

No. 762,129.

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