(No Model.) 2 Sheets—Sheet 1.

C. F. A. CONVERT.

HYDROCARBON BURNER AND DEVICE FOR AUTOMATICALLY FEEDING THE SAME.

No. 481,273. Patented Aug. 23, 1892.

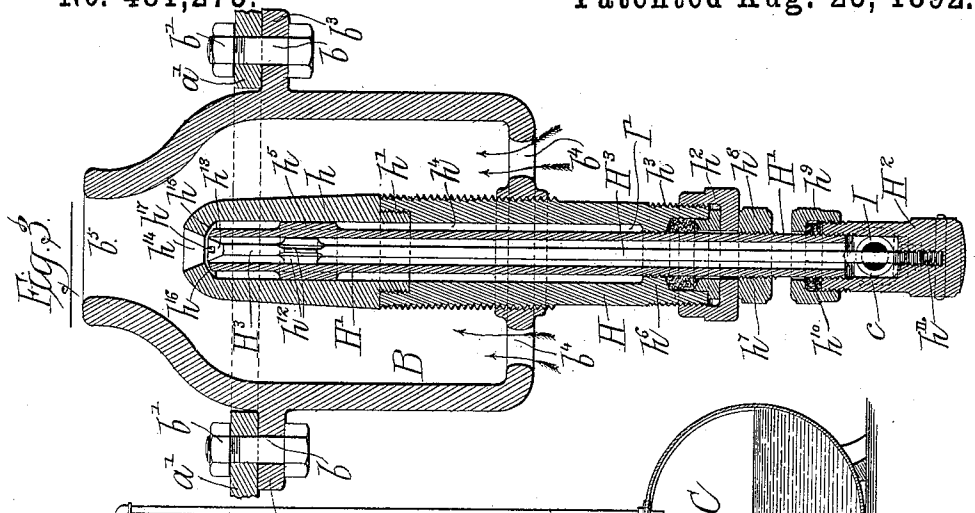


Fig. 3.

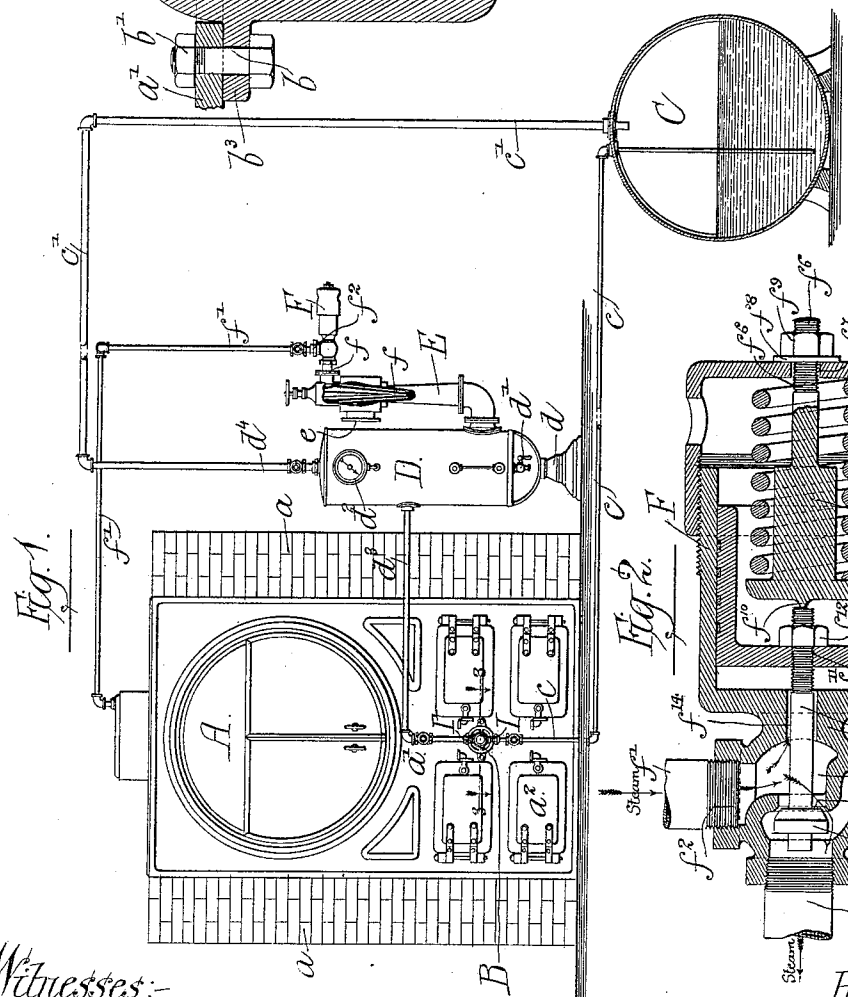


Fig. 1.

