(No Model.) 2 Sheets—Sheet 1.

L. GODDU.

PETROLEUM BURNER.

No. 465,817. Patented Dec. 22, 1891.

FIG. 8.

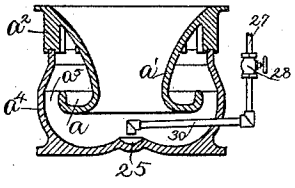


FIG. 6.

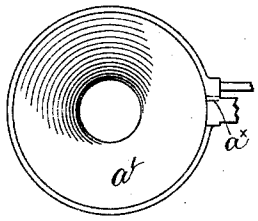


FIG. 9.

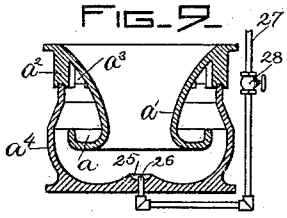


FIG. 1.

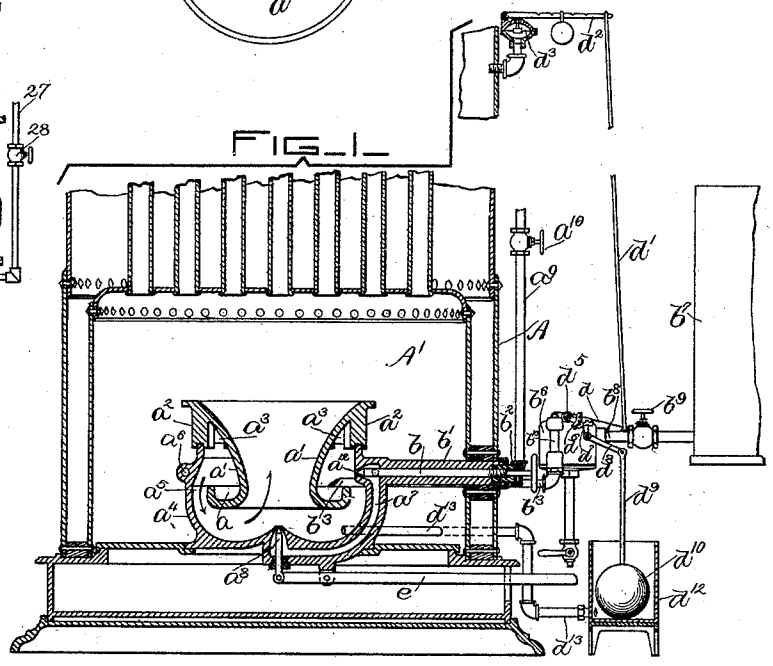


FIG. 7.

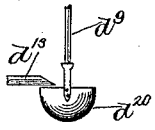


FIG. 10.

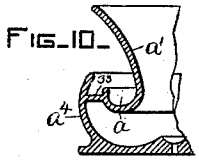


FIG. 2.

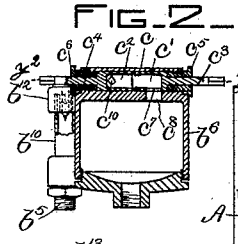


FIG. 5.

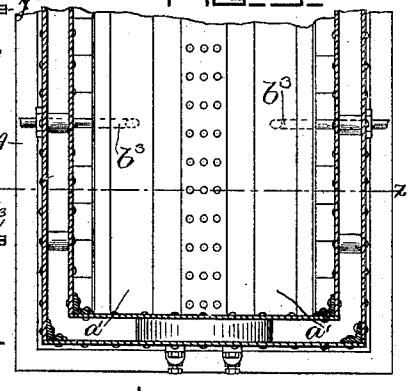


FIG. 4.

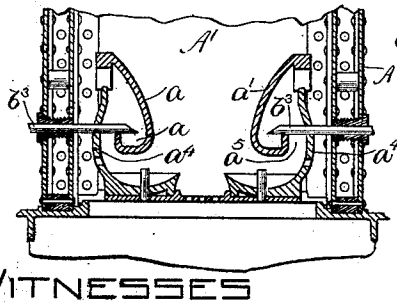
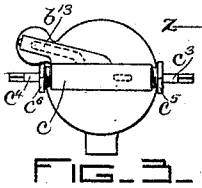


FIG. 3.



