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AUTOMATIC OIL STOKER.

APPLICATION FILED MAY 29, 1911.

1,035,576. Patented Aug. 13, 1912.

Fig. 1.

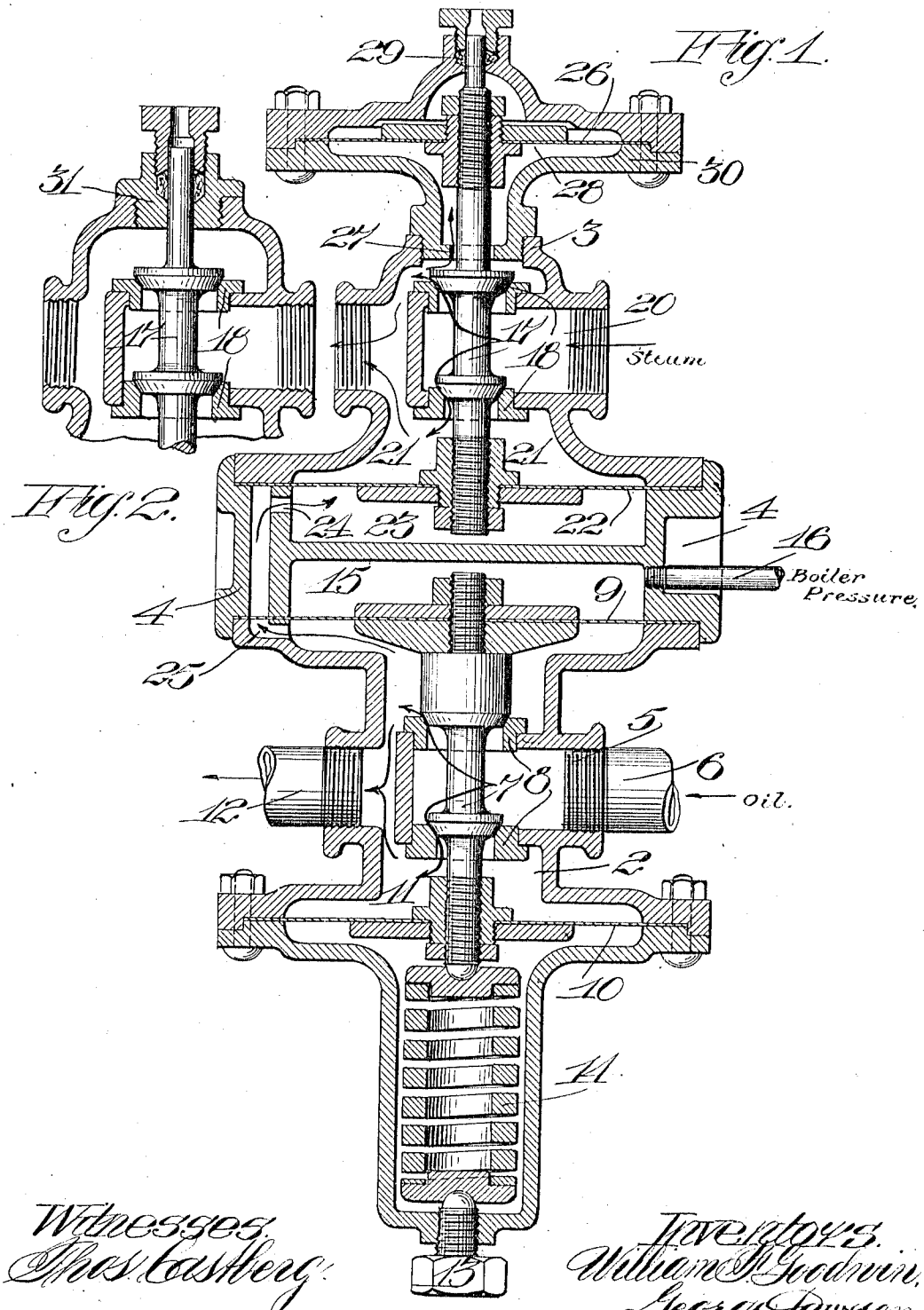

Fig. 2.

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AUTOMATIC OIL-STOKER.

1,035,576. Specification of Letters Patent. Patented Aug. 13, 1912.

