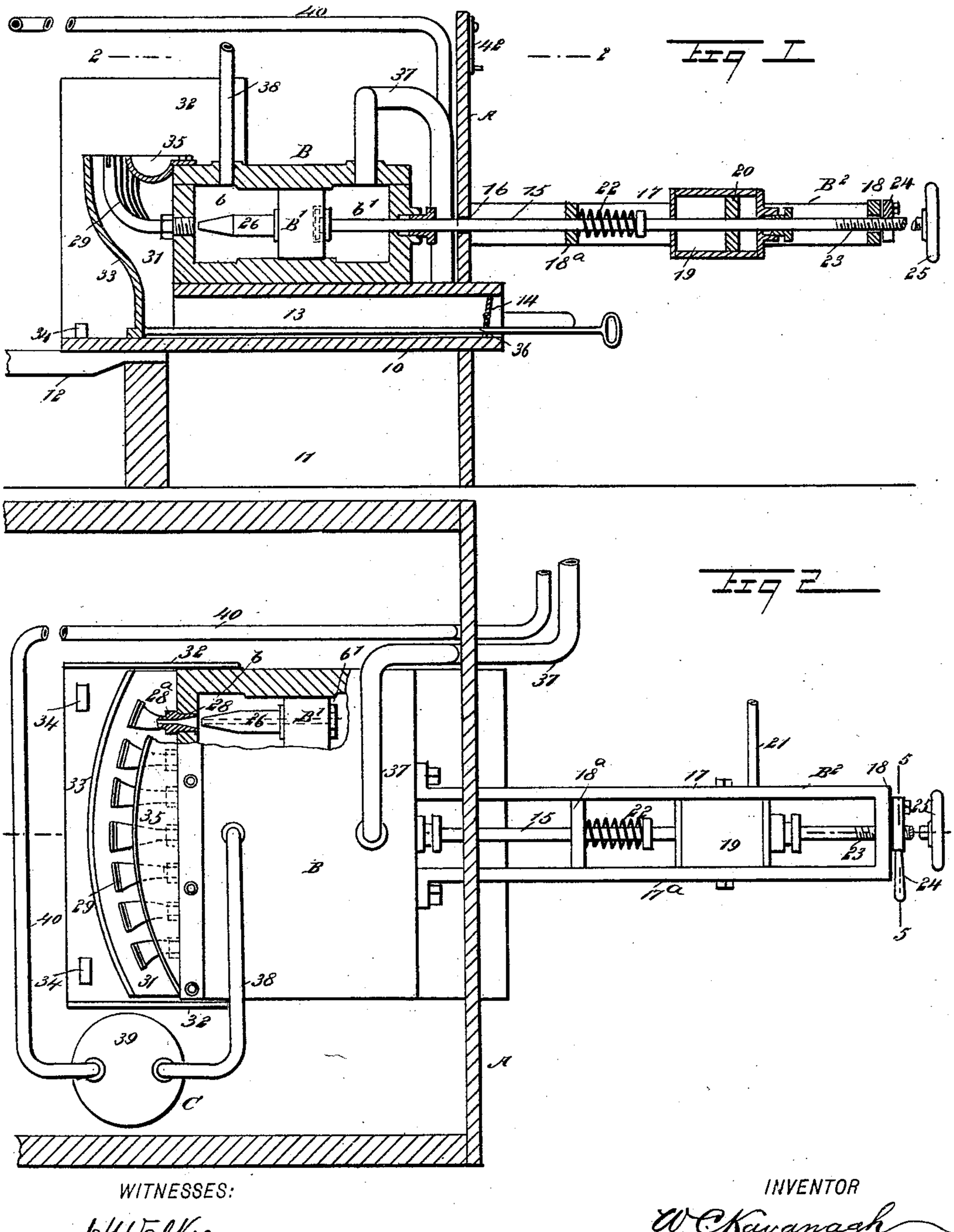
(No Model.) 2 Sheets—Sheet 1.

W. C. KAVANAGH.

HYDROCARBON BURNER.

No. 592,739. Patented Oct. 26, 1897.



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(No Model.) 2 Sheets—Sheet 2.