WITNESSES

Bernice J. Noyes.

Frederick L. Emery.

INVENTOR

Louis Goddu,

by Crosby & Gregory

Attys.

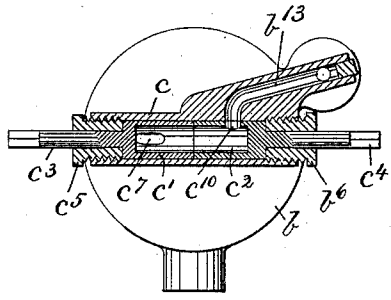
(No Model.) 2 Sheets—Sheet 2.

L. GODDU.

PETROLEUM BURNER.

No. 465,817. Patented Dec. 22, 1891.

Fig. 11.



Witnesses.
H. Y. Davis.

Inventor.
Louis Goddu,
by Crosby & Gregory attys

UNITED STATES PATENT OFFICE.

LOUIS GODDU, OF WINCHESTER, MASSACHUSETTS, ASSIGNOR TO JAMES W. BROOKS, OF CAMBRIDGE, AND FRANK F. STANLEY, OF SWAMPSCOTT, MASSACHUSETTS, TRUSTEES.

PETROLEUM-BURNER.

SPECIFICATION forming part of Letters Patent No. 465,817, dated December 22, 1891.

Application filed September 2, 1889. Serial No. 322,662. (No model.)

To all whom it may concern:

Be it known that I, LOUIS GODDU, of Winchester, county of Middlesex, State of Massachusetts, have invented an Improvement in Petroleum-Burners, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to apparatus for burning oils, especially unrefined oils, such as crude petroleum, and is an improvement upon the apparatus shown and described in another application, Serial No. 250,705, filed by me September 26, 1887.

Prior to my invention I am aware that attempts have been made to employ crude petroleum as a fuel for heating purposes; but prior to my invention this has not been successfully done, so far as I am aware, because the heavier hydrocarbons held in suspension or solution by the lighter hydrocarbons are, when subjected to heat, deposited in the burner or apparatus employed, such deposit accumulating rapidly and choking up the burner or apparatus, and the said material deposited, as described, is further deleterious, because it forms a non-heat-conducting coating or lining within the burner.

In accordance with my present invention I employ a shallow trough or receptacle to contain the oil, having an upwardly and preferably outwardly extended side wall, preferably provided, as herein shown, with one or more depending legs or projections, which rest upon and are secured to a support, herein shown as a concaved plate or wall constituting a deflector, and which forms with the side of the shallow trough a passage through which the flame arising from the burning oil is directed down under and in contact with the said trough. The deflector or concaved wall referred to is preferably made in one piece and is provided, preferably, with a circumferential core or passage which communicates with a radial core or passage having its outlet at the bottom of the deflector and substantially near its center. The passages referred to form steam-passages for the admission of steam to be commingled with the flame after it has passed below the shallow trough. The oil to be burned is supplied to the shallow trough through a pipe communicating with the outlet-port of a valve-casing containing, preferably, two independent valves, one of which is controlled by the pressure in the boiler to cut off the supply of oil to the burner, the other of which is operatively connected, as will be described, to a regulator, which may be a float located in a chamber or vessel communicating with the interior of the deflector referred to, so that excess of oil in the deflector may flow into the chamber or vessel, and, by raising the float automatically, cut off the supply to the burner, or the said regulator may be a cup or receptacle connected to the valve and adapted to receive oil from a pipe connected to the deflector. The admission of steam into the burner may be controlled by suitable valves, which may be actuated by hand or be automatically controlled by the pressure in the boiler.

My invention therefore consists, essentially, in the combination, with a shallow trough to contain the oil in small quantity to be burned and a side wall extended upwardly from the inner edge of the shallow trough to form an outlet-passage for the products of combustion, of a deflecting-wall located outside of and extended downward from the outer edge of the trough to form therewith a passage through which the products of combustion pass down under and in contact with the bottom of the said trough, substantially as will be described.