Fig. 2.

Witnesses:-
Louis M. Whitehead.
Louise Miller.

Inventor:-
C. F. Adolf Convert.

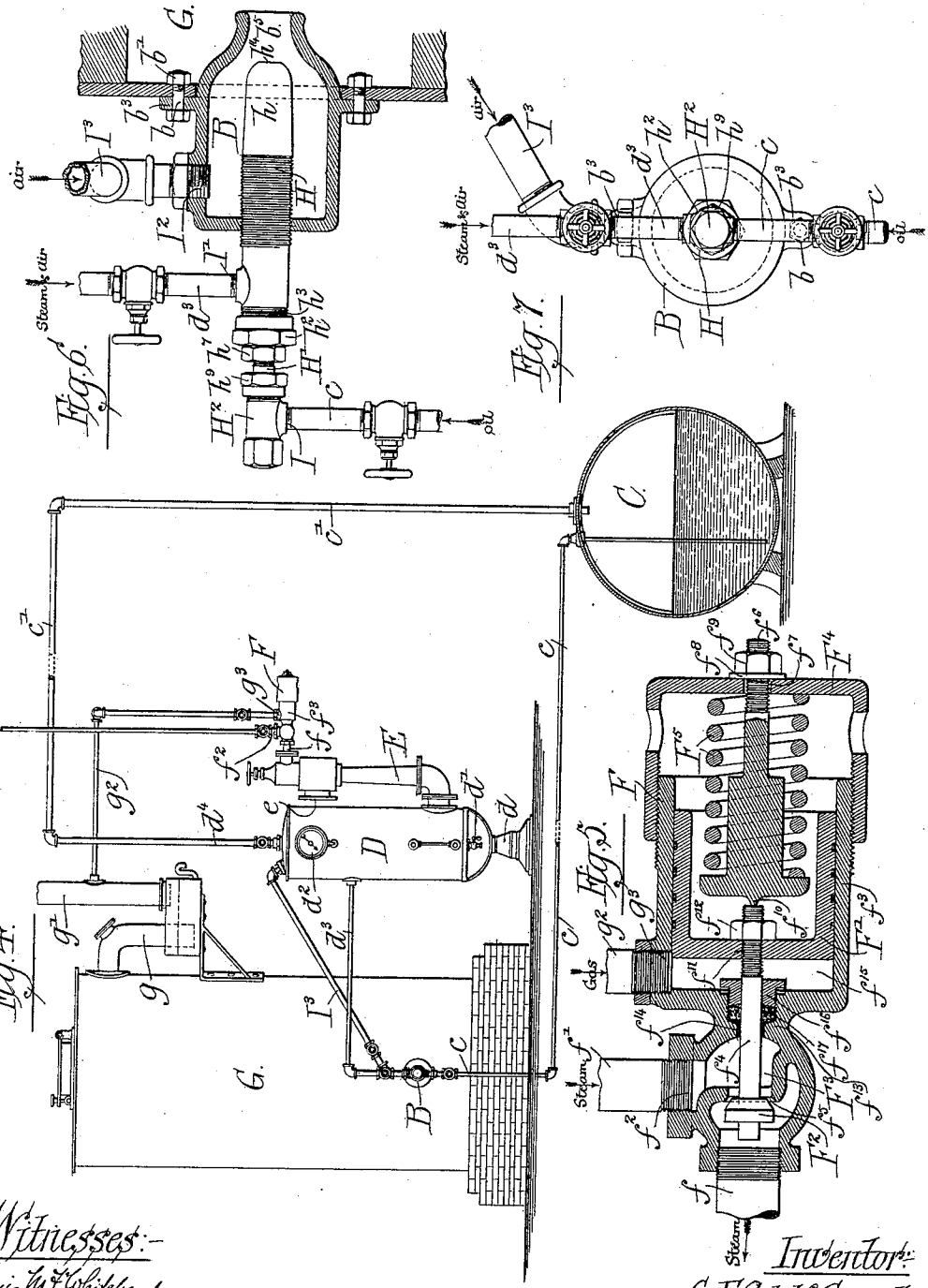
By:- Dayton, Poole & Brown
His Attorneys.