Application filed May 29, 1911. Serial No. 630,043.

To all whom it may concern:

Be it known that we, WILLIAM F. GOODWIN and GEORGE DAWSON, citizens of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Automatic Oil-Stokers, of which the following is a specification.

This invention relates to oil controlling apparatus, and particularly to an automatic oil stoker for oil burning furnaces.

The object of the present invention is to provide a device for automatically regulating the amount of oil fed to burners beneath boilers; to provide a stoker adapted to so regulate and control the fuel oil and necessary steam for atomization to one or more burners as to maintain a steady steam pressure on the boiler within the limits of its capacity or at a certain degree; and to provide a stoker involving a novel arrangement of valves, and to operatively connect the same in a practical manner.

An important object of the present invention is to provide means whereby the valves will operate automatically and in unison in a frictionless manner, and which will be efficient, strong and durable and quickly adaptable to control the flow and feed of oil to burners of both the inside and outside mixing type.

Oil burners include two distinctly different classes known as inside and outside mixing burners. In the former the oil and steam are mixed in an interior chamber within the burner before it is discharged; and in the outside burner the oil and steam are mixed just beyond the tip of the burner after discharging from the same.

The present invention is designed to be quickly operable, and effective to control the mixture and pressure of steam and oil in either of the above mentioned burners.

The invention consists of the parts and the construction and combination of parts, as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a central, longitudinal section through the stoker. Fig. 2 shows the steam end of the stoker as arranged for controlling the supply of steam and oil to inside burners.

The stoker, as illustrated in the present embodinment of this invention, consists of the oil end or section 2, and a steam end or member 3, bolted together by a flanged bridge or head 4, disposed between the oil and steam ends. The oil end 2 is provided with a connection 5, to which may be coupled an oil supply pipe 6, connected to a suitable source of supply from which oil is delivered into the connection 5 under suitable pressure, say, for instance, seventy pounds.

The flow of oil from the connection 5 into the interior of the oil section 2 is controlled by a double shouldered valve 7, seating upon upper and lower seats 8. Upon the stems or reduced portions of the double shouldered valve are connected upper and lower diaphragms 9 and 10, which form within the interior of the oil end 2 a chamber 11 from which the oil is delivered after it passes through the valve openings within the seat 8 into a discharge or delivery pipe 12, leading to the burner or burners, not shown.

When the valve 7 is opened, the pressure of oil from the source through the connection 6 flows into the chamber 11 and exerts an equal force upon the diaphragms 9 and 10. There is interposed below the diaphragm and between an adjusting device, here shown as a screw 13, a powerful spring or equivalent resilient device 14, the pressure of which against the diaphragm 10 is determined by the adjustment of the screw 13. The pressure of the oil admitted past the valve 7 into the chamber 11 is not effective upon the spring 14, but the spring is reacted upon by the pressure of steam from a boiler, not shown, conducted into a chamber 15 through a suitable connection, as a pipe 16, above the upper diaphragm 9 and below the bridge or head 4. Thus with a given boiler pressure, say one hundred and fifty pounds, in the controlling chamber 15 above the diaphragm 9, and with the expansible spring 14 adjusted to approximately equalize the pressure in the chamber 15, at this equalization of forces, the valve 7, controlling the flow of oil from the inlet

side of the oil end into the delivery chamber 11, becomes sensitive so that a slight increase of pressure of steam in the controlling chamber 15, acting upon the diaphragm 9, closes the valve 7 upon its seats and slightly compresses the spring 14, thus cutting off the flow of oil.

When for any reason the steam pressure in the controlling chamber 15 becomes lower than the average desired pressure of one hundred and fifty pounds, the expansible spring 14, acting against the stem of the valve 7, lifts the latter and admits a larger quantity of oil to flow through the oil inlet into the delivery chamber 11 and thence to the burner.