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Fig 3

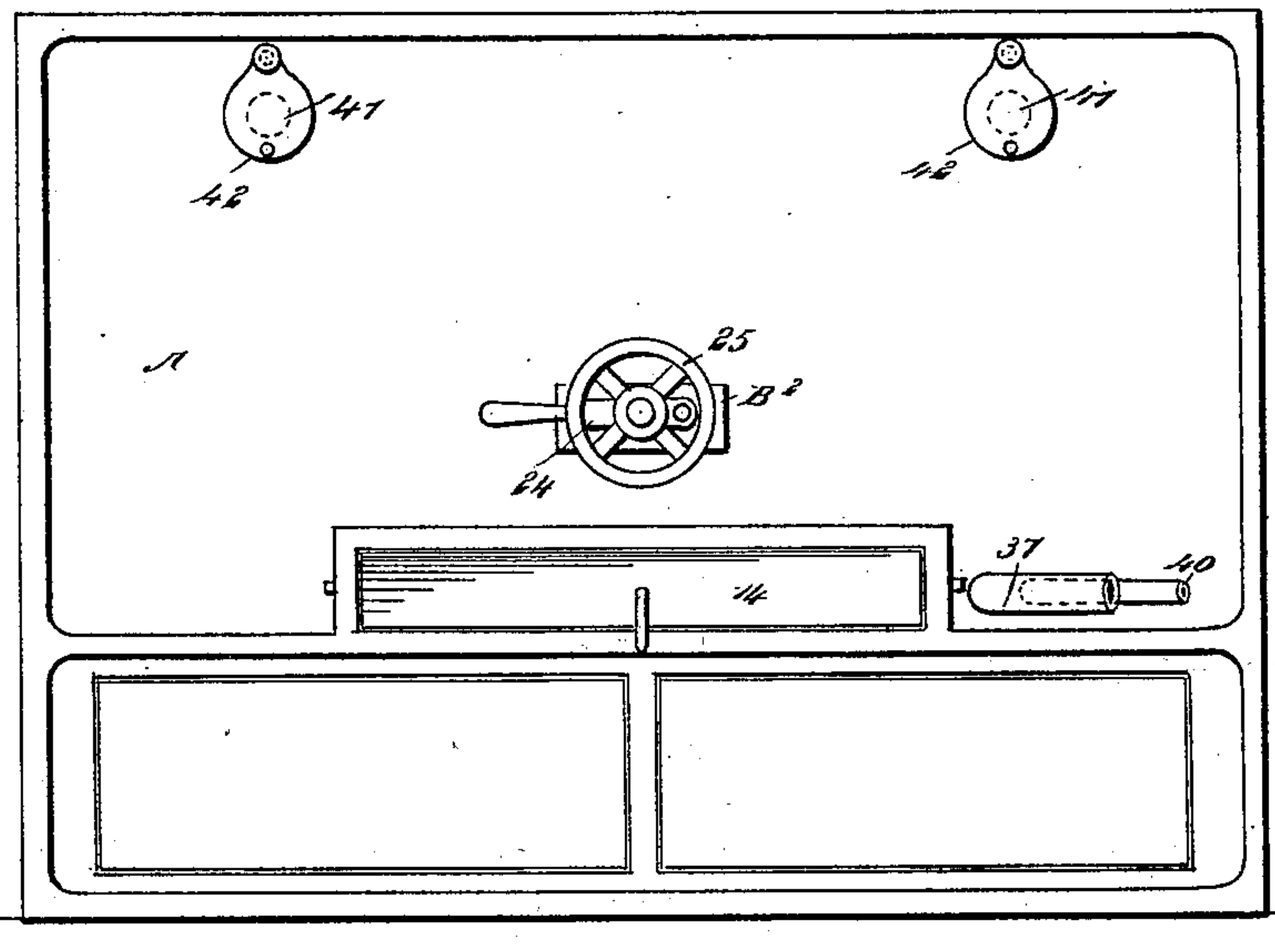


Fig 4

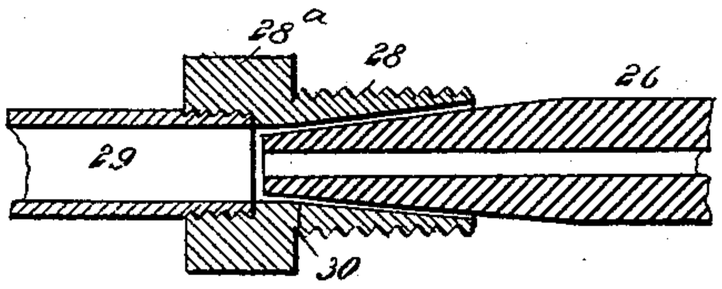


Fig 5

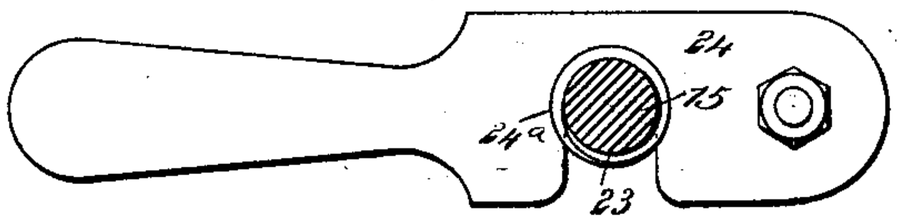
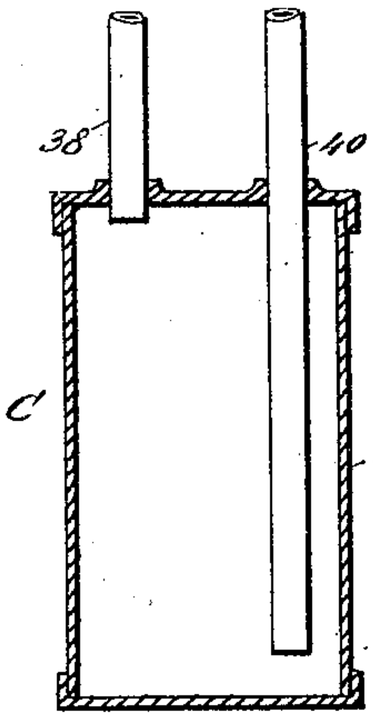


Fig 6



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UNITED STATES PATENT OFFICE.

WILLIAM C. KAVANAGH, OF NEW YORK, N. Y., ASSIGNOR TO SOPHIA D. DESSAU, OF SAME PLACE.

HYDROCARBON-BURNER.

SPECIFICATION forming part of Letters Patent No. 592,739, dated October 26, 1897.

Application filed April 1, 1895. Serial No. 544,035. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM C. KAVANAGH, of New York city, in the county and State of New York, have invented a new and useful Improvement in Hydrocarbon-Burners, of which the following is a full, clear, and exact description.

My invention relates to an improvement in hydrocarbon-burners; and it has for its object to provide a burner adapted especially for use in a furnace for the purpose of generating steam, or which may be used for other purposes, and to provide a means whereby the burner may be operated without the aid of air-tanks or auxiliary steam-boilers.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures and letters of reference indicate corresponding parts in all the views.

