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DEVICE FOR DELIVERING GASEOUS FLUID UNDER PRESSURE.

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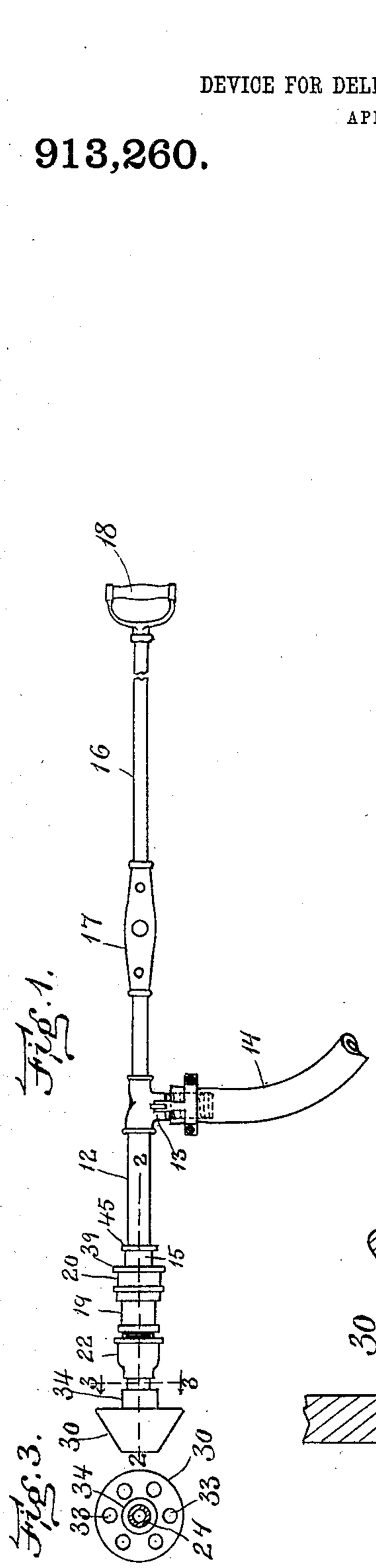

