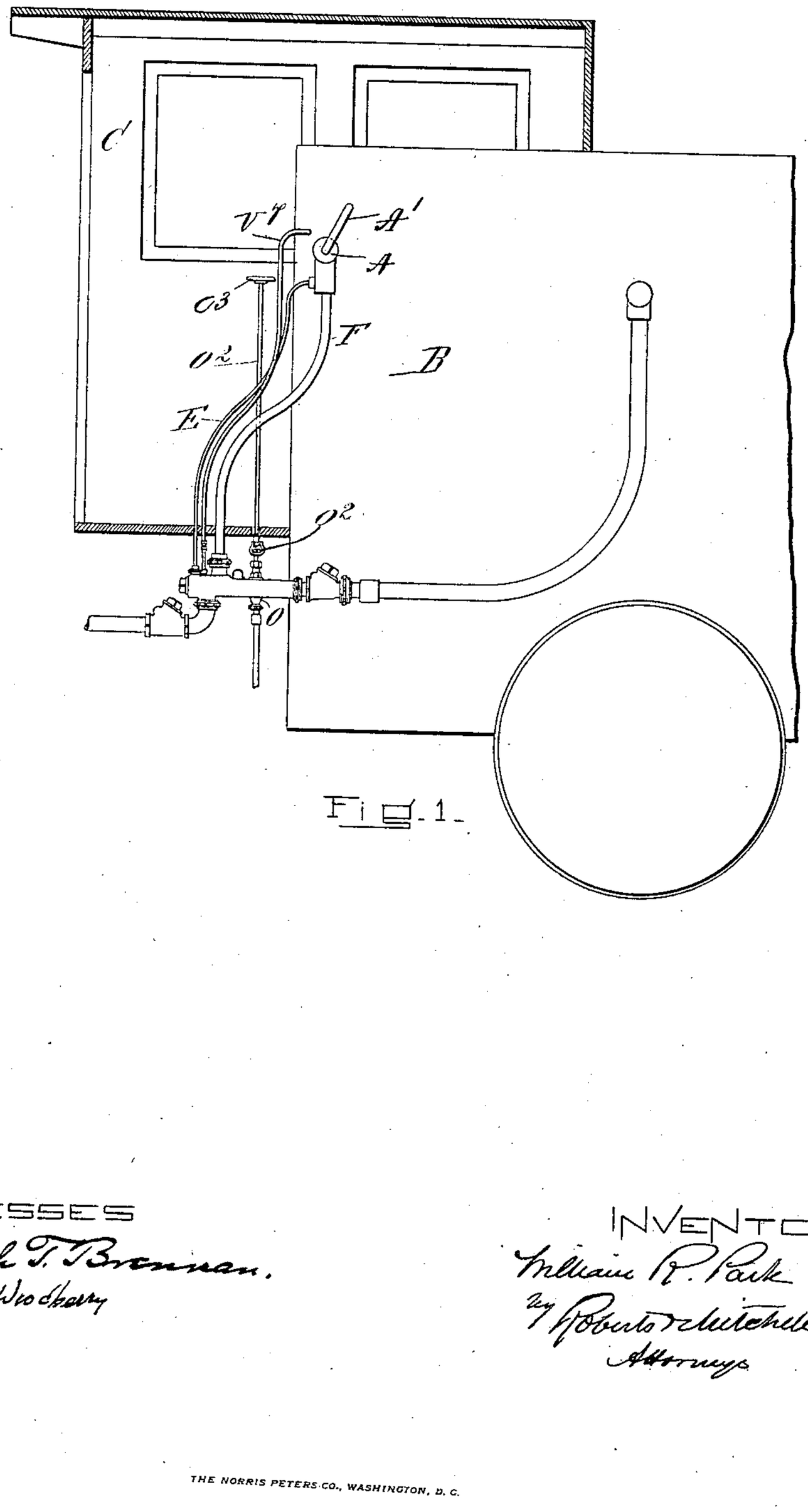

Fig. 1.

WITNESSES

Joseph T. Brennan.

C. D. Woodbury

INVENTOR

William R. Park

by Roberts & Mitchell

Attorneys

No. 886,849. PATENTED MAY 5, 1908.

W. R. PARK.

INJECTOR.

APPLICATION FILED JUNE 11, 1907.