(No Model.) 2 Sheets—Sheet 2.

C. F. A. CONVERT.

HYDROCARBON BURNER AND DEVICE FOR AUTOMATICALLY FEEDING THE SAME.

No. 481,273. Patented Aug. 23, 1892.



Witnesses:-
Louis M. F. Whitehead.
Irvine Miller.

Inventor:
C. F. Adolf Convert
by: Dayton, Poole & Brown
his Attorneys.

UNITED STATES PATENT OFFICE.

CHARLES F. ADOLF CONVERT, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE LIQUID CARBONIC ACID MANUFACTURING COMPANY, OF SAME PLACE.

HYDROCARBON-BURNER AND DEVICE FOR AUTOMATICALLY FEEDING THE SAME.

SPECIFICATION forming part of Letters Patent No. 481,273, dated August 23, 1892.

Application filed June 30, 1891. Serial No. 398,007. (No model.)

To all whom it may concern:

Be it known that I, CHARLES FREDERIC ADOLF CONVERT, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Hydrocarbon-Burners and Devices for Automatically Feeding the Same; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to automatic regulating devices applied, primarily, to apparatus used in the manufacture of gas where oil is the fuel and is supplied to the combustion-chamber by an oil-burner; but may also be used in apparatus supplied with oil-burners placed under steam-boilers and for similar purposes.

The invention consists in the novel devices and combination of devices illustrated in the drawings, described in the specification, and more particularly pointed out in the appended claims.

In said drawings, Figure 1 is a side elevation of an apparatus embodying my invention, showing the steam-boiler connections. Fig. 2 is a central vertical sectional view, enlarged, of the regulating device proper. Fig. 3 is an enlarged longitudinal sectional view of the burner. Fig. 4 is a view similar to that shown in Fig. 1, representing the apparatus as applied to a gas-making retort. Fig. 5 illustrates in a sectional view, enlarged, the regulating device proper, showing the slight modification therein when the regulator is employed in the apparatus shown in Fig. 4. Fig. 6 is an enlarged view of the burner, partially in section, showing the pipe connections and the pipes leading thereto. Fig. 7 is a rear view of the latter.

I will first describe the invention in connection with a steam-boiler, as is shown in Figs. 1, 2, and 3.

Let A represent the boiler mounted in the usual masonry a, provided with a fire-front a' and doors a^2.

B is the burner as a whole, which supplies oil as a fuel to a suitable combustion-chamber beneath the boiler. The burner B is connected to the fire-front a' by means of the bolts and nuts $b\,b'$, said bolts passing through suitable openings in the projecting lugs b^3 of the burner and through the said fire-front a'.

C is a tank or other suitable source of oil-supply, from which the oil in said tank C is conveyed through the pipe c to the burner B, one end of said pipe c being connected with the said burner and the other end being inserted within the tank, as shown in Fig. 1.

c' is a suitable pipe through which air is forced, in the manner hereinafter explained, into the chamber C, therein exerting a pressure upon the contents of the said chamber or tank C. It will thus be obvious that the oil in the tank C will be fed by the pressure exerted upon it into and through the pipe c to the burner B, and that if the oil be ignited at the burner a draft will be caused and a suction created in the pipe c, which will further tend to draw the oil from the tank C to the burner. Thus the burner B will at all times be supplied with fuel.

D is what I have termed a "reservoir" or "condenser." It is mounted conveniently upon a suitable standard d, and is supplied with steam and air through what I have chosen to call a "blower" E. The water of condensation may from time to time be drained off through the cock d'. A gage d^2 will disclose the amount of pressure in the reservoir D. A pipe d^3 will convey some of the steam and air from the reservoir D to the oil-burner B, for the purpose hereinafter specified. A second pipe d^4 will convey air from the reservoir D into the pipe c', which, as before explained, opens into the tank C and exerts a pressure upon the contents of the tank. The steam which does not pass through the pipe d^3 is condensed in the reservoir D, and so only air will pass out through the pipe d^4 to the tank, and also at a greatly-reduced pressure, as will be hereinafter explained.

F is the regulator proper. It is connected at f with the top of the blower E. A pipe f', one end of which is connected to the steam-dome of the boiler A, as shown, and the other end of which is connected at f^2 to the regulator, conveys steam from the said boiler to the said regulator.