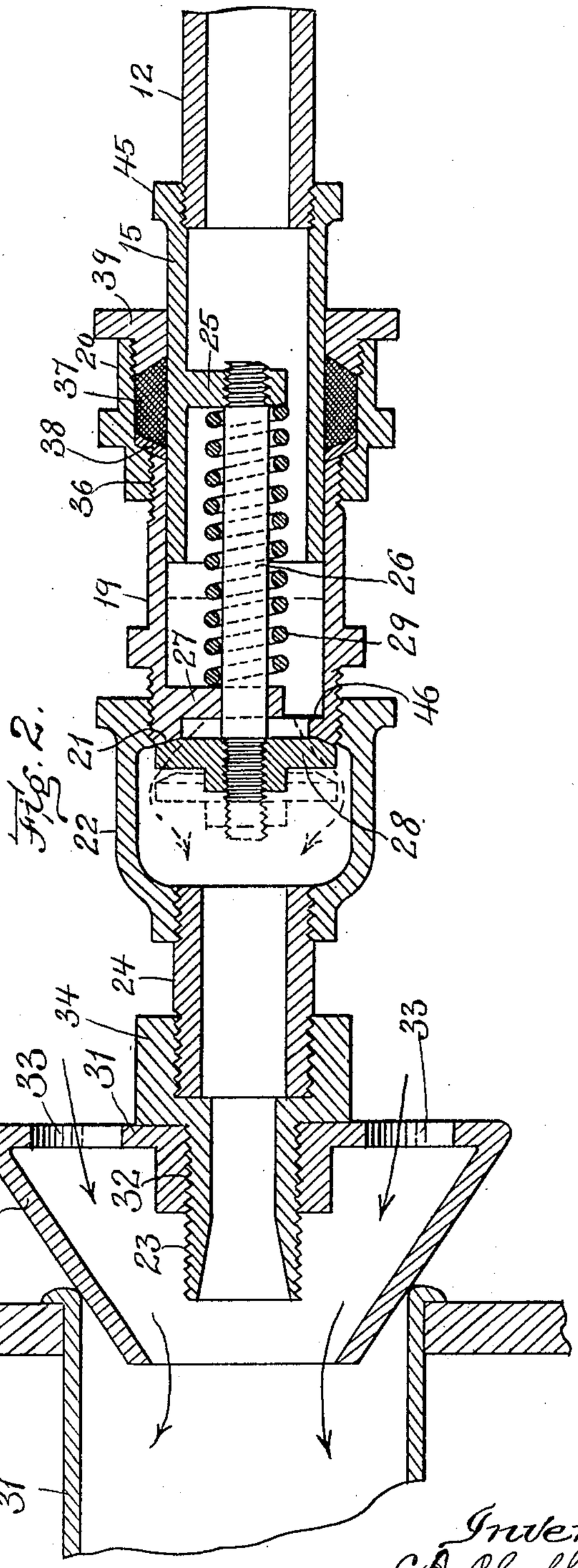

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DEVICE FOR DELIVERING GASEOUS FLUID UNDER PRESSURE.

No. 913,260. Specification of Letters Patent. Patented Feb. 23, 1909.

Application filed October 23, 1908. Serial No. 459,217.

To all whom it may concern:

Be it known that I, CHARLES A. CLAFLIN, of Medford, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Devices for Delivering Gaseous Fluid Under Pressure, of which the following is a specification.

This invention relates to devices for delivering steam or other gaseous fluid under pressure in a forcible jet adapted for various purposes such as cleaning boiler tubes. Appliances for this purpose are in use including a portable steam conduit adapted to be flexibly connected with a source of steam supply, and to be presented to the tubes of the boiler so as to inject steam into the tubes.

The invention has for its object, first, to provide an improved construction of boiler tube cleaner whereby an ample current of air is enabled to follow the steam into the tube, the flow of air being induced by the flow of steam, and preventing any retardation of the passage of the steam through the tube which might be caused by a failure to admit enough air with the steam to relieve the vacuum caused at the receiving end of the tube by the steam current.

The invention also has for its object to provide improved means for providing for the opening of the passage through a portable telescopic conduit by a relatively light pressure of the delivering end of the latter against a fixed support, such as the end of a boiler tube, and for automatically closing the steam passage when the conduit is removed from the said support.

The invention consists in the several improvements which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification,—Figure 1 represents a side elevation of a boiler tube cleaner embodying my invention. Fig. 2 represents an enlarged section on line 2—2 of Fig. 1, showing the head of the tube cleaner engaged with a boiler tube. Fig. 3 represents a section on line 3—3 of Fig. 1.

The same reference characters indicate the same parts in all the figures.

My improved device when embodied in a tube cleaner, comprises a telescopic portable conduit composed of an inner and an outer member having a balanced valve, the inner member as a whole being indicated by the reference letter *a*, and the outer member by the reference letter *b*. In the embodiment of my invention here shown, each of these members is composed of a plurality of parts or sections detachably connected, a portion of the outer member *b* being adapted to inclose and slide upon a portion of the inner member *a*.

The preferred details of construction of the members *a* and *b* are as next described. The member *a* comprises a tubular section 12 having at one end an elbow 13 which is provided with a suitable coupling or other means whereby a flexible steam supply pipe or hose 14 may be connected to the inner member. The portion of the inner member which slides in the outer member is a tubular cylindrical section 15 attached to the section 12. The inner member is provided with a suitable elongated handle 16 having a plurality of hand grips 17 and 18 by which the cleaner as a whole may be conveniently manipulated.

The outer member *b* includes a tubular section 19 adapted to slide upon the section 15 of the inner member, and provided with a stuffing box 20 which maintains a steam-tight joint around the section 15, said stuffing box being described in detail hereinafter. On one end of the section 19 is formed a valve seat 21 which is located at one end of a valve chamber formed by an enlarged section 22 forming a part of the outer member. The remaining parts of the outer member are a steam-delivering nozzle 23 which constitutes the outer end of the outer member, and a coupling section 24 which connects the nozzle 23 with the valve chamber section 22.