Figure 1 is a vertical section of a sufficient portion of an upright fire-tube boiler provided with my improved burner to enable my invention to be understood, a portion of the oil-supplying tank being shown; Fig. 2, a vertical section of my improved valve apparatus for controlling the supply of oil; Fig. 3, a top or plan view of the valve apparatus shown in Fig. 2; Fig. 4, a transverse section on line *z z*, Fig. 5, of a portion of a modified form of boiler with my improved burner adapted thereto; Fig. 5, a top or plan view of the apparatus shown in Fig. 4; Fig. 6, a top or plan view of the deflector or concaved plate shown in Fig. 1; Fig. 7, a modification of the regulator;

Figs. 8, 9, and 10, modifications to be referred to; and Fig. 11 a horizontal section on the line $y^2 y^2$, Fig. 2, to more clearly show the construction of the valves, a part only of the valve-stems being shown in section.

The boiler A, which is shown in Fig. 1 as an upright fire-tube boiler, but which may be of any usual or desired type of construction, has located in its fire-box A′ a burner for the consumption of crude oils and embodying my invention.

The burner is herein shown as composed of an annular shallow trough a, having secured to or forming part of it an upwardly and preferably outwardly expanded or extended side wall a'. The side wall a' is provided on its outer side, as shown in Figs. 1, 8, and 9, with legs or studs a^2, which project down at intervals, so as to leave an opening a^3 between every two adjacent legs for the passage of air. Each depending leg a^2, as herein shown, is provided with a slot, into which is fitted the upper end of a concaved plate or wall a^4, constituting a deflector, the said legs being secured to the said plate or wall in any desired or suitable manner.

The deflecting-wall a^4 is shown in Fig. 1 as circular in form to conform to the shape of the shallow trough, and the said deflecting-wall forms with the outer upturned side of the said trough a passage a^5, through which the flame from the burning oil is directed down under and in contact with the bottom of the shallow trough.

The deflecting-wall a^4 in the present instance is cored annularly near its upper end above the shallow trough to form a circumferential passage a^6, having its inlet separated from its outlet by a suitable partition or wall indicated by dotted lines $a^\times$, Fig. 6, the passage a^6, having its inlet mouth or port connected to a steam-inlet pipe a^9, provided with a cock or valve a^{10}, the outlet end or mouth of the passage a^6 communicating with the radial passage a^7 formed in the deflecting-wall. The passage a^7 extends down to the bottom of the deflecting-wall a^4 and communicates with the interior of the burner through a port, which is controlled, as herein shown, by a plug-valve a^8. The steam-inlet pipe a^9 in practice is connected to the steam-dome of the boiler.

The passage a^7 at its upper end, preferably at the junction of the said passage with the circumferential passage a^6, may be provided with an outlet-port a^{12}, located above the shallow trough a and adapted to admit steam into the space between the side wall a' and deflecting-wall a^4, above the said trough, the said outlet-port being controlled, as herein shown, by a plug-valve b, extended through a hollow arm b' of the deflecting-wall a^4, the said arm being extended through the side of the boiler, as herein shown, and provided with a suitable stuffing-box b^2 of any usual construction.

The oil to be burned, which in practice is preferably crude petroleum-oil, is supplied to the burner or shallow trough through a pipe b^3, extended through the boiler-shell and connected, as herein shown, to a threaded nipple b^5, secured to or forming part of a shell or case b^6, into which the oil from the supply-tank b^7 is admitted through a pipe b^8, provided with a suitable valve or cock b^9. The threaded nipple b^5 is preferably connected by a glass or other transparent tube or pipe b^{10} to another nipple b^{12}, which communicates with the outlet-passage b^{13} (see Fig. 11 and dotted lines, Fig. 3) of a valve-casing c, herein shown as a tube secured to or forming part of the shell b^6, it being shown as secured to the top thereof.

