

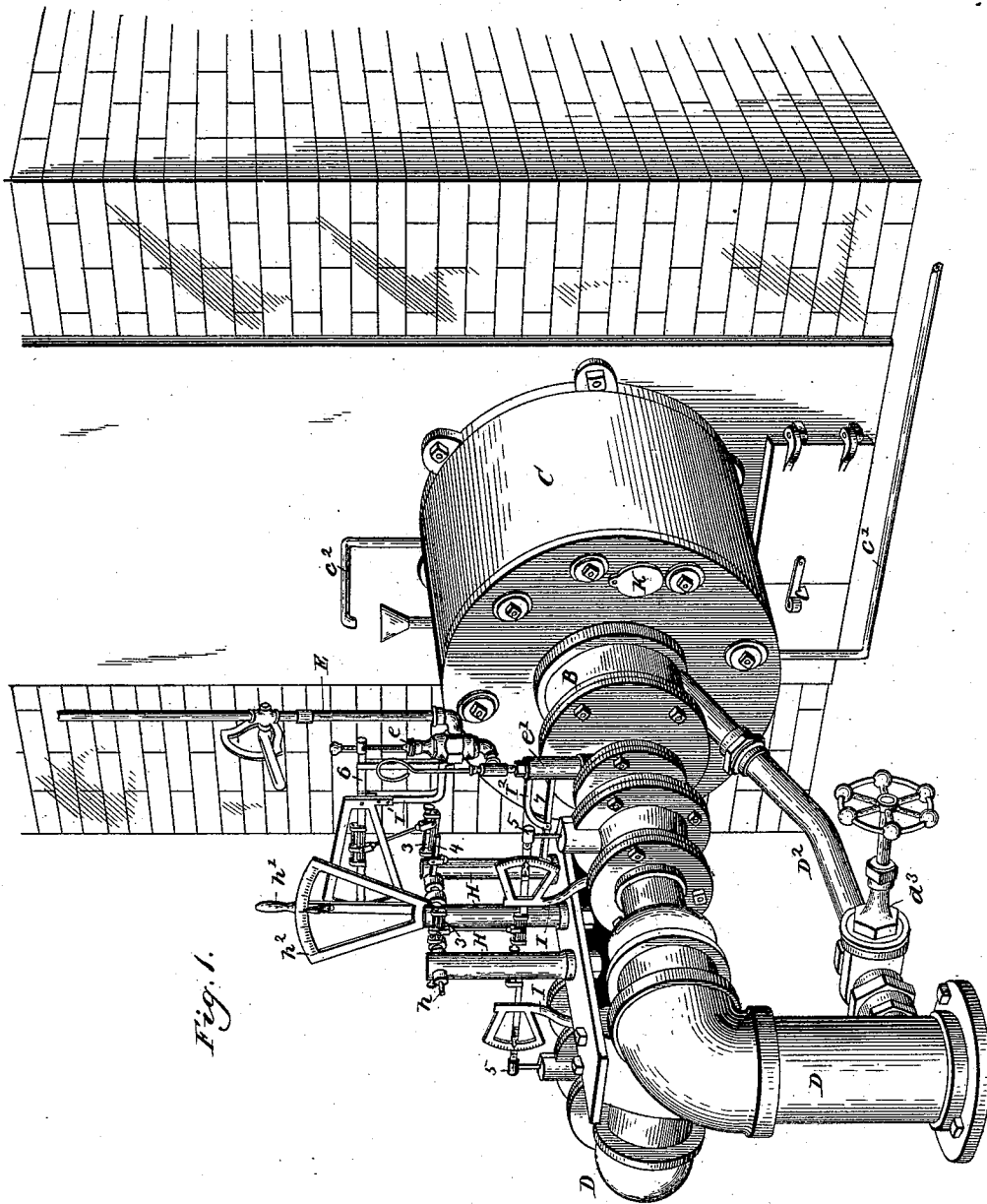
(No Model.)

2 Sheets—Sheet 1.

J. LEEDS.
BOILER FURNACE.

No. 471,673.

Patented Mar. 29, 1892.