While this stoker is designed to operate in conjunction with burners wherein the atomization of the oil is accomplished by the agency of steam, it may be used with equal facility where the oil is atomized through the agency of air or other compressed fluid. In the present adaptation the oil is delivered to a burner with a certain proportioned volume of steam, which volume is controlled automatically by the variation of pressure of oil on the delivery side in the chamber 11 of the stoker. This control of steam supply is obtained by mounting in the steam end 3 of the stoker, a suitable device, here indicated as a double shouldered valve 17, seating upon upper and lower seats 18, through which steam is conveyed through an inlet connection 20. When the valve 17 is lifted from its seats 18 the steam, which may be at, say, one hundred and fifty pounds pressure, flows past the valve 17 into a steam chamber 21 formed within the steam end 3, above a diaphragm 22, which is connected to the lower end of the stem of the valve 17. Below the diaphragm 22 and above the bridge member 4 is provided a chamber 23 into which oil passes through a port 24 and a passageway 25, which leads into the delivery chamber 11 at the oil end 2. Thus whenever the oil controlling valve 7 has been elevated to permit oil to flow into the chamber 11, this accumulation of oil gradually passes forwardly through the port 24 and passageway 25 into the upper oil chamber 23, below the diaphragm 22, connected to the valve 17.

In what are called inside burners the oil and steam are delivered at equal pressures. In the outside mixing burners the oil and steam are delivered at different pressures; a very efficient mixture being obtained when the two pressures in the latter instance are relatively three of steam to one of oil. This constant ratio of pressures is obtained in the present stoker by attaching to the upper end of the steam control valve 17 a diaphragm 26, which in the present instance is shown as being two-thirds of the area of the lower steam diaphragm 23.

When steam has been admitted into the delivery side of the steam end 3 into the chamber 21, it passes from thence upwardly through a port 27, into a chamber 28 beneath the diaphragm 26, attached to the upper end of the valve 17.

The operation in the stoker thus constructed to control the flow of oil to outside mixing burners is as follows: Assuming that the average working pressure to be maintained in a boiler is one hundred and fifty pounds, this pressure is led directly beneath the bridge member 4, into the chamber 15 above the oil controlling diaphragm 9, and the spring 14 is then adjusted to approximately balance the desired pressure of one hundred and fifty pounds in the chamber 15. When from any cause whatsoever there is a variation of pressure above or below the average in the chamber 15, the oil controlling valve 7 will move relatively its seats 8 and increase or decrease the volume of oil flowing into the delivery chamber 11, as governed by the increase or decrease of pressure in the controlling chamber 15, so that if the steam pressure in the chamber 15 falls below one hundred and fifty pounds the spring 14 will expand and move the valve 7 upwardly away from its seats 8 and permit a larger volume of oil to pass to the delivery pipe 12. This increase in the volume of oil, flowing into the chamber 11, causes an increase of pressure in the oil chamber 11 and also in the chamber 23, so that the pressure in the latter chamber becomes effective against the diaphragm 22 to lift the valve 17 and increase the volume of steam flowing past the valve 17. When the stoker is to control the flow of fuel and steam to an outside burner, pressure in the chamber 21 will normally be three times the pressure existing in the oil chamber 23 below the diaphragm 22. This is for the reason that the unbalanced area of the diaphragm 22 over the diaphragm 26 is equal to one-third that of the balanced area, thus making it necessary that an excess of the ratio three to one will be necessary before the steam pressure in the chamber 21 can seat the valve 17. When the stoker has been set going with an operative steam pressure of ninety pounds in the steam delivery chamber 21, the operative pressure in the oil chamber 23, below the diaphragm 22, will remain normally at thirty pounds. Thus when a larger volume of oil is delivered into the chamber 11 an increased pressure accumulates below the diaphragm 22 and thus lifts the valve 17 to admit a larger volume of steam to the discharge or delivery side 21 of the steam end 3. It will then be seen that the ratio

of oil to steam is constantly maintained at practically three to one. When an increase of pressure occurs in the controlling chamber 15, above the diaphragm 9, this pressure is effective to depress the valve 7 and tend to cut off a volume of oil passing from the inlet side of the oil end 2 into the delivery side or chamber 11. Consequently, a reduction of pressure of steam in the controlling chamber 15 makes a proportionate increase of pressure in the chambers 11 and 23. This increase of pressure in the latter chamber permits the pressure of steam in the chamber 21, above the diaphragm 22, to lift the steam control valve 17 and let in a proportionate amount of steam. The action of the stoker is thus very sensitive and constantly automatic, and the differential areas of the diaphragm 22 and the diaphragm 26 serve to maintain a constant proportional ratio of three to one between the oil and steam delivered to the burner.

