

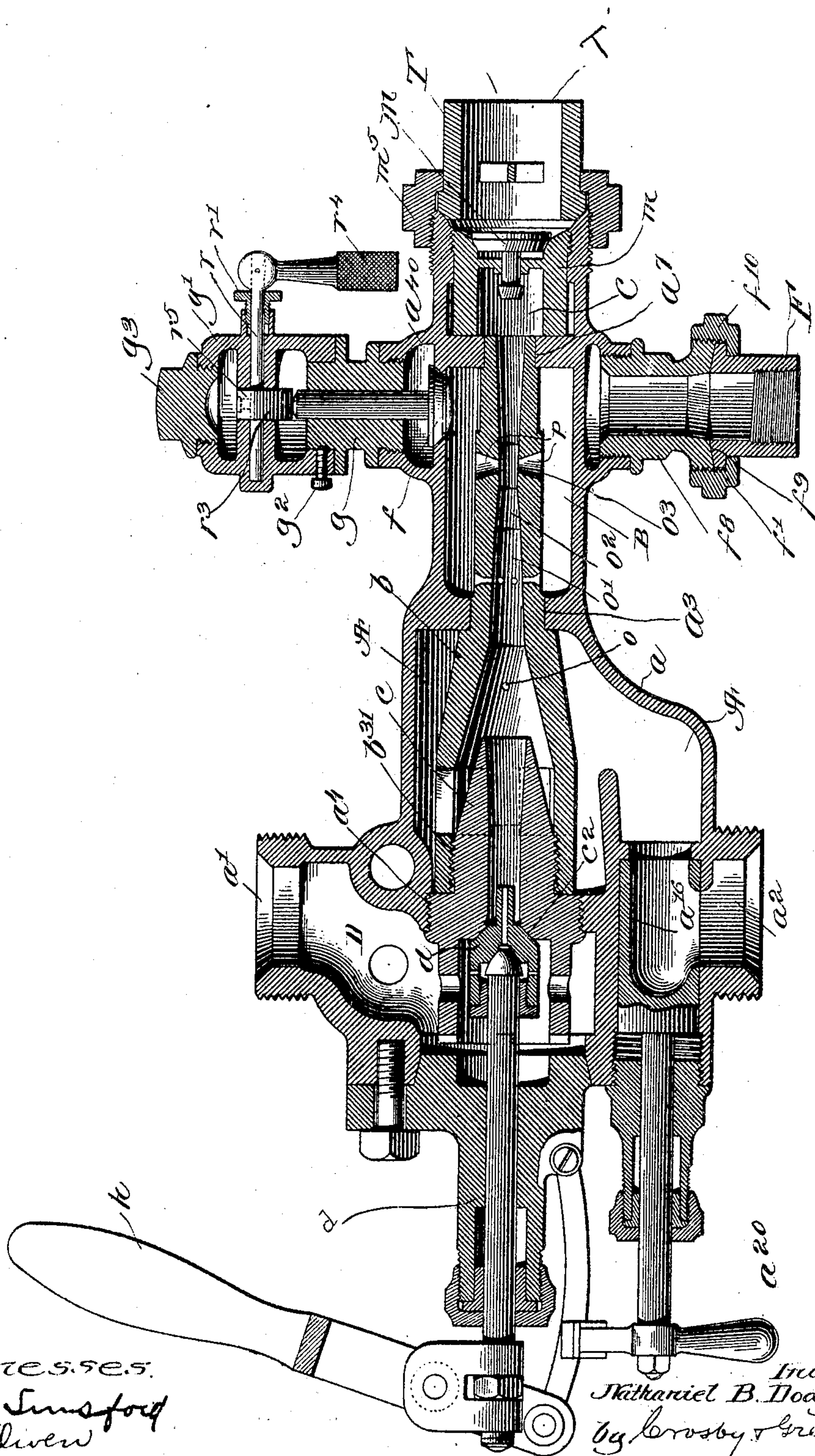
No. 798,399.

PATENTED AUG. 29, 1905.

N. B. DODGE.

INJECTOR.

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INJECTOR.

No. 798,399.

Specification of Letters Patent.

Patented Aug. 29, 1905.

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To all whom it may concern:

Be it known that I, NATHANIEL B. DODGE, a citizen of the United States, residing at Fitchburg, county of Worcester, State of Massachusetts, have invented an Improvement in Injectors, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawing representing like parts.

This invention relates to injectors more particularly adapted for supplying locomotive-boilers with feed-water; and it consists in certain improvements in that type of injector described and illustrated in my prior patent, Reissue No. 11,877, granted December 11, 1900.

The object of the invention is to provide an injector embodying in its construction various features tending to simplification of parts and increased efficiency and ease of operation.