WITNESSES:

Edwin L Bradford
A F Randall

INVENTOR

Julius Leede
BY
V.D. Shackbridge & Son.
ATTORNEYS

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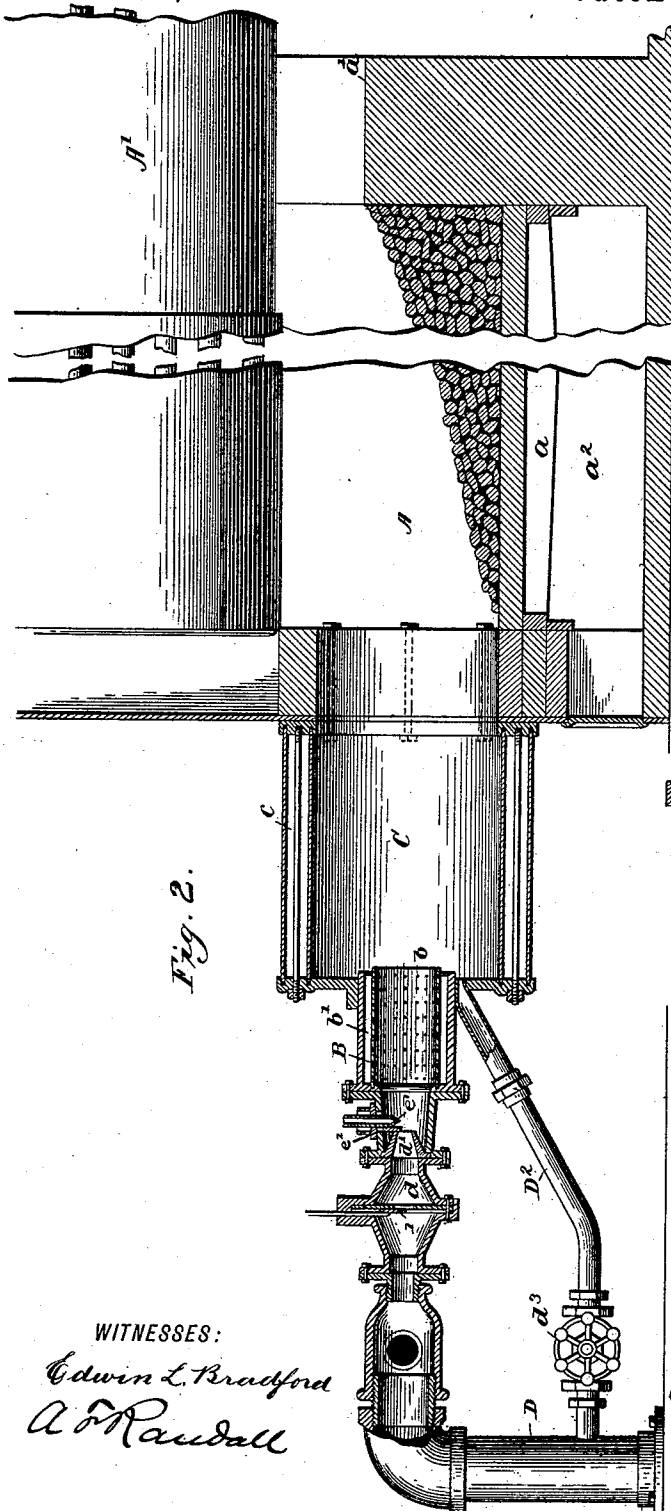


Fig. 2.

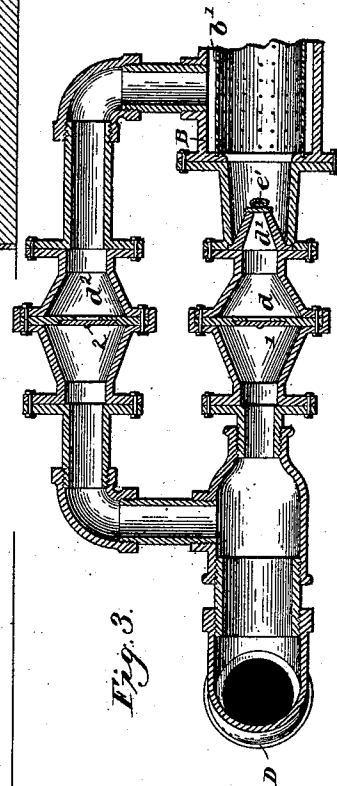


Fig. 3.

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UNITED STATES PATENT OFFICE.

JULIUS LEEDE, OF MINNEAPOLIS, MINNESOTA.

BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 471,673, dated March 29, 1892.

Application filed December 20, 1890. Renewed September 5, 1891. Serial No. 404,859. (No model.)