Figure 1 is a vertical longitudinal section through a portion of a furnace, the burner located within the furnace, and the air channels or ducts connected with the burner. Fig. 2 is a horizontal section taken substantially on the line 2 2 of Fig. 1. Fig. 3 is a front elevation of the furnace, the burner being in position therein. Fig. 4 is an enlarged longitudinal detail section through a supply-nozzle, the nipple in which it is entered, and a portion of the burner-nozzle communicating with the supply-nozzle. Fig. 5 is a transverse section through an extension from the burner, taken practically on the line 5 5 of Fig. 2; and Fig. 6 is a longitudinal section through a carbon-depository.

In carrying out the invention the furnace A, to which the burner B is to be applied, need not be altered in any manner. The dead-plate 10, however, located at the top of the ash-pit 11, is made to extend a predetermined distance out beyond the front of the furnace and a certain distance over the grate-bars 12 thereof. The fire-door of the furnace, however, is removed, and in the space thus disclosed a box is entered, being made to rest upon the dead-plate 10. In fact, said plate will constitute the bottom of the box, and this box extends outward from the furnace a distance corresponding to that of the dead-plate, and the said box is open at both its outer and inner ends, being adapted to constitute an air-chute 13 to deliver air from outside into the furnace. A damper-door 14 is pivoted in the outer end of the air-chute 13, and when said door is closed the entrance to the chute is completely closed, but said door may be opened to any desired extent.

