(No Model.)

N. WASHBURN.

APPARATUS FOR BURNING CRUDE PETROLEUM.

No. 418,326. Patented Dec. 31, 1889.

Fig: 1.

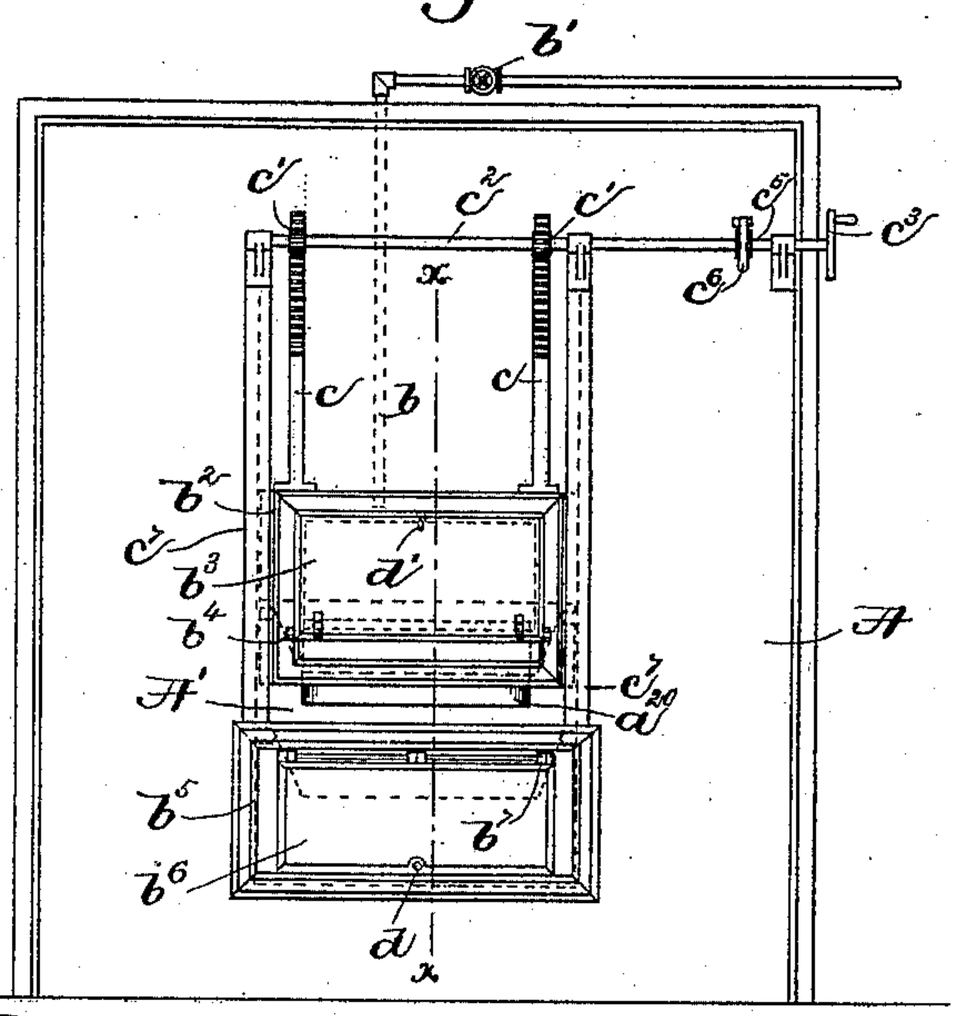


Fig: 2.