To all whom it may concern:

Be it known that I, JULIUS LEEDE, a citizen of the United States, residing at Minneapolis, Hennepin county, Minnesota, have invented certain new and useful Improvements in Boiler-Furnaces; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in boiler-furnaces for burning liquid hydrocarbon fuel.

The object of the invention is to apply the flame and products of combustion so as to secure a maximum effect from the heat thereof.

The invention consists generally in the combination, with the usual fire-chambers of an ordinary furnace, of a primary and a supplemental combustion-chamber, said combustion-chambers being arranged outside and in advance of the usual fire or heating chambers of the furnace.

The invention also consists in other combinations hereinafter described and claimed.

In the drawings, Figure 1 is a perspective. Fig. 2 is a longitudinal vertical section showing my improvement connected with the fire-chambers of a boiler, the upper parts being broken away; and Fig. 3 is a horizontal section through my attachment.

A is a chamber corresponding with the usual primary fire-chamber of a boiler-furnace.

A' is a boiler; *a*, the grate-bars; *a'*, the bridge-wall; and *a*² the ash-pit.

In front of the fire-chamber A, I attach a primary and a supplemental combustion-chamber for burning liquid hydrocarbon.

B is the primary combustion-chamber, made cylindrical and arranged horizontally. The sides of this chamber are inclosed by a wall having perforations *b b*, and around the perforated wall is a casing adjusted so as to leave an annular chamber *b'* between the inner and outer wall.

C is a supplemental combustion-chamber connected with and arranged in advance of the primary combustion-chamber and attached to the front plate of an ordinary furnace. This chamber is properly of a diame-

ter about three times as great as that of chamber B and approximates the size of the fire-chamber under the boiler. A water-jacket *c* surrounds this chamber, the same being supplied through pipe *c'* and relieved through pipe *c*², which discharges into a funnel or other receptacle to be conducted to the boiler as feed-water or otherwise, as may be desired.

D is a blast-pipe leading from a blower or other source of air-supply under pressure through a valve-chamber *d* and ends in a nozzle *d'*, having an elongated vertically-arranged slot. A branch *D'* of this pipe leads from the main trunk behind the valve-chamber *d* through valve-chamber *d*² to the annular space *b'* around the inner wall and discharges into combustion-chamber B through the perforations *b b*. Another branch *D*² leads from the main trunk to the rear end of supplemental combustion-chamber, discharging just beneath and in front of the forward extremity of chamber B. This latter branch is provided with a cock or valve *d*³ for regulating at will the opening through the same.

E is an oil-supply pipe leading from source of supply through a regulating-valve *e* and a movable nozzle *e'* to a point in front of the blast-nozzle *d'*.

In valve-chambers *d d*² I have reciprocating valves or cut-offs 1 and 2, respectively. These valves slide in dovetail grooves over or across ports in the diaphragms across the valve-chambers to augment or reduce said ports and regulate the volume of air passing through them.

Attached to the movable oil-nozzle *e'* is a plate or cut-off *e*², whose lower edge terminates in the same horizontal plane with the lower end of the nozzle. When the cut-off is moved to contract or enlarge the air-nozzle, the oil-nozzle moves with it, so that the air-current will always impinge against the stream of oil as it issues from its nozzle. The oil-nozzle has an elongated narrow slit extending athwart the blast-nozzle, so as to present a thin film or sheet of liquid to the blast.

Mounted on suitable supports *H H H* above the blast-pipe and its branches is a rock-shaft *h*, having laterally-projecting arms 3 3 and 4 and operating lever-handle *h'*, and upon one of these supports adjacent to the handle is a graduated scale *h*². Upon other supports

I I, I', and I² are mounted vibrating lever-arms 5 5, 6, and 7. Graduated scales are also mounted on each of these supports except I². To the other ends of the levers 5 5 the air-valves 1 and 2 are attached. To the other end of lever 6 the piston of oil-valve *e* is attached. To one end of lever 7 the movable oil-nozzle *e'* and connected plate *e''* are attached, and all of these levers are operatively connected with the rock-shaft by means of links or connecting-rods reaching from said levers to the laterally-extending arms. The arms 3 3 and levers 5 5 and 6 have movable blocks, to which the connecting-links are attached, the purpose being convenience of adjustment of the relative movement of the several valves and the nozzle.

The graduated scale indicates to the operator the exact relative position of the valves at all times.

K is a door or cover for an opening through the end of supplemental combustion-chamber, through which a torch is inserted for igniting the oil spray or vapors when starting the furnace.