2 SHEETS—SHEET 2

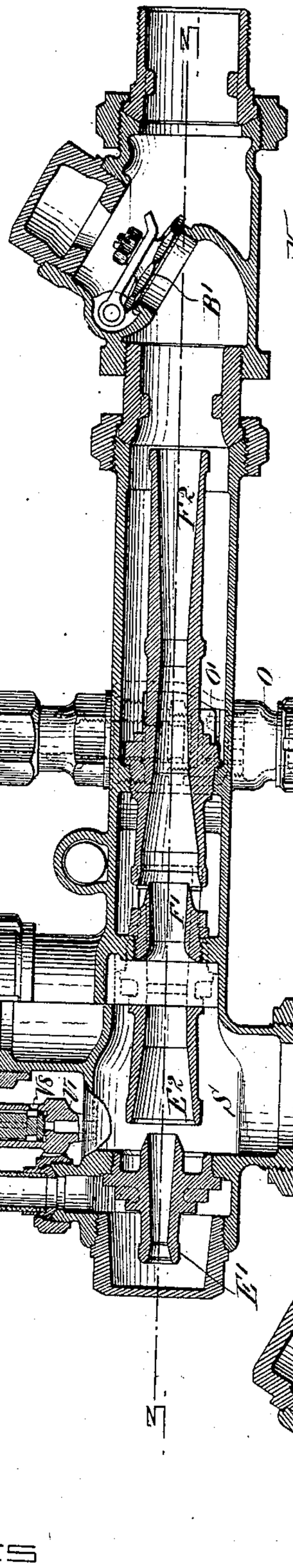

Fig. 2.

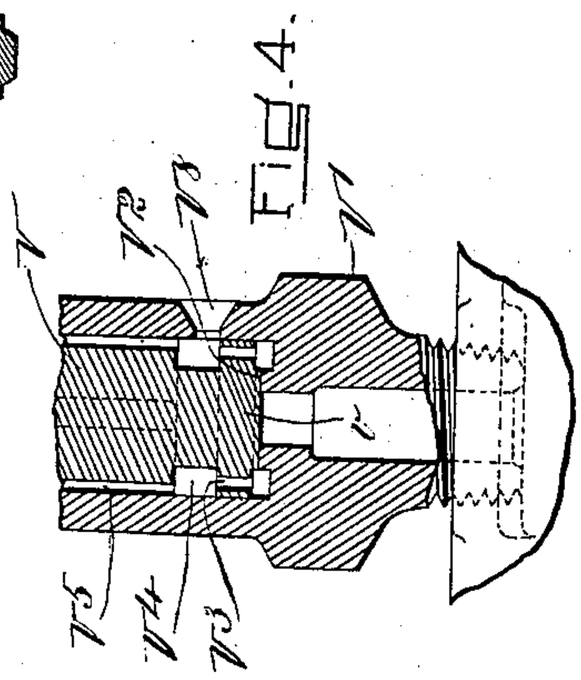

Fig. 4.

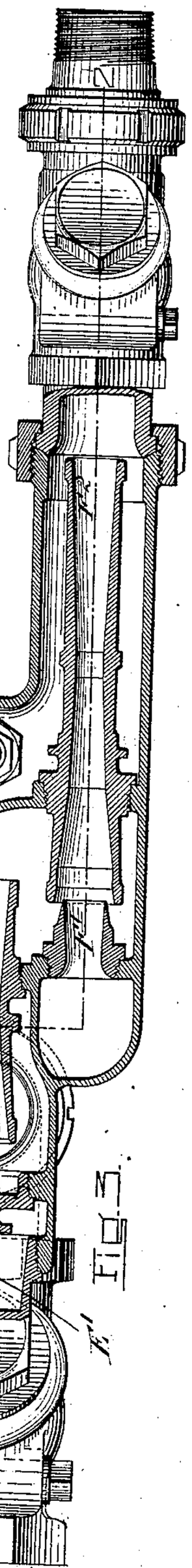

Fig. 3.

WITNESSES

Joseph T. Brennan.

C. D. Wadsley

INVENTOR

William R. Park

by Roberts & Mitchell

Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM R. PARK, OF TAUNTON, MASSACHUSETTS, ASSIGNOR TO UNITED INJECTOR COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

INJECTOR.

No. 886,849. Specification of Letters Patent. Patented May 5, 1908.

Application filed June 11, 1907. Serial No. 378,402.

To all whom it may concern:

Be it known that I, WILLIAM R. PARK, a citizen of the United States, and resident of Taunton, in the county of Bristol and State of Massachusetts, have invented new and useful Improvements in Injectors, of which the following is a specification.

My invention relates to boiler feeding injectors and consists in improvements which, though applicable to lifting injectors, may also be applied to non-lifting injectors, that is to say, injectors which receive their supply of water under a head so that the operative parts of the injector do not have to lift water to obtain a supply to be forced into the boiler.