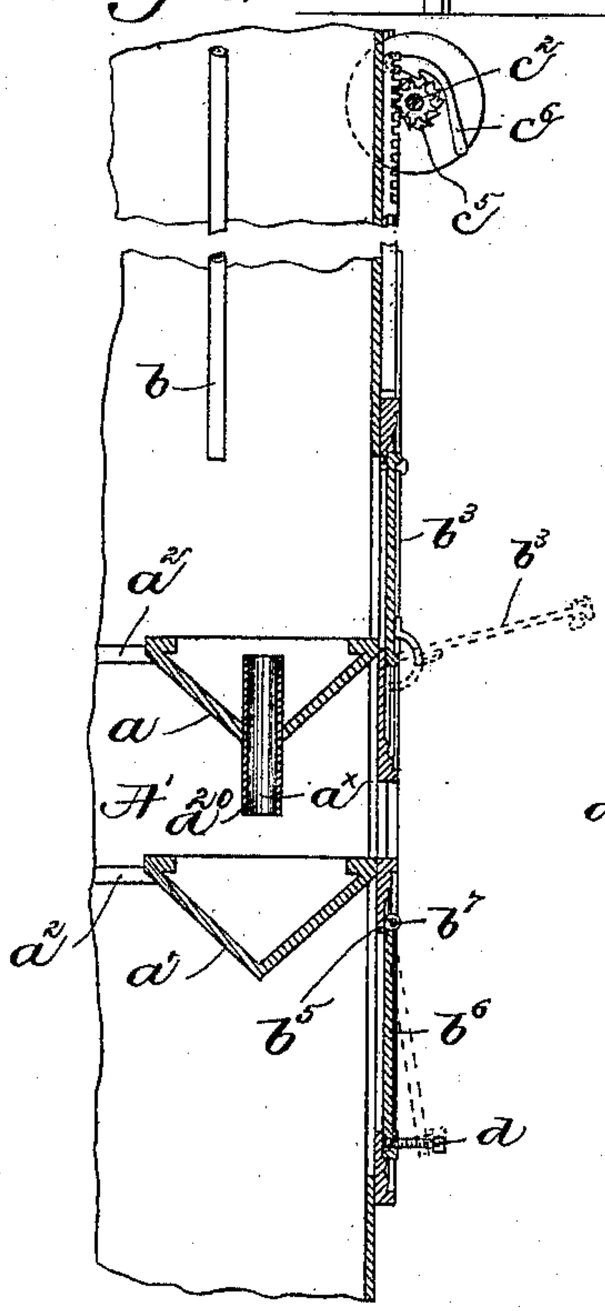


Fig: 5.

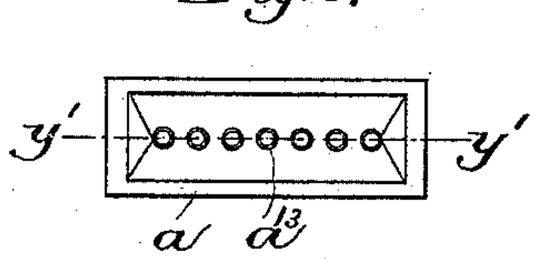


Fig: 6.

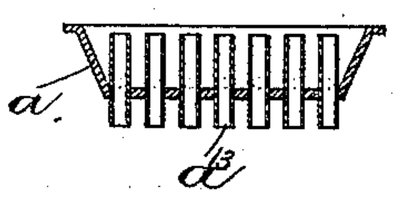


Fig: 4.

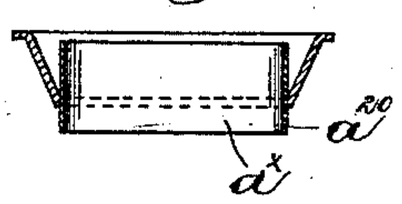
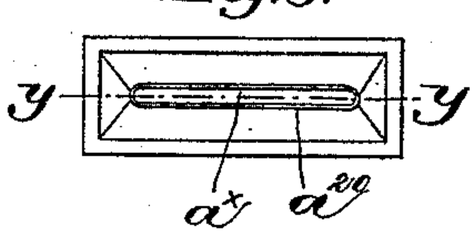


Fig: 3.



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UNITED STATES PATENT OFFICE.

NATHAN WASHBURN, OF BOSTON, MASSACHUSETTS.

APPARATUS FOR BURNING CRUDE PETROLEUM.