The invention especially is directed to improvements in the construction of the combining-cone and its connection with the end check-valve, also in the overflow-check-valve operating mechanism and also in the connections with the outlet-port.

In the present invention the injector comprises a casing containing five separate and distinct chambers, one for the steam-supply, one for the water-supply, one for superheating the water, one for the overflow, and one for the end check-valve, and they are comprised in a single-piece casing. The overflow or waste-water chamber in this invention is close-walled and when the overflow-valve is closed secures the production of a very complete vacuum. The combining-cone also passes entirely through the overflow or waste-water chamber and seats firmly against the wall of the chamber. The end check-valve shell is inclosed in its separate chamber and is screwed up against the opposite side of the wall from that entered by the combining-cone. These features of construction in particular have been found after experiment to produce an extremely quick-acting and efficient injector. The vacuum produced is all that is required, and the construction and arrangement of the parts is such that none of them, including the combining-cone and the

end check-valve shell, work loose during the operation of the injector. As is well known, the injector is a vital feature, especially in a locomotive-engine, and the working loose of the parts under the powerful pressures and shocks to which it is subjected act to materially decrease, if not entirely destroy, its efficiency.

Another feature of the invention which is considered important is the provision of a rotarily-adjustable casing for the overflow-valve, so that the handle of the valve can be brought into any desired position.

The features above referred to and various other features of the invention will be more fully defined and set forth in the appended claims.

The single figure of drawing represents, chiefly in longitudinal cross-section, an injector embodying the invention.

The general arrangement and mode of operation of the injector is fully set forth in the aforesaid Reissue Patent No. 11,877, to which reference is hereby made for a more detailed description of the parts not concerned in the present invention. The casing of the injector *a* is made in a single casting and is substantially the same in general construction as in the said reissue patent. This casing has the novel construction of being provided interiorly with five separate chambers—viz., the chamber *D* for the steam-supply, into which the port *a'* opens; the chamber for the water-supply, into which the port *a''* opens; the superheating-chamber *A*; the chamber for the waste or overflow *B*, and the end check-chamber *C*. The superheating-chamber *A*, the rotatable cylindrical valve *a¹⁶*, connecting the water-chamber with the superheating-chamber, the operating-handle *a²⁰* for the said valve, and the connected parts are all substantially as shown in the said Reissue Patent No. 11,877. The steam-cone *c*, having the combining-cone *b* screw-threaded thereon at *b³¹* and itself screw-threaded in an opposite direction in the casing-seat *a⁴*, is also constructed substantially as in said Reissue Patent No. 11,877. The steam-chamber *D*, opening into the steam-cone *c*, the starting-valve *d*, seating against the seat *c²* of the steam-cone, the starting-valve stem *d'*,

its operating-handle h and connections are all constructed substantially as shown in the said Patent No. 11,877.

My improved combining-cone b is constructed with five frusto-conical communicating interior chambers, the first three of which o o' o^2 , beginning from the end of the steam-cone, converge toward the delivery end of the steam-cone, while the remaining two chambers o^3 and o^4 diverge in the direction of the delivery end. By long experiment and investigation I have found that by this construction the most effective action of the injector is secured. The casing a is also provided in addition to the annular seat a^3 for the combining-cone with an annular seat a^7 in the partition which separates the overflow or waste chamber B from the end check-chamber C, and the combining-cone is seated in both of the seats a^3 and a^7 and is provided with shoulders abutting against these two seats, so that when the combining-cone is placed in position it is firmly held on the two seats. By this construction the combining-cone discharges directly opposite the end check-valve M and in the most efficient manner. The shoulders of the combining-cone are ground to fit precisely the walls against which they abut, and when the combining-cone is screwed into position it is so firmly held that there is no danger of the end of the combining-cone or any other portion working loose during the action of the injector, and thereby a tight joint is formed, so that the back pressure from the boiler is prevented from forcing steam or water from the end check-valve chamber into the vacuum.

Ports p are provided, preferably, from the chamber o^3 in the combining-cone to the overflow or waste chamber B. In practice I prefer to elongate somewhat the chamber B and the end of the combining-cone from that shown in the drawing and to bring the ports p substantially in line with the overflow-valve f . While this is not necessary, it renders the injector somewhat quicker in its action.

The end check-valve M, seated in its supporting-shell m , is screwed into the end of the casting n and is contained in a separate end check-chamber C. The shell of the end check-valve is also ground to fit against the wall of the shoulder a^7 , so that when it is screwed in position it is locked in place by abutting against the said wall, and this serves to prevent the working loose of the end check-valve and its shell during the action of the injector.