Looking more particularly now at Fig. 2, I

describe the construction of the regulator F, as follows: F′ is a piston working within the cylindrical housing f^3 of the regulator, to actuate the valve F^2 by means of the valve-stem f^4, which passes through the valve-seat f^5 and the valve-chamber F^3. The pipe f' connects at f^2 with the valve-chamber F^3 and supplies steam thereto while the pipe f connects the valve-chamber F^3 with the uppermost portion of the blower E, as clearly shown. A cup-shaped cap F^4 is secured to the outer end of the housing f^3 by screw-threads or other convenient means. Within said cap F^4 and the outer end of the hollow-shaped piston F′ is an expansion-spring F^5, which is so set or adjusted as to normally cause the valve F^2 to be open—that is, to stand away from the valve-seat f^5 in the position shown in Fig. 2—and thus permit steam to pass through the pipe f', the valve-chamber F^3, and out through the pipe f. The operation of this is as follows: The spring F^5 being adjusted to any desired tension and the valve F^2 being open and away from the valve-seat f^5, as shown, steam from the steam-boiler A will pass into the valve-chamber F^3 and out in two directions, one being through the passage-way f^{14} into the chamber f^{15} and the other being through the valve-seat f^4 and out through the pipe f. When the pressure of the steam thus entering the chamber f^{15} becomes greater than the adjusted tension of the spring F^5, it overcomes the force of said spring and, pressing against the piston-head F′, compresses the spring F^5 and closes the valve F^2 against the valve-seat f^5 in an obvious manner. Steam being thus cut off from the supply-pipe f, it follows that no steam can pass into the blower E nor into the reservoir D nor through d^3 to the burner, nor can any air pass out of the reservoir D through the pipes d^4 c' into the oil-supply tank C. Thus the pressure on the oil and the suction at the burner being diminished the oil will not flow readily or at all through the pipe c to the burner B, and hence the fire beneath the boiler is reduced, and steam is therefore not generated in the boiler beyond the desired pressure or extent. When, however, the pressure of steam in the boiler lessens, the pressure in the chamber f^{15} on the piston-head F′ correspondingly diminishes until it is less than the pressure exerted by the spring F^5, whereupon said spring automatically expands, opens the valve F^2 and steam is thus permitted to pass again through the valve-chamber F^3 out through the supply-pipe f to again do its work. I thus have the steam generated in the boiler by means of heat produced from an oil exerting an influence upon the contents of an oil-supply tank to force the oil to the said burner, automatically checking the supply of oil, in the manner heretofore described, when the work is progressing too rapidly and automatically renewing the supply of oil to the burner when the work diminishes. As this regulator, however, may be operated by gas as well as by steam, I have illustrated in Figs. 4, 5, 6, and 7 the slightly-modified form of construction that will be necessary to employ when the regulator is supplied with gas, the illustration chosen being that of a closed gas-generator to which oil is supplied for the purpose of making fuel-gas and from which the gas thus generated is fed to my improved regulator. In said Fig. 4 let G represent a suitable gas-retort to which the oil to be burned therein and converted into gas is supplied to the burner B by means of the pipe c from the tank C, in the same manner as heretofore explained. The gas generated in said retort G passes out through an overflow-pipe g and thence to a delivery-pipe g'. From this delivery-pipe g' is a branch pipe g^2, the lower end of which connects with the shell f^3 of the regulator at g^3, whereby gas may be furnished to the chamber f^{15}. In this application of the regulator the passage-way f^{14}, surrounding the valve-stem f^4, is closed by means of a gland f^{16} and a packing f^{17}, so arranged in any familiar manner as to permit the valve-rod f^4 to be moved longitudinally therethrough and at the same time to prevent steam from the valve-chamber F^3 passing through the passage-way f^{14} and into the chamber f^{15}, as heretofore explained. The other parts of the regulator and the mode of operation thereof are precisely the same as heretofore explained, with this exception: that when the pressure of gas in the delivery-pipe g' exceeds the regulated pressure or tension of the spring F^5, the force of the latter is overcome by the pressure of said gas in the chamber f^{15}, the piston F′ is moved and the valve F^2 is closed, as before explained, and upon the lessening of said pressure of gas the spring F^5 automatically expands, as in the former instance, the valve-seat f^5 is opened, and steam is again allowed to pass into the pipe f.