Broken fire-brick or other refractory material, substantially as shown, is filled in the space A.

Operation: The blast being started, oil being fed through its nozzle and blown in spray through chamber B and then ignited, the operation will be substantially as follows: The oil will be atomized and given a longitudinal or forward impulse by the blast through air-nozzle *d'* and oxygen for partial combustion furnished. The forward movement of the gaseous and vaporous products will be retarded and further oxidized by the annular blast through the perforations *b b*. The resultant products (carrying unconsumed vapors and gases and finely-divided particles of carbon) pass into the enlarged supplemental combustion-chamber, where additional air through branch D² is supplied and space and time afforded for the expansion and further ignition of the combustible material. From thence a highly-heated undulatory flame then rushes from chamber C to the fire-chamber space A, passes over the refractory material in said chamber and over the bridge-wall, and continues in a relatively thin rolling sheet of visible flame nearly to the rear end of the boiler, where it ends, and the heated incombustible products pass through the boiler-flues and escape through the stack in the usual way.

Having now described my invention, what I claim is—

1. The combination of a combustion-chamber having air-inlet ports around its sides and separate injector-port through one end and valved air-conduits communicating with the chamber through said ports, substantially as described.

2. The combination of a combustion-chamber having air-inlet ports around its sides and separate inlet-port through one end and means consisting of valved conduits and air

under pressure for supplying and regulating a desired relative volume of air to the chamber through the respective ports, substantially as described.

3. The combination of a primary combustion-chamber having inlet-ports around its sides and a separate inlet-port at one end, an enlarged supplemental combustion-chamber adjacent to the primary chamber having air-port, and means, as valved conduits and air under pressure, for regulating and supplying the proper relative volume of air through the several ports, substantially as described.

4. The combination of a combustion-chamber having inlet-ports around its sides and a separate port at one end, oil-supply pipe, oil-valve, air-conduits leading to the different passages, air-valves, and a rock-shaft for simultaneously operating the said valves, substantially as described.

5. The combination of a combustion-chamber, oil-supply pipe, means, as a blast, for spraying oil, adjustable oil-nozzle, and an air-valve having one edge in a plane with and adjustable with said nozzle, substantially as described.

6. The combination of a combustion-chamber having air-inlet ports around its sides and separate inlet-port through one end, oil-valve, movable oil-nozzle, air-valve adjacent to the oil-nozzle, air-conduits leading to the different inlet-ports, valves in said conduits, a rock-shaft carrying laterally-extending arms, and links connecting the arms, valves, and oil-nozzle, substantially as described.

7. The combination of a primary combustion-chamber, an enlarged supplemental combustion-chamber in front of said primary chamber, the heating-chamber of an ordinary furnace in advance of these combustion-chambers, and means for feeding air under pressure to both the combustion-chambers, substantially as described.

8. A furnace for burning liquid or gaseous fuel, consisting of a combination of a fuel-supply pipe, a primary combustion-chamber having air-inlet ports around its sides and separate port through one end, leading to said chamber, air-blast pipes discharging through said ports, an enlarged supplemental combustion-chamber, and the heating-chamber of an ordinary furnace, substantially as described.

9. A boiler-furnace for burning liquid or gaseous fuel, embracing the combination of a primary combustion-chamber having endwise and lateral air-passages, means for feeding the fuel to said chamber, means for feeding air under pressure through said air-passages, and an enlarged supplemental combustion-chamber, substantially as described.

10. The combination of a primary combustion-chamber having ports around its sides and separate port at one end for the admission of air, an oil-pipe for supplying oil in rear of said chamber, air ducts or pipes for conducting air under pressure through the side and end air-ports to said chamber, an

enlarged supplemental combustion-chamber, and an air-duct for supplying air under pressure to said supplemental chamber and fire and heating chamber beneath the boiler, substantially as described.

11. A furnace involving the combination of a primary combustion-chamber having air-inlet ports around its sides and separate port in one end, an oil-feed, a forced-air feed leading to the inlet-ports of the combustion-chamber, an enlarged supplemental combustion-

chamber, and forced-air feed leading to the said supplemental chamber, said chambers being arranged outside the main heating-region of a furnace, substantially as described. 15

In testimony whereof I affix my signature in the presence of two witnesses.

JULIUS LEEDE.

Witnesses:

WM. M. STOCKBRIDGE,
A. F. RANDALL.