Within the section 15 of the inner member is an abutment 25, preferably formed as a three-armed spider, to which is rigidly attached a valve stem 26 extending lengthwise of the conduit and projecting at one end into the valve chamber 22, said stem being adapted to slide in a guide 27, which is also preferably formed as a three-armed spider, affixed rigidly to the section 19.

28 represents a valve located in the chamber 22, said valve being rigidly attached to the valve stem 26, and adapted to close upon the seat 21.

29 represents a spring which surrounds the valve stem 26 and bears at one end on the abutment 25, and at the opposite end on the guide 27, said spring yieldingly pressing the inner member *a* rearwardly, and holding the valve 28 yieldingly against its seat 21.

30 represents a frusto-conical head adapted to engage or partially enter a boiler tube 31, the tapered external surface of the head coming to a bearing on one end of the tube, as indicated in Fig. 2. The larger end of the head 30 has a transverse wall 31′ provided at its center with an internally threaded socket 32 which engages an external thread on the nozzle 23. The end wall 31′ is provided with a plurality of air inlets 33, which, as shown in Fig. 3, are arranged in a circular series around the nozzle. The smaller end of the head 30 is open, and the head is formed to inclose an annular air passage surrounding the nozzle, one end of said passage having free communication with the external air through the inlets 33, while the other end has free communication with the interior of the boiler tube 31 through the smaller open end of the head. The inner end of the nozzle 23 is preferably enlarged to form a socket 34 which is internally screw-threaded to engage the coupling section 24.

The described device is operated by applying the head 30 to the end of the tube 31 and exerting longitudinal pressure through the handle 16 on the inner member *a* against the stress of the spring 29, the spring yielding and permitting the movement of the inner member *a* and of the valve 28 attached thereto, as described, in the direction required to separate the valve from its seat, as indicated by dotted lines in Fig. 2. Steam is thus permitted to pass around the valve and through the nozzle 23, which is supported by the engagement of the head 30 with the boiler tube substantially in alinement with said tube, so that the jet of steam delivered by the nozzle passes through the tube in the direction of its length.

It will be observed that the valve and its seat are located between the steam inlet 14 and the tube engaging head 30, said valve and seat being entirely separated from the head so that the interior of the head is occupied only by the nozzle 23 and by the annular air passage surrounding said nozzle. Provision is therefore made for the admission of an ample quantity of air to insure the rapid passage of the steam through the tube, the air thus admitted mingling with the steam and the whole forming a blast which moves with high velocity through the tube and effectively removes all foreign matter deposited upon the inner surface thereof.

It will be observed that the annular air passage is entirely within the portion of the head which bears upon the end of the boiler tube, so that the area of said passage is in no way affected by wear of the external surface of the head by contact with the ends of the tubes. This statement is made to distinguish my improved cleaner from other contrivances for the same purpose in which a head is employed having external ribs adapted to bear upon the end of a boiler tube the spaces between the ribs forming air passages outside the head. When these ribs are worn by frictional contact with the ends of the boiler tubes, the air passages are correspondingly restricted,—a result which does not take place in my improved device.

I believe myself to be the first to provide in a device of this character, a telescopic valved conduit having a tube-engaging head which incloses an air space surrounding a steam-delivering nozzle held in alinement with the tube, and a valve adapted to be opened and closed by movements of one member of the conduit relatively to the other, the valve and its seat being entirely outside the head so that the interior of the head is utilized entirely in forming an annular air passage around the steam-delivering nozzle.