The tailpiece T, attached to the delivery end of the casing a by the coupling m^5 and provided with the spider or grid T', are all constructed as shown in the said Reissue Patent No. 11,877.

It is common experience in the use of injectors of this general type that the waste steam discharged from the outlet-port f' rises again around the injector and especially in cold weather befores the window of the cab adjacent to which these injectors are commonly located or in other ways interferes with not only the handling of the injector, but of other parts of the locomotive or boiler. To avoid this difficulty, I have provided a screw-threaded tailpiece F, fitting against the usual connection f^8 with a ground seat f^9 and clamped to the said connection f^8 with a coupling f^{10} . The tailpiece F is then attached to a pipe or hose leading to the bottom of the locomotive or to some point where the escaping steam cannot be detrimental.

In my prior patent, Reissue No. 11,877, the overflow check-valve f was held downward when the injector was to be used as a heater by a spring-pressed plunger or piston. This device has, however, been found inefficient for many purposes, and I have devised the following construction: The overflow check-valve f is slidingly mounted in a cap g , which cap is screwed into the top of the hollow boss a^{40} , connecting with the waste-chamber B. The hollow boss forms the valve-chamber for the valve f . A chambered casing g' is revolubly mounted on the cap g and locked in position thereon by a set-screw g^2 . The chambered casing g' is provided with a screw-threaded cap g^3 , whereby access may be had to the cam R^3 for adjusting it upon its shaft. In the chambered casing g' is journaled a shaft r , one end of the shaft terminating within the wall of the casing and the other end passing through the wall and provided with a packing-screw r' to prevent the escape of any steam which may leak into the chamber. On the shaft r is mounted a cam r^3 and a handle r^4 for operating the shaft. At one side and projecting from the wall of the casing is a stop r^5 , (shown in dotted lines.) The steam is confined in the valve-chamber in the boss a^{40} , but should any escape around the valve-stem into the cam-chamber, which seldom happens, the stuffing-box in the cam-chamber prevents any leakage to the outside.

When it is desired to hold the overflow check-valve f on its seat, the handle r^4 is turned to bring the cam r^5 down against a valve-stem. The valve is thus firmly locked in position. When the handle r^4 is raised to allow the overflow-valve f free action, it might under the jarring action of the engine fall and lock the valve down when not desired. To prevent this, I provide the stop r^5 , over against which the cam r^3 is thrown when the valve is to be left free.

The casing g' is rotatably mounted on the cap g^5 , so as to allow of the handle r^4 being

placed in proper position for operation without interfering with the adjacent parts of the cab or locomotive.

It will be seen from the drawing that the
5 overflow or waste-water chamber bounded at each end by the annular seats a^3 a^7 is close-walled, the only opening from said chamber being through the overflow-valve f . This secures the production of a practically com-
10 plete vacuum, rendering the injector quick and certain in its action.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

15 1. An injector comprising a casing, annular seats located in the casing at each end of the waste or overflow chamber, a bearing-hole in each seat, the one nearer the boiler end being of smaller diameter than the other,
20 a combining-cone extending entirely through the waste or overflow chamber and provided with shoulders abutting against the faces of the said seats away from the boiler end, and fitting snugly the bearing-hole in each seat.

25 2. An injector provided with a combining-cone having a plurality of connected frusto-conical chambers converging in the direction of the delivery end, and a succeeding plurality of connected frusto-conical chambers diverging to the delivery end of the combining-cone, an overflow or waste chamber, and
30 openings from the first diverging chamber of the combining-cone into the said overflow or waste chamber.

35 3. An injector comprising a casing, an individual or separate chamber therein for the end check-valve, a supporting-shell in which

the end check-valve is mounted, the said supporting-shell being screwed into and passing
40 entirely through the chamber and seating against the end wall of the chamber whereby it is held firmly locked in position.

4. An injector comprising a casing, an individual or separate chamber therein for the
45 overflow or waste water, an individual or separate chamber therein for the end check-valve, a combining - cone passing entirely through the first chamber and seating against the wall separating said chambers, a support-
50 ing-shell in which the end check-valve is mounted screwed into and passing entirely through the second chamber and seating
against the opposite side of the wall separating the said chambers.

5. An injector provided with an overflow
55 check-valve, a valve-chamber for said valve, a chambered casing located in line with the overflow valve - chamber and into which chamber the valve-stem projects, a cam in-
60 side of said chambered casing for operating the valve, a spindle upon which the cam is mounted passing through the wall of the cas-
ing and provided with a handle on the exterior, a stuffing-box on the wall of the cas-
ing through which the spindle passes, means
55 for rotarily adjusting and locking in position the said chambered casing.

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

NATHANIEL B. DODGE.

Witnesses:

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