My improvements are also addressed to the conditions arising out of the development of locomotive design and construction, which has been constantly in the direction of increased steaming capacity and boiler pressures; as the maximum available space within which this expansive development can take place is limited by the prevailing standard conditions of railway practice and equipment construction, one conspicuous result thereof has been the encroachment of the locomotive boiler upon the space reserved and required for the locomotive engine driver and fireman until these necessary accommodations have been brought to an almost irreducible minimum. Consequently, the space within the engine cab, which on locomotives of earlier design was ample for all the mechanical equipment under the control of the engine driver, has now become uncomfortably crowded and practically inadequate, especially in view of the fact that with the progressive decrease in cab accommodations there has come a progressive increase in the number, size and capacity of the auxiliary mechanical contrivances appertaining to the modern locomotive. The boiler feeding injector is one of these essential adjuncts which must be not only under the control but under the immediate inspection of the engine driver and heretofore it has been the usual and general practice to mount the injector in or near the cab so that the engine driver may not only operate but may also observe the operation of this very essential instrument.

By the aid of my improvements presently to be described, it is possible to place the injector below and outside of the cab but at the same time to conserve the supervision of the engine driver over the injector without imposing any additional inconvenience upon him; and to keep him constantly as aware of the behavior of the instrument as though it were mounted in the cab.

In the drawings hereto annexed which illustrate a mode of embodying and carrying into effect my invention and improvements,—Figure 1 is a general view of the cab end of a locomotive engine showing a practical arrangement of an injector equipped with my improvements; Fig. 2 is a longitudinal, vertical section of a double tube injector on the line 2—2 of Fig. 3, also embodying my improvements; Fig. 3 is a horizontal section on the line 3—3 of Fig. 2; and Fig. 4 is a detail of the vent valve on an enlarged scale.

My improvements will be found applicable both to lifting and non-lifting injectors and will perform their functions whenever, for any reason, the injector of either type is located outside of the cab or in such places as remove it from the immediate observation of the engine driver.

In the illustration of my invention shown in these drawings, the injector is suspended upon suitable brackets or other fastenings outside of and below the cab C preferably at a level below that of the bottom of the water tank to which the injector is connected by the usual pipe coupling which is not shown in these drawings. This location of the injector insures a ready supply of water to be forced into the boiler B and thus relieves the injector of the duty of lifting water from a supply located below it. In Figs. 2 and 3 I have shown an injector of the double tube type which is commercially represented by the Hancock "inspirator". This instrument is termed a double tube injector for the reason that two distinct sets of tubes are employed whereof one comprises a steam tube and a combining tube in which the internal cross sectional proportions are such, that the tube, when properly connected to a source of water supply will suck or lift the water; and the other set of tubes comprises a steam tube and combining tube of such internal cross sectional proportions that they will force water against a pressure equal to or greater than that of the steam which furnishes the motive power of the instrument. As in the case of the Hancock "inspirator" double tube injectors have been, for the most part, employed first to lift water from a source below the instrument and then to

force it into a boiler, the first set of tubes performing the lifting function and the second set, the forcing function. In either case, the first set of tubes feeds a supply of water to the second set, the latter forcing the water into the boiler.

While by preference, I apply the improvements which constitute my present invention to an injector which is located at a level below that of the water supply, I still believe it to be advantageous to employ a double tube injector, which, while it does not actually lift water in the ordinary sense, nevertheless performs a function analogous to water lifting in that it propels a stream of water to the forcing tubes at a rate and in a quantity largely in excess of that which can be effected by the ordinary gravitational flow, and also acts as a regulator to adjust automatically the water supply to suit variations in steam pressures. My improvements, however, may be applied advantageously to single tube injectors. In the arrangement shown in the drawings, there is provided in the engine cab C, a steam valve A controlled by a valve handle A′ which admits steam from the boiler into the injector steam pipes E and F. The steam pipe E conducts steam to the steam tube E′ which belongs to the first, or feeding set of tubes while the pipe F conducts steam to the forcer steam tube F′. On the admission of steam to the injector which by reason of its preferred location is already flooded with water, steam issuing from the steam tube E′, establishes a stream through the combining tube E^2, drawing water from the suction chamber S in the injector casing and thus taking water from and through the pipe connection S′. The water passing from the tank to the injector tubes is controlled by a check valve at S^2, a small return opening being provided at S^3, for purposes hereinafter to be described. Water delivered by the tubes E′ E^2 passes to the forcer combining tube F^2 and is there entrained by the jet of steam issuing from the forcer tube F′ and forced into the boiler through the check valve-controlled opening at B′. When the steam is admitted to the injector for the purposes of starting it the overflow valve O′, which controls the final overflow O, is open so as to permit the establishment of the stream of water through the instrument. This overflow valve O′ is operated by means of a rod O^2 which extends upward to a handle O^3 located in the engine cab within easy reach of the engine driver. When the stream is established through the overflow opening, the valve O′ is closed by means of the handle O^3 and the above mentioned connection, and under proper conditions the stream of water then enters the boiler. If, however, as sometimes happens, the stream of feed water has not been properly established or the injector "breaks", the engine driver will have no immediate information of this condition of things when, as in the illustration shown, the injector is located outside of the cab and not within range of the engine driver's inspection.