As a further improvement in automatically-regulated oil-burning devices I will describe the construction of a burner which by practice I have demonstrated is required for producing successful and practical results. Such a burner is illustrated more particularly in Fig. 3, the connections being those employed when the burner is applied beneath a steam-boiler and the regulator is operated by steam from the said boiler. Said burner consists, primarily, of the outer housing or shell B, made in a single piece or part and provided with suitable inlet air-passages b^4, located in the rear portion of the shell, and with a somewhat closed bottle-shaped mouth b^5 at the end opposite the air-passages b^4. Projecting through the rear wall of the shell B and preferably secured thereto by screw-threads is a two-part tube H, the forward part or end h of which forms a nozzle and is conveniently secured to the part H in a familiar manner, as shown at h'. The rear end of the tube H is closed by a suitable cap h^2, adapted to be adjusted to the part H by screw-threads h^3, as shown. A second tube or pipe H′ is passed

through the cap h^2 and extends into the chamber h^4 of the part h. The tube H′ is provided at its forward end with radial feathers or wings h^5, which act as bearings and guides for the forward end of the tube H′. The said tube H′ is provided exteriorly at h^6 h^7 with screw-threads, the former of which engage a centrally-projecting annular screw-threaded flange in the tube H, whereby the tube H′ may be adjusted within the said tube H. A jam-nut h^8 engages the screw-threads h^7 and locks the tube H′ against the cap-nut h^2. The extreme rear end of the tube H′ is screw-threaded and enters the interiorly screw-threaded forward end of a cap connection H^2 and is locked in position therein by a jam-nut h^9, which in turn incloses a suitable packing-ring or gasket h^{10} in a familiar manner.

H^3 is a rod placed within the tube H′, screw-threaded at its rear end and adapted to engage screw-threads in a recess h^{11} in the rear end of the connection H^2. Near the forward end of the said rod H^3, I provide wings h^{12}, similar to the wings h^5 of the tube H′, whereby the forward end of said rod H^3 is guided within the forward end of the tube H′ as a bearing. The extreme outer end of the rod H^3 is enlarged similar to the head of a screw, as clearly shown at h^{13}. The largest diameter of the head h^{13} is such as to permit the head to fit nicely within the interior of the tube H′ and at the same time afford the oil in said tube H′ an opportunity to pass out of said tube between the mouth thereof and this cone-shaped end h^{13}. The shape of the end h^{13} is such as to cause the oil to pass from the end of the tube H′ in an outwardly-extending circle, and the nozzle h is provided at its end with an opening h^{14}, which opening has outwardly-opening walls, the general direction of which are parallel with the sides of the head h^{13} and the smallest diameter of which is the same as the greatest diameter of the said head. Oil is admitted to the burner from the supply-pipe c at I and passes into and through the tube H′ and around the rod H^3. Steam and air pass from the reservoir D through the pipe d^3 and enter the tube H at I′, passing through said pipe, around the tube H′, and out through the nozzle h and the opening h^{14}. It will be observed that the interior of the nozzle h immediately adjacent to the inner end of the opening h^{14} is in the form of an annular shoulder h^{15}. The tube H′ is so adjusted with respect to the nozzle h, as previously explained, as to leave a passage-way h^{16} between the shoulder h^{15} and the outer end of the tube H′. It will be obvious, therefore, that the steam and air which pass from the interior of the tube H′ will pass into the opening h^{14} through the passage-way h^{16} and in so doing will cross the path of the oil that issues from the interior of the tube H′. The object of this particular construction is to afford a complete steam spray for the oil and thus subdivide the latter and thereby facilitate its combustion and the realization of the maximum quantity of heat-units therein. Air being drawn in by suction through the opening b^4 unites with the sprayed oil in the opening b^5 and combustion takes place at this point. It will be observed that by means of a slot h^{17} in the end of the rod H^3 the latter may be adjusted by means of its screw-threaded end h^{11} without dismembering the entire burner. It will also be observed that the adjustment of the tube H′ with respect to the tube H may also be accomplished without dismembering the burner, and, further, that the two tubes H and H′ may be adjusted simultaneously with respect to the housing B before requiring any adjustment with each other—that is to say, the tube H′ having been adjusted in tube H, no further adjustment will be required when the tube H is adjusted in the housing B.

In the construction shown in Fig. 6 the air-holes b^4 may be omitted, and air or air and steam taken in through the opening I^2. In this case the opening I^2 is connected by the pipe I^3 with the upper portion of the reservoir D. By introducing the steam and air, or heated air if the steam be condensed, around the pipe H′, I manage to keep the latter warm and thus tend to produce a suction within the same and thus draw the oil through the pipe c from the tank C. This, in addition to the pressure exerted on the oil in the tank, will cause the burner to be constantly supplied with the proper quantity of oil for fuel.