The valve 7 is balanced against the pressure on the feed side of the oil end, and is also balanced against the pressure on the delivery side of the oil end by reason of the equality of the areas of the diaphragms 9 and 10, thus rendering this valve free from frictional resistance or other causes and rendering it sensitive only to variations of pressure in the controlling chamber which is directly connected to the boiler. Any variation of pressure in the boiler is directly indicated by a movement of the valve 7.

Any movement of the valve 7 is automatically indicated by a movement of the valve 17, due to variations of pressure in the chamber 23 which is in direct communication with the delivery pressure chamber 11, so that the volume of steam delivered through the stoker is always controlled only and directly by means of the oil valve 7, which in turn is actuated by variations of pressures in the controlling chamber 15.

In order to eliminate any possible vibration of the steam valve 17, its upper stem is slightly reduced and surrounded by a packing or friction creating device 29; just sufficient friction being exerted upon the valve stem to prevent it from moving or rattling upon its seats 18.

The foregoing portion of this specification has referred to the device as being erected for a controlling of oil and steam delivered to outside mixing oil burners, but the device may be quickly and easily adjusted to control the flow of steam and oil to inside mixing burners. This adjustment merely requires the removal of the supporting bonnets 30, in which is mounted the upper diaphragm 26; the bonnets being connected to the upper steam end 3 by screw threads, or other appropriate means. When the bonnets 30 have been removed a plug 31, indicated in Fig. 2, may be inserted into the screw threads in the upper portion of the oil end 3, thus leaving the steam controlling valve 17 provided with only one diaphragm 22, which will thus become sensitive to move the valve 17 when there is any variation between the pressures above and below the diaphragm 22, since in inside mixing furnaces the oil and steam are delivered at approximately even pressures and thereby when the pressures are uniform in the chambers 21 and 23 in the stoker, no movement of the valve 17 will occur, but any variation in one or the other of the chambers will cause a movement of the valve 17 to permit a reduction or increase in the volume of steam passing through the steam end of the burner.

Having thus described our invention what we claim and desire to secure by Letters Patent, is—

1. An automatic stoker for controlling the supply of fuel to a burner, comprising an oil chest or end, and a steam head, said oil chest having flexible diaphragms at opposite portions inclosing an intermediate chamber, a double-shouldered valve operable within the oil chest, said oil chest having alined spaced seats for the shoulders of said valve, an oil pipe entering said chest between said seats, and a discharge pipe leading from said oil chamber, one of said diaphragms forming a wall of the steam chamber of said head and being at one end of the valve, and a device adjustable against the other end of the valve adapted to counterbalance a given pressure in the steam head against the first named diaphragm.

2. An automatic stoker for controlling the supply of fuel to a burner, comprising an oil chest or end, and a steam head, said oil chest having flexible diaphragms at opposite portions inclosing an intermediate chamber, a double-shouldered valve operable within the oil chest, said oil chest having alined spaced seats for the shoulders of said valve, an oil pipe entering said chest between said seats, a discharge pipe leading from said oil chamber, one of said diaphragms forming a wall of the steam chamber of said head and being at one end of the valve, a spring at the other end of the valve and bearing thereagainst and adapted to counterbalance a given pressure in the steam head, and a screw for adjusting the tension of said spring.

3. An automatic stoker for controlling the supply of fuel to a burner, comprising an oil chest, a steam end, and an intermediate steam head forming the connection between the oil chest and steam end, said head having upper and lower chambers and a side passage communicating with one of the chambers, a steam pipe entering the other of the chambers of said head, said oil chest having a chamber connecting through said passage with the first-named chamber of the

steam head, said steam end having an inlet and an outlet, and having a double ended valve with a diaphragm at each end, one of the diaphragms forming a wall of the first named chamber of the steam head, and said steam end having double seats for the valve, the valve in the steam end being actuated by the pressure of oil on the delivery side of the oil chest.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

WILLIAM F. GOODWIN.
GEORGE DAWSON.

Witnesses:
CHARLES EDELMAN,
JOS. J. MAHONEY.