The separation of the valve from the head and nozzle gives the nozzle an unobstructed outlet so that the current of steam is not deflected by anything between the nozzle and the tube 31, but passes with unobstructed force directly into the tube where it is free to expand and fill the tube while passing through it. The separation of the valve from the head also permits a much greater area of the end wall 31′ and the air inlets therein, than would be possible if the valve were located within the head, in which case the air inlet area would be limited by the space occupied by the valve. The externally threaded nozzle forming the delivering terminal for the telescopic conduit and detachably secured to the adjacent member 24 of said conduit, and the head having an end wall 31′ at its larger end, said wall being provided with an internally threaded socket to engage the external thread on the nozzle, provides a very simple construction of the steam-delivering and air conducting portions of the device, this construction permitting both the nozzle and the head to be readily removed when worn and new parts substituted for them.

The stuffing box 20 is provided at one end with an internal screw thread 36 adapted to engage an external screw thread on the section 19 of the outer member *b*. The interior of the stuffing box is chambered smoothly to form a packing cavity 37 of greater diameter than the internally threaded portion 36.

38 represents a choke ring which is inserted loosely in the cavity 37 and is formed to bear against one end of the section 19, and extends across the screw thread joint which connects the stuffing box with said section. Said ring is preferably beveled to fit a corresponding bevel on the end of the section 19.

39 represents a gland which is externally threaded to engage an internal thread in the larger end of the stuffing box. The inner end of the gland has a bevel opposite to that of the choke ring. The gland and the choke

ring constitute the ends of the packing cavity, said ends being oppositely beveled so that when the distance between them is decreased, they press the packing inwardly against the section 15. The stuffing box is adjustable lengthwise of the section 19 by reason of its screw thread connection therewith. When the packing material has been inserted in the cavity 37 and confined by the gland 39, it may be compressed from time to time by turning the stuffing box in the direction required to move it toward the head 30. The choke ring 38 does not partake of this movement, it being backed by the section 19; hence, the packing is compressed between the gland and the choke ring by the described adjustment of the stuffing box. The section 15 has an enlargement 45 having a hexagonal surface to engage a wrench. Said enlargement acts as a stop to prevent the removal of the gland 39 from the section 15 when the gland is detached from the stuffing box.

The inner member *a* of the telescopic conduit presents an area exposed to the back pressure of steam within the conduit, or in other words, to steam pressure tending to close the valve, this area being provided by the end 41 of the section 15, which enables the steam pressure to coöperate with the spring 29 in closing the valve, so that a relatively light spring is sufficient for this purpose, and a relatively light outward pressure on the inner member *a* is sufficient to open the valve. In other words, the valve is approximately balanced by the steam pressure within the conduit so that it is sensitive and is adapted to be closed by a light spring which may be overcome by a light pressure exerted by the operator. The sensitiveness of the valve may be incurred, first, by providing the section 19 of the outer member *b* with an inwardly projecting shoulder 46 which is exposed to steam pressure tending to force the outer member outwardly and thus close the valve; and secondly, by making the internal cross sectional area of the coupling or section 24 of the outer member less than that of the section 15 of the inner member, this difference in cross sectional area resulting in an outward pressure of the outer member *b* tending to close the valve. The internal cross sectional area of the nozzle 23 may be less than that of the coupling section 24 for the purpose last described.

It will be seen from the foregoing that the internal surface of each of the members *a* and *b* is formed to cause the fluid pressure in the conduit to assist the valve-closing moment of the spring 29.

My invention may be embodied in a device for delivering steam or other gaseous fluid under pressure, including the inner and outer conduit sections, the valve, the valve closing spring and the valve seat, without the head 30, the internal surfaces of one or both of the members *a* and *b* being formed to cause the fluid pressure in the conduit to assist the valve-closing action or moment of the spring.

It is obvious that the described device may be used to deliver compressed air or other gaseous fluid under pressure instead of steam.

I claim:

1. A device of the character stated comprising a conduit, having means at its inner end portion for connection with a fluid pressure supply pipe, and a delivering nozzle at its outer end, and a frusto-conical hollow head attached to the conduit and forming with the nozzle, a direct annular air passage open at both ends of the head and entirely surrounding the nozzle, said head being adapted for engagement with the end of a boiler tube.