The valve-casing c contains, as herein shown, two independent valves c' c^2, preferably made as hollow tubes and provided with valve-stems c^3 c^4, extended through stuffing-boxes c^5 c^6, secured to the opposite ends of the valve-casing c. The hollow valve c' is provided, preferably, with a longitudinal slot c^7, constituting a port, which registers with the port c^8 in the shell or case b^6, the port c^7 constituting the inlet-port of the valve. The hollow valve c^2 is provided with a preferably transverse or radial slot c^{10} to register with the passage b^{13}, the said slot constituting the outlet-port for the valve. The valve is preferably made in two independent sections c' c^2, so that they may be rotated independently of each other, for a purpose as will be described. The valve-stem c^3 has its end preferably made square, or of other than round shape, to be engaged by a lever d, to which is connected one end of a link d', having its other end connected to a weighted lever d^2, which is raised and lowered by the steam-pressure within the steam-dome of the boiler acting on a diaphragm d^3 of a regulator of any usual construction, and such as known in the market as the "Clark" regulator.

It will be seen that the supply of oil from the case or shell b^6 passes through the ports c^8 c^7 into the valve c', and from thence into the valve c^2, and the said supply will be automatically cut off by rotating the valve c' from the position shown in Fig. 2 to that shown in Fig. 11, so as to bring the port c^7 out of line with the port c^8, which rotation is effected by the raising of the lever d^2 by the steam-pressure in the boiler.

The valve-stem c^4 of the valve c^2 has its end preferably made square, or of other than rounded shape, to be engaged, as herein shown, by a lever d^5, provided with a segment of a gear d^6, with which co-operates a segment of a gear d^7 on a lever d^8, which may be connected by a link d^9 to a float d^{10}, located in a vessel or receptacle d^{12}, the latter having its bottom connected by pipe d^{13} to the lower end of the deflecting wall a^4 near the bottom thereof, the lower end of the said deflecting-wall being upturned to form a shallow basin to receive any excess or surplus oil which may overflow from the shallow trough a, the said excess flowing off through the pipe d^{13} into the vessel d^{12}, in which it accumulates and

raises the float, and through the levers d^8 d^5 rotates the valve c^2 from the position shown in Figs. 2 and 11 to one substantially at right angles thereto, so as to bring the port c^{10} out of line with the passage b^{13}, and thus close the outlet-port of the valve c^2 and cut off the supply of oil to the burner. It will thus be seen that the supply of oil to the burner is automatically regulated, not only by the steam-pressure which operates the inlet-valve, but also by the excess of oil which operates the outlet-valve.

The plug-valve a^8, controlling the admission of steam into the center of the burner, is connected to one end of a lever e, extended beyond or outside of the boiler, which may be operated by the foot or otherwise.

The boiler will be provided with usual dampers, (not shown,) by which air may be admitted to the fire-box A'.

In the operation of my improved burner the oil admitted to the shallow trough a is ignited, and the air in the fire-box A' passes through the spaces a^3 and down through the passage a^5, carrying with it the flame arising from the burning oil, the said flame being thus brought beneath and in contact with the bottom of the shallow trough a, thereby intensely heating the same and enabling the crudest petroleum to be burned without deposition of residue, the said flame passing up into the fire-box, as indicated by arrows.

I have herein shown in Fig. 1 the shallow trough a and its side wall a' as circular in form, as is also the deflecting-wall a^4; but I do not desire to limit my invention to this particular shape of apparatus or burner, as it is evident that the same may be changed, according to the kind and shape of boiler with which it is to be used—as, for instance, when employed in connection with the locomotive-boiler the said shallow trough may be made substantially straight and of considerable length, and the deflecting-wall a^4 in this instance may be made of considerable length to co-operate with the said burner, substantially as shown in Figs. 4 and 5, wherein a burner comprising a shallow trough, its side wall, and the deflecting-wall co-operating therewith are shown.

I have thus far described my improved burner as employed with boilers in which a substantially high steam-pressure is attained; but I do not desire to limit my invention to the use of my improved burner with boilers as described, as it may be used in furnaces and like apparatus, and especially to heat boilers carrying only a low steam-pressure—such, for instance, as used in apartment hotels for heating purposes.