The burner B is located upon the top of the air-chute 13, the inner end of the burner being preferably flush with the inner end of the said chute, as shown in Fig. 1. The body of the burner consists of a casing of any approved shape, but preferably the said casing is made substantially rectangular, as shown in the drawings. The casing is divided into two compartments, an inner compartment *b* and an outer compartment *b'*, by means of a sliding block B', extending from one end of the casing to the other. A piston-rod 15 is secured to the central portion of the outer face of the sliding block B', as shown in Fig. 1, and the said rod extends outward through a suitably-packed aperture 16 in the front of the burner-casing, and the said piston-rod is likewise passed out from the furnace through an opening in the front thereof. The piston-rod is held to slide in a frame B^2, located principally outside of the furnace, and this frame, as shown in Fig. 2, comprises, preferably, two side bars 17 and 17^a, connected at their outer ends by a cross-bar 18, a second cross-bar 18^a being placed a predetermined distance from the furnace. A steam-receiving box 19 is secured within the frame B^2, between the cross-bars 18 and 18^a, and the said box is provided with a piston-head 20, the said head being connected with the piston-rod 15, and a steam-pipe 21, carried from a boiler, for example, is made to enter the box 19 between its outer end and opposing face of the piston-head 20. A spring 22 is coiled around the piston-rod 15, having bearing against the inner cross-bar 18^a of the frame and a collar formed on the said rod, the tendency of the spring being to force the rod outward, and at the outer extremity of the piston-rod 15 an exterior thread 23 is formed,

and the threaded portion of the rod is carried through an opening in the end of the frame, moving freely therein, and terminates in a hand-wheel 25, or its equivalent. A nut 24, somewhat in the form of a lever, is fulcrumed upon the end of the frame, and the threaded opening in the said nut is produced in the bottom edge thereof, so that when the sliding block B′ is to be operated by hand the nut may be thrown downward to a contact with the threaded surface of the rod, and the said rod will be screwed inward or carried outward, as occasion may demand; but when the sliding block B′ is to be operated automatically the nut 24 is carried entirely out of engagement with the piston-rod 15.

The sliding block B′ within the burner-casing is provided with any desired number of supply-nozzles 26. These nozzles extend entirely through the block and principally beyond the inner face thereof. The outlet ends of the nozzles are tapering, as shown best in Fig. 4, and the nozzles may be secured in the sliding block by means of nuts, as illustrated, or they may be expanded in place. Nipples 28, corresponding in number and location to the supply-nozzles, are introduced into the inner side surface of the burner-casing, and ordinarily these nipples are screwed to place, being provided with an exterior threaded surface back of a head-section 28^a, and in the said head-section the receiving end of a burner-nozzle 29 is screwed or equivalently secured.

The chamber or bore 30 in the nipple 28 is tapering and is adapted to receive the tapering end of a supply-nozzle 26, and the supply-nozzle is enabled to pass well into the head of the nipple and virtually into the burner-nozzle 29, and by reason of this extreme movement on the part of the supply-nozzle any carbon that may form or lodge in the bore 30 of the nipple will be crushed, permitting the supply-nozzle to deliver its full quota of ignitible material to the burner-nozzle. It is obvious that the supply-nozzles carried by the sliding block B′ are made to enter the nipples 28 or are withdrawn therefrom by the sliding movement of the block controlled by the piston-rod 15, and I desire it to be distinctly understood that if in practice it is found desirable the seats for the supply-nozzles may be made directly in the casing instead of being formed through the medium of the nipples illustrated in Fig. 4.

An air-supply passage or duct 31 is formed at the rear of the burner B, and the said passage or duct is contracted at the top and at the bottom, the bottom of the passage or duct being in direct communication with the air-chute 13. This air-supply passage or duct is made up of two side plates 32, which are secured, preferably, to the dead-plate 10 longitudinally thereof, and the back wall 33 of the passage or duct is movable to and from the front wall thereof, the latter being the inner end of the burner-casing. In fact the rear wall of the air-supply passage or duct 31 is practically a door which is held to slide upon the dead-plate 10, being limited in its outward movement by stops 34.

The sliding door or wall 33 of the air-supply passage or duct is substantially straight at its lower end and is curved upwardly and rearwardly at its upper end, whereby the space between the lower portion of said door or movable wall and burner-casing is less than the space between these two parts at the top of the door; but the upper portion of the air-supply passage or duct is contracted by securing a concaved hood 35 preferably upon the top of the burner-casing, as shown in Fig. 1. Both the hood and the movable door or wall 33 of the air-supply passage or duct are laterally curved, being bowed in a rearwardly direction and on concentric lines, as shown in Fig. 2.

The burner-nozzles 29 are curved upward from the burner-casing, and their upper ends are assembled in the upper contracted portion of the air-supply passage or duct, as shown in Figs. 1 and 2. The upper ends of the burner-nozzles are cut or slit vertically, whereby they have openings at each side and the flame will be broad and ample, and, again, owing to these openings, the flames from the burners, taking a lateral as well as a vertical direction, will insure each and every burner being lighted when the combustible material is applied. Furthermore, as the burner-nozzles are screwed or otherwise adjustably attached to the burner-casing the said burner-nozzles may be given an upward, downward, or side inclination, or any particular number or any particular one may be adjusted independently of the others.