For the purpose of informing the engine driver that the injector is not in proper operation, I provide the following attachment to the instrument. Into some portion of the conduit or series of chambers which constitute the water passage to the combining tube of the injector, I insert, as a vent, a valve controlled pipe section V′, preferably placing this on the instrument so that it communicates with the suction chamber although it may be placed in communication with any portion of the said water passage where under normal conditions of proper operation the pressure is near to or lower than the outside atmospheric pressure.

The vent V′ is controlled by the valve V which rests upon the valve seat V^2, the body of this valve being of such proportions and weight that the valve rests with an appreciable load upon its seat. The load on the valve V holds the valve to its seat with sufficient pressure to allow the injector being used as a water heater, that is to say, to blow back a small quantity of steam into the water tank to warm the water or keep it from freezing in winter weather. As this is a useful and important function of locomotive engine injectors, it would be highly inadvisable to provide a vent valve without a load for the reason that in such case, even the moderate pressure of steam required to overcome the head of water in the tank and connecting pipes would lift the vent valve from its seat and allow the steam to escape without performing its office of water heating. A spring may be substituted for the weight, but I prefer the construction shown. The valve V is perforated at V^3 and has a groove turned in it at V^4 from which groove longitudinal channels V^5 run along the body of the load part of the valve to the holes V^6 through which steam or water may pass to or from the pipe V^7. The interior of the pipe section V′ contains not only the valve seat V^2 but is so proportioned that it fits the cylindrical surface of the valve V which has a lower portion *v* which acts as a piston valve within the pipe section V′. The opening V^8 is placed so that it registers with the groove V^4 when the valve is seated but so that when the valve lifts the piston portion *v* thereof closes the drain opening V^8 and thus prevents the escape of steam through said drain opening compelling it to find its way up through the aforesaid channels and holes to the vent pipe opening at the upper end of the pipe V^7. If steam is condensed in the vent pipe V^7 the water of condensation will find its way through the channels and passages of the valve V to and out of the opening V^8. This

vent pipe V^7 terminates in an opening in the cab C at some convenient point where it may be within the observation of the engine driver.

In case the injector fails to start, or when in operation it "breaks", steam from the boiler at once fills the instrument creating pressure therein sufficient to lift the loaded valve V from its seat V^2 when steam passes through the several valve channels, above mentioned, into the vent pipe V^7 and emerges at the cab end of the pipe thus notifying the engine driver that the injector is out of operation, when, by closing the steam valve and opening the overflow valve by the means above described, he can restart the instrument. The blow back passage S^3 which is formed in the supply pipe check valve casing is of sufficient capacity to admit steam to the water tank for the purpose of heating the water.

I have described my invention as applied to a double tube injector but it may also be applied to a single tube or simple injector of the Giffard type, in which case the vent opening will be made preferably in the suction chamber of the injector wherein the pressure is reduced by the normal operation of the instrument.

I believe it to be advisable and in most cases necessary to employ in connection with an automatically venting injector, such as above described, a return check in the connections to the tank such as shown at S^2, so that when the injector breaks or fails to operate, the full effect of steam pressure may be felt upon the vent valve V and not spend itself by blowing back copiously through the tank connections. The presence of this check valve in the tank connections makes it certain that the vent valve V shall operate when it should. The load whether applied by a weight or a spring upon the vent valve V should be proportioned or adjusted so that pressure adequate to overcome the head of water in the tank and its connections will not suffice to lift the vent valve. This will enable the engine driver, as suggested above, to blow steam back gently through the injector to warm the tank water when desired. The blow back aperture S^3 may be located either in the suction check valve or, as shown in the drawings, in the partition upon which the check valve seat is formed. Obviously such an aperture must be in the suction check valve casing in order properly to perform its office.

What I claim and desire to secure by Letters Patent is:

1. The combination in an injector, of steam and combining tubes, suction chamber and overflow outlet, of a vent communicating with the water supply passage, and a check valve controlling the vent, said valve provided with a piston portion sliding in a valve casing, the casing, having a drain aperture, said drain aperture controlled by the piston portion of the vent valve, to close the drain opening as the check valve opens.

2. The combination in an injector of steam and combining tubes, suction chamber and overflow outlet, a check valve controlling the suction, a blow-back aperture, a vent tube communicating with the water supply passage between the suction check valve and the injector tube, and a check valve loaded to resist normal pressures to control the vent.

Signed by me at Boston, Suffolk county, Massachusetts, this twenty-seventh day of May, 1907.

WILLIAM R. PARK.

Witnesses:
ODIN ROBERTS,
E. D. CHADWICK.