When used with furnaces, the burner will preferably be made substantially as shown in Figs. 8 and 9, the deflecting-wall a^4 at the center being recessed or made cup-shaped, as at 25, to receive a small quantity of water, which may be supplied either by a pipe or nozzle 26, extended up through the bottom of the deflecting wall, as shown in Fig. 9, the said pipe or nozzle being connected to a supply-pipe 27, provided with a cock or valve 28, or the said water may be supplied by a pipe 30, extended through the side of the deflecting-wall and connected to the supply-pipe 27, as shown in Fig. 8. The supply-pipe 27 may and preferably will be connected to a supply-tank (not shown) located at a sufficient height—as, for instance, at the top of the building—and the supply of water may be regulated to a nicety by the cock or valve 28, so that but a single drop of water at a time may be brought in contact with the bottom of the deflecting-wall, which bottom being intensely heated immediately converts the water into steam, and thus assists and renders perfect the combustion.

I have herein shown the side wall a' as an integral part of the shallow trough; but it is evident that the said wall may be an independent part fastened in any suitable manner to the shallow trough.

The parts of the burner will preferably be made of iron; but instead thereof they may be made of fire-clay or other refractory material.

I have herein shown the side wall a' provided with lugs which rest upon the deflecting-wall and leave air-spaces; but I do not desire to limit myself to this specific manner of supporting the trough and its attached side wall, as the said parts may be supported by bars 33, secured to the trough and to the deflecting-wall, as shown in Fig. 10, or in any other convenient manner.

Referring to Fig. 7, the overflow-pipe d^{13} discharges into a cup or vessel d^{20}, connected to the valve-stem to close the inlet-valve.

I claim—

1. The combination, with a fire-box, of a shallow trough suspended therein to receive and hold the oil to be consumed and a deflector located outside of and extended below and underneath the shallow trough to form a passage for the products of combustion contiguous to the shallow trough, the air admitted into the fire-box drawing the flame from the surface of the oil in the trough down under and in contact with the bottom of the trough, whereby the flame created in the trough is utilized to heat the trough at its under side to insure a complete combustion, substantially as described.

2. The combination, with a shallow trough to contain the oil in small quantity to be burned and a side wall extended upwardly from the inner edge of the shallow trough, of a deflecting-wall located outside of and extended downward from the outer edge of the trough to form therewith a passage for the products of combustion contiguous to the outer side of the upwardly-extended side wall and through which the products of combustion pass down under and in contact with the bottom and inner side or edge of the said trough, substantially as described.

3. The combination, with a shallow trough to contain the oil in small quantity to be burned and a side wall extended upwardly from the inner edge of the shallow trough, of a deflecting-wall located outside of the outer edge of the trough and inclined downward toward the inner edge of the trough to form with the outer edge of the trough a passage for the products of combustion contiguous to the outer side of the upwardly-extended side wall and through which the products of combustion pass down under and in contact with the bottom and inner side or edge of the said trough, substantially as described.

4. The combination, with a shallow trough to contain the oil in small quantity to be burned and a side wall extended upwardly from the inner edge of the shallow trough above the outer edge of the same and provided with lugs on its outer side, of a deflecting-wall supporting said lugs and forming with the outer edge of the shallow trough a passage for the products of combustion, substantially as described.

5. The combination, with an annular shallow trough to contain the oil in small quantity to be burned, having an annular inside wall extended upwardly from the inner edge of said shallow trough above the outer edge of the same, forming a central outlet-passage for the products of combustion, of an annular deflecting-wall located outside of the outer edge of the trough and inclined downward to form with the outer edge of the trough a passage for the products of combustion, substantially as described.

6. The combination, with a petroleum-burner, of a valve-casing, provided with an inlet-port connected to an oil-supply and an outlet-port connected to the said burner, an independent valve for each part, a regulator connected to the inlet-valve and operated by the pressure of the boiler, and a regulator connected to the outlet-valve and operated by excess of oil from the burner, substantially as described.

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

LOUIS GODDU.

Witnesses:
GEO. W. GREGORY,
JAS. H. CHURCHILL.