In the blower E, e is an opening through which air is taken by means of suction, the pipe f bending and passing downwardly in the blower E below the mouth of the opening e. I find it advantageous to furnish air to the pipes d^4 c' and into the tank C at a greatly-reduced pressure from that exerted by the steam and air as it comes into the reservoir D. By having the outlet-pipe d^3 to the oil-burner lower than the outlet-pipe d^4, by reason of the short connection of the burner with the reservoir as against the long connection of the latter with the oil-tank, and by reason of the expansion of the steam in the reservoir and the condensation that takes place therein, I find that the boiler-pressure is reduced fully one-sixth in the oil-tank. Thus if I have a pressure of sixty pounds in the boiler the air-pressure in the tank C is only ten pounds. If it is inconvenient to have the pipes d^4 c' very much greater in length than the pipe d^3, I may subject the pipes d^4 c' to a cooling medium—as, for example, by having cold water from a hydrant-faucet trickling down on the pipe. Thus any steam which may find its way from the reservoir D into the pipe d^4 is condensed.

I regard the reduction of the steam-pressure and the supplying of the air to the oil-tank at a reduced pressure, as described, a very important factor in the successful operation of an automatic regulating apparatus.

It will be observed that the rod H^3 may be adjusted within the oil-pipe H′ from the front end thereof without dismembering the burner,

but that such adjustment does not regulate the supply of oil through the tube H′ for the reason that there is no seat or part corresponding to a valve-seat against which the conical end of the rod can be forced and thus the moving of the rod longitudinally within the tube leaves the same space between the outer edge of the rod end and the interior of the tube at all times. It will further be noted that the flanges or wings h^{12}, near the ends of the rod, properly guide the same and prevent the rod becoming bent, thus insuring the exit of the oil from the oil-tube at all times in a complete circle.

I claim as my invention—

1. An oil-burner regulating device consisting of an automatically-operated valve communicating at one end with a source of steam or gas supply and communicating at the other end with a suitable reservoir, of suitable pipes connecting said reservoir with the source of fuel-supply and with an oil-burner, and a pipe or pipes connecting said oil-burner with said source of fuel-supply, substantially as specified.

2. In an oil-burning device, the combination of a burner connected with a suitable source of oil-supply, a reservoir connected at one end with an air and steam inlet blower and at its other end with the said burner and the oil-supply tank, a blower for supplying steam and air to the said reservoir, and an automatic regulating device controlling the inlet of steam to said blower, substantially as specified.

3. The combination of the housing provided with an air-inlet and a discharge-nozzle and adapted for rigid attachment to a furnace-front, the steam and air tube H, adjustably secured therein and projecting beyond the outer end of the housing, said tube terminating at its inner end in a flaring discharge-nozzle, an oil-tube H′, adjustably secured in tube H and projecting beyond the outer end thereof, and a rod adjustably secured within the oil-tube and having its exposed inner end shaped to receive an adjusting-tool, substantially as described.

4. The combination of the housing provided at its inner end with a discharge-opening and at its outer end with an air-inlet and a tapped hole, the steam and air tube H, threaded between its ends to engage said tapped hole, said tube terminating at its inner end within the housing in a flaring discharge-nozzle and having at its outer end a female thread, the oil-tube H′, threaded between its ends to engage the female thread of tube H, and provided at its closed outer end with a threaded socket and a rod threaded at its outer end to engage said socket, and provided at its inner end with an enlarged head slotted to receive a screw-driver, substantially as described.

5. In an oil-burning apparatus, the combination of the boiler A and burner B, reservoir D, blower E, regulator F, and oil-supply tank C, the pipe d^3, connecting the burner with the reservoir, the pipes d^4 c', connecting the latter with the tank C, the pipe c, connecting the tank with the burner, the pipe f', connecting the regulator with the boiler, all operating substantially as and for the purpose specified.

6. A device for regulating oil-burners, comprising a burner, a supply-tank connected therewith, a reservoir, also connected with said burner, a steam-supply pipe provided with an automatically-regulating valve and leading to a blower having an air-inlet, said blower being connected with said reservoir, and suitable connections whereby the several parts operate, as described, to feed steam and air under pressure to the burner and to feed air under a lesser pressure to the supply-tank, substantially as specified.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

C. F. ADOLF CONVERT.

Witnesses:

IRVINE MILLER,

TAYLOR E. BROWN.