2. A device of the character stated comprising a telescopic conduit, having means at its inner end portion for connection with a fluid pressure supply pipe, and a delivering nozzle at its outer end, a frusto-conical hollow head attached to the conduit and forming with the nozzle, a direct annular air passage open at both ends of the head and entirely surrounding the nozzle, said head being adapted for engagement with the end of a boiler tube, a valve attached to one of the members of the conduit, a seat formed on the other member of the conduit, and a spring adapted to hold the valve yieldingly against the seat, said valve and seat being located between the steam inlet and the head, so that the interior of the head is occupied only by the nozzle and the annular air passage surrounding it, whereby an ample induced flow of air through the head into the tube is permitted.

3. A device of the character stated comprising a conduit having means at its inner end portion for connection with a fluid pressure supply pipe, and an externally threaded delivering nozzle at its outer end, a frusto-conical hollow head having a transverse wall at its larger end provided with an internally threaded socket adapted to engage the nozzle, and with air inlets arranged in a circular series around the nozzle, the smaller end of the head being open, so that the head forms, with the nozzle, a direct annular passage entirely surrounding the nozzle and adapted to conduct an induced current of air to a boiler tube with which the head is engaged.

4. A device of the character stated comprising a telescopic conduit composed of an inner member provided with means for attachment to a fluid pressure supply pipe, an outer member provided with a delivering nozzle, an internal valve seat attached to the outer member and located between the head and the steam inlet, a valve stem attached to an abutment affixed to the inner member and extending lengthwise of the conduit

through a guide affixed to the outer member, a valve affixed to said stem within the outer member, and adapted to engage said seat, and a spring surrounding the valve stem between said guide and abutment, and adapted to yieldingly force the inner member backwardly and hold the valve yieldingly against its seat, the inner surface of the inner member being formed to cause the fluid pressure in said conduit to assist the valve-closing moment of the spring.

5. A device of the character stated comprising a telescopic conduit composed of an inner member provided with means for attachment to a fluid pressure supply pipe, an outer member provided with a delivering nozzle, an internal valve seat attached to the outer member and located between the head and the steam inlet, a valve stem attached to an abutment affixed to the inner member and extending lengthwise of the conduit through a guide affixed to the outer member, a valve affixed to said stem within the outer member, and adapted to engage said seat, and a spring surrounding the valve stem between said guide and abutment, and adapted to yieldingly force the inner member backwardly and hold the valve yieldingly against its seat, the inner surface of the outer member being formed to cause the fluid pressure in said conduit to assist the valve-closing moment of the spring.

6. A device of the character stated comprising a telescopic conduit composed of an inner member provided with means for attachment to a fluid pressure supply pipe, an outer member provided with a delivering nozzle, an internal valve seat attached to the outer member and located between the head and the steam inlet, a valve stem attached to an abutment affixed to the inner member and extending lengthwise of the conduit through a guide affixed to the outer member, a valve affixed to said stem within the outer member, and adapted to engage said seat, and a spring surrounding the valve stem between said guide and abutment, and adapted to yieldingly force the inner member backwardly and hold the valve yieldingly against its seat, the inner surfaces of both members being formed to cause the fluid pressure in said conduit to assist the valve-closing moment of the spring.

7. A device of the character stated, comprising a telescopic conduit composed of an externally threaded outer member having an internal valve seat, an inner member slidable in the outer member and having a valve adapted to bear on said seat, and a spring which yieldingly forces the inner member rearwardly and seats the valve, a stuffing box having at one end an internal thread engaged with the external thread of the outer member, the interior of the stuffing box being of greater diameter than said internal thread to form a smooth surfaced packing cavity, a choke ring inserted loosely in said cavity and forming one end thereof, said ring being seated on the inner end of the outer member, and a gland having a detachable screw thread connection with the stuffing box and forming the outer end of the packing cavity, said stuffing box and gland being adjustable on the outer member to compress the packing, the inner member having an enlargement which acts as a stop to limit the separation of the gland from the stuffing box.

In testimony whereof I have affixed my signature, in presence of two witnesses.

CHARLES A. CLAFLIN.

Witnesses:
C. F. BROWN,
P. W. PEZZETTI.