SPECIFICATION forming part of Letters Patent No. 418,326, dated December 31, 1889.

Application filed January 2, 1889. Serial No. 295,204. (No model.)

To all whom it may concern:

Be it known that I, NATHAN WASHBURN, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Apparatus for Burning Crude Petroleum, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object to provide a novel apparatus for burning petroleum and other oils, it being especially adapted for burning crude petroleum containing heavy hydrocarbons.

Prior to my present invention I am aware that numerous attempts have been made to burn crude petroleum; but so far as I am aware such attempts have been unsuccessful, owing to the imperfect combustion of the oil, the lighter oils being consumed, while the heavier hydrocarbons were deposited in the burner in the form of soot or black residuum. In my experiments I have discovered and practically demonstrated that crude petroleum may be successfully burned by regulating the supply of oxygen or air and controlling the direction of the flame, as will be described, by a suitable damper.

My improved apparatus is especially adapted to be used where a high heat is required—such, for instance, as in furnaces. The oil to be consumed is fed into a preferably V-shaped trough or burner suspended in the combustion-chamber and provided, preferably, with an elongated opening or duct having its side walls extended up into and down below the said burner, the said duct or opening leading the flame from above to the under side of the burner to thereby enable the said burner to be heated on its under side.

The particular features of my invention will be pointed out in the claims at the end of this specification.

Figure 1 is a front elevation of one form of furnace provided with a petroleum-burner embodying my invention; Fig. 2, a section of Fig. 1 on line $x\ x$; Fig. 3, a plan view of one form of burner; Fig. 4, a section of Fig. 3 on line $y\ y$; Figs. 5 and 6, modified forms of burners to be referred to, Fig. 6 being a section of Fig. 5 on line $y'\ y'$.

The furnace A, composed of fire-brick or other material capable of withstanding a substantially-high heat and provided with a combustion-chamber A′, may be of any desired or usual construction. The combustion-chamber contains within it, as herein shown, two suspended trough-shaped receptacles $a\ a'$, constituting burners, they being supported, as shown, at their ends upon ledges or bars a^2 on the side walls of the furnace. The burner a is preferably provided with an elongated opening or duct $a^\times$, having its walls a^{20} extended up into and down below the bottom thereof, the upper ends of the said walls being extended, preferably, to nearly the top of the receptacle a. The burner a' may be provided with an opening or duct $a^\times$, or it may be made without it, as shown in Fig. 2.

The oil to be consumed, preferably crude petroleum, may be fed into the burner a from a pipe b, connected to a suitable oil-supply, the said pipe being in practice provided with a suitable cock or valve b', (see Fig. 1,) by which the amount of oil supplied to the burner may be controlled.

The furnace A is provided, as shown, with a vertically-sliding frame or damper b^2, having a door b^3 hinged thereto, as at b^4. The furnace front has a lower casting or frame b^5, having a door b^6 hinged thereto, as at b^7, the door b^6 constituting a lower damper. The upper damper b^2 is made adjustable vertically with relation to the lower damper, as herein shown, by means of rack-bars c, in mesh with pinions c' on a shaft c^2, provided with a handle c^3, the said damper b^2 being held in adjusted position, as shown, by a ratchet-wheel c^5 on the shaft c^2, and a pawl c^6, secured to the furnace. The upper damper is movable in suitable guides c^7.

In practice I have ascertained that a most perfect combustion of the oil may be obtained with a burner having the duct or opening $a^\times$ by adjusting the upper damper b^2 so that its lower edge will be near the level of the lower end of the walls of the duct $a^\times$, substantially as shown in Figs. 1 and 2, whereby the air to support combustion is admitted below the burner a. The draft of air passing under the burner a draws the flame from the surface of the burning oil in the burner a down through the duct $a^\times$, from which the said flame issues free from unconsumed car-

bon and substantially white, thus indicating perfect combustion. By adjusting the damper b^2 the amount of oxygen or air supplied may be controlled, so that the desired amount thereof necessary to produce perfect combustion of the oil may be admitted, which may be ascertained by the condition or appearance of the flame. The door b^6 of the lower casting b^5 may be opened at its bottom, more or less, to supply air to the lower burner a' below the same, and be kept in position by the set-screw d. I prefer to employ the auxiliary burner a', in connection with the burner a, to catch the oil which may flow over the top of the walls a^{20}, the ignition of such oil in the auxiliary burner heating the burner a on its under side; but, if desired, the burner a' may be entirely dispensed with and the supply of oil controlled, so that only such an amount of oil will be admitted or supplied to the burner a as will be consumed in the said burner without overflowing the same.

The combustion of the oil is regulated chiefly by the damper b^2. If it is desired to retard the combustion or, as it were, to deaden the fire, the door b^3 will be opened by means of the thumb piece or nut d, so as to admit a greater amount of air above the burner a than is admitted below it, thus decreasing or substantially stopping the passage of flame down through the duct $a^\times$ to heat the burner on its under side, the said door being moved into the dotted-line position, Fig. 2. When the door b^3 is opened, only a surface-combustion of the oil takes place, and the said surface-combustion is imperfect, owing to the excess of oxygen, and the heat of the flame is diminished in direct proportion to or according to the amount of air admitted through the door b^3. In this manner the heat derived from the burning oil may be controlled within limits—as, for instance, if a high heat is required the door b^3 will be closed to cut off the supply of air above the burner, and if a low heat is desired the door will be wide open, while if a heat between the extremes is desired the door will be opened, more or less, between its extreme open and closed positions. The flame passing down through the duct $a^\times$ heats the oil in the burner a and converts the lighter oils into vapor, while the heavier hydrocarbons are heated to such degree as to disintegrate them or put them in condition to be easily consumed, so that the crude oil supplied to the burner is wholly consumed, thereby obviating a deposit or residuum in the said burner.

By means of the damper, herein shown as having a door, it is possible to determine the quantity of atmospheric air to be admitted both below and above the burner to establish and maintain more or less perfect combustion.

Instead of providing the burner a with a continuous flame-duct $a^\times$, I may employ a number of tubes a^{13}, extended above and below the bottom of the burner, as shown in Figs. 5 and 6. The tubes a^{13} in practice will be placed substantially near each other to form practically a continuous slot or duct, and the said tubes in practice will be of substantially-large size or area, so as to avoid choking up, which practical experience has demonstrated will take place if the tubes are of substantially-small area.

I claim—

1. The combination, with the fire-box of a furnace, of a fluid-burner located therein and consisting of a trough or receptacle provided with a duct having side walls extended up into and below the said receptacle, a fluid-supply for said burner, and a damper, substantially as described, adjustable with relation to the said burner, whereby the air to support combustion may be admitted under the burner to draw the flame in the burner down through the said duct to effect a perfect combustion and obtain a maximum heat or may be directed down upon the oil in the burner to produce an imperfect combustion and thereby a minimum heat, substantially as described.

2. The combination, with the fire-box of a furnace, of a fluid-burner located therein and consisting of a trough or receptacle provided with a substantially-continuous duct extended longitudinally the length of the said trough and having side walls extended up into and below the said receptacle, a fluid-supply for said burner, and a damper, substantially as described, adjustable with relation to the said burner, whereby the air to support combustion may be admitted under the burner to draw the flame in the burner down through the said duct to effect a perfect combustion and obtain a maximum heat or may be directed down upon the oil in the burner to produce an imperfect combustion and thereby a minimum heat, substantially as described.

3. The herein-described fluid-burner, consisting of a trough-shaped receptacle provided with a substantially-continuous duct extended the length of the said receptacle and having side walls extended up into and down below the said receptacle, substantially as described.

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

NATHAN WASHBURN.

Witnesses:
JAS. H. CHURCHILL,
BLANCHE DEWAR.