The adjustment of the door or movable wall 33 of the air-supply passage or duct is accomplished through the medium of a rod 36, which is passed through the air-chute 13 and outward through an opening in the damper-door 14. The door or movable wall 33 of the air-supply passage or duct is therefore adjusted after the manner of a Bunsen burner, securing perfect combustion and any desired color of flame. A steam-pipe 37, connected with a boiler or other source of steam-supply, is made to enter the outer compartment *b′* of the burner, while oil is supplied to the inner compartment *b* through a pipe 38. This pipe is connected with what I denominate a "carbon-depository" C. (Shown in Fig. 6.) This depository consists of a receptacle 39, shown in the drawings as of cylindrical form and provided with a cap at both top and bottom, either one of which may be removed. The pipe 38, connected with the oil-chamber of the burner, is made to enter the top of the receptacle 39, but only extends a short distance within the same, and a second pipe 40, which is brought from any source of oil-supply—a tank overhead, for example—is made to pass through the upper portion of the receptacle down within a short distance of the bottom, and the pipe 40, which may be termed

the "primary oil-supply" pipe, is carried in through the wall of the furnace, and the depository is likewise located within the furnace. It will be understood that if in practice it is found desirable any number of bends may be produced in the primary supply-pipe 40 or in the final supply-pipe 38. It is evident that when the oil passes down into the depository through the pipe 40 the heavier carbonaceous matter will be deposited on the bottom of the said depository, while the lighter substances will pass to the oil-chamber of the burner through the final supply-pipe 38. It is obvious that since the door 33 of the air-supply passage or duct is operated from the outside of the furnace the said door may be adjusted to obtain a clear blue flame without the least waste of oil during the operation.

The operation of the burner is accomplished in substantially the following manner: An oil-tank is placed, for example, about fifteen feet high, said tank being capable of holding from one to two barrels of oil, and is connected with the primary oil-supply pipe 40. Waste saturated with oil is then placed in the air-chute 13 and is set alight. The oil is then allowed to flow through the extended feed-pipe and thence into the depository, where the lighter constituents of the oil pass off to the burner. The oil will then be ejected at the burner-nozzles 29, being lighted at that point, and one burner will light that next to it in the event any of them should be missed by the party intrusted with the task of lighting them. The heat from the flame in passing over the depository and over the extended feed-pipe within the furnace immediately resolves the oil into its constituent gases. After the burners have been lighted the door 33 of the air-supply passage or duct 31 is adjusted to obtain a clear blue flame and the damper-door 14 is manipulated to supply a sufficient quantity of air for perfect combustion, and it is evident that the air rushing in through the chute 13 will, by reason of the peculiar construction of the air-supply passage or duct 31, impinge with force upon the outlets of the burner-nozzles, thereby insuring a perfect commingling of the oil with the air. As the steam is generated in the boiler it will exert more or less pressure on the piston-head 20, controlling the piston-rod 15 of the burner sliding block, and when the steam has been generated to a certain degree the pressure of the aforesaid piston-head 20 will be so great as to cause the supply-nozzle to completely close the entrance to the burner-nozzles, and when steam is generated it will enter the chamber b' of the burner and the steam will commingle with the oil and the air, producing a flame of maximun intensity. As the pressure of steam runs down the spring 22 on the piston-rod 15 will force the piston-rod outward and open communication to the burner-nozzles to a greater extent, thus adding to the intensity of the flame. The furnace is provided with sight-openings 41, normally covered by lids 42, whereby the progress of combustion may be noted from the outside of the furnace at any time. It will be understood that water or air under pressure may be substituted for steam in the automatic operation of the supply or cut-off nozzles 26.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The furnace, combined with the dead-plate, located at the top of the ash-pit, and which has its inner end project over the front end of the grate-bars, and its front end extend beyond the front of the furnace; the air-chute, the damper in the chute, the burner-tubes, located above and in front of the rear edge of the plate, and means for supplying the burner-tubes with fuel, substantially as shown.

2. The furnace, the dead-plate located at the top of the ash-pit and which has its inner end project over the front end of the grate-bars and its front end extend beyond the front of the furnace, the air-chute, and a damper in the chute, combined with the burners placed in front of the rear edge of the plate, means for providing the burner-tubes with fuel, and the rear wall placed upon the top of the plate between its rear edge and the burner-tubes, substantially as described.

3. The furnace, the dead-plate located at the top of the ash-pit, and which has its inner end project over the front end of the grate-bars and its front end extend beyond the front of the furnace, the air-chute, and a damper in the chute, combined with the burner-tubes placed in front of the rear edge of the plate, means for providing the burner-tubes with fuel, an adjustable wall placed upon the rear portion of the plate between its rear edge and the burner-tubes, and means for adjusting the plate so as to regulate the supply of air to the burner-tubes, substantially as set forth.

4. The furnace, the dead-plate located at the top of the ash-pit, and having its inner end project over the front end of the grate-bars and its outer end extend beyond the front of the furnace and provided with stops at its inner end, the air-chute formed upon the top of the dead-plate, a damper placed in the chute, burner-tubes located above and in front of the rear edge of the plate, and means for supplying the burner-tubes with fuel, combined with a vertical adjustable wall placed upon the rear end of the plate, and an adjusting-rod connected to the wall and having its front end extend beyond the front end of the air-chute, substantially as specified.

5. An air-supply passage or duct, consisting of stationary front, bottom and side walls, and an adjustable rear wall, combined with the burner-tubes located at the top of the air-supply duct, an air-chute conducting air into the bottom of the air-supply duct, and means for adjusting the rear wall, substantially as shown.

6. An air-supply passage or duct consisting of stationary side, bottom, and front walls, combined with a movable rear wall, means for adjusting it, burner-tubes located at the top of the air-supply duct, a stationary hood also located at the top of the air-supply duct in front of the burner-tubes, an air-flue conducting air into the bottom of the air-supply duct, and means for controlling the passage of the air through the flue, substantially as described.

7. An air-supply passage or duct, having stationary front, side and bottom walls, a movable rear wall, and means for moving it, combined with burner-tubes placed at the top of the air-supply duct, an air-chute for admitting air into the bottom of the air-supply duct, and means in the chute for regulating the supply of air, the rear wall being curved so that the air-supply duct is smallest at the bottom and largest at the top, substantially as set forth.

8. In a hydrocarbon-burner, an air-supply passage or duct, provided with a vertical curved rear wall that is horizontally adjustable in relation to the burner-tubes, for the purpose of regulating the supply of air to the burner-tubes, combined with the burners placed in the top of the air-supply duct, an air-chute for regulating the supply of air to the bottom of the air-supply duct, and means placed in the chute for controlling the passage of the air through the chute, substantially as shown.

9. In an oil-burner, an oil-receiving chamber having outlets, means for controlling the same, and burner-tubes connected with the outlets, and an air-supply passage or duct formed around the said burner-tubes and open at the top, the said duct being contracted at top and bottom and having an air-supply at its lower end, one wall of said duct being movable to control the character of the flame, as and for the purpose set forth.

10. In an oil-burner, the combination with the burner-tubes thereof, of an air-supply passage or duct formed around the same, contracted at top and bottom and having one of its walls movable and adjustable, an air-chute connected with the air-supply passage or duct, and a damper controlling the admission of air into said chute, as and for the purpose set forth.

11. The combination of a curved burner-tube for combustible fuel, a chamber communicating with said burner-tube, a wall conforming to and situated adjacent to the burner-tube and forming with a wall of the chamber an air-passage to and coextensive with the burner-tube, a plate supported by the chamber and extending to near the end of the burner-tube, and means connected with the chamber for supplying steam and oil to the burner-tube, substantially as shown.

12. The combination with a chamber having connected therewith means for supplying steam and oil, a burner-tube communicating with said chamber and adapted to receive the steam and oil, an air-passage surrounding and coextensive with said burner-tube, and an air-chute lying below the chamber and adapted to supply air to the passage.

13. The combination with a chamber having connected therewith means for supplying steam and oil, a burner-tube communicating with said chamber and adapted to receive the steam and oil; an air-passage surrounding and coextensive with said burner-tube and provided with a movable wall and an air-chute lying below the chamber, and adapted to supply air to the passage.

14. The combination with a chamber having connected therewith means for supplying steam and oil, a piston placed in said chamber, and provided with means for closing the inner ends of the burner-tubes, with the burner-tubes communicating with said chamber and adapted to receive steam and oil therefrom; and an air-passage surrounding and coextensive with said burner-tubes, and an air-chute lying below the chamber and adapted to supply air to the passage, substantially as specified.

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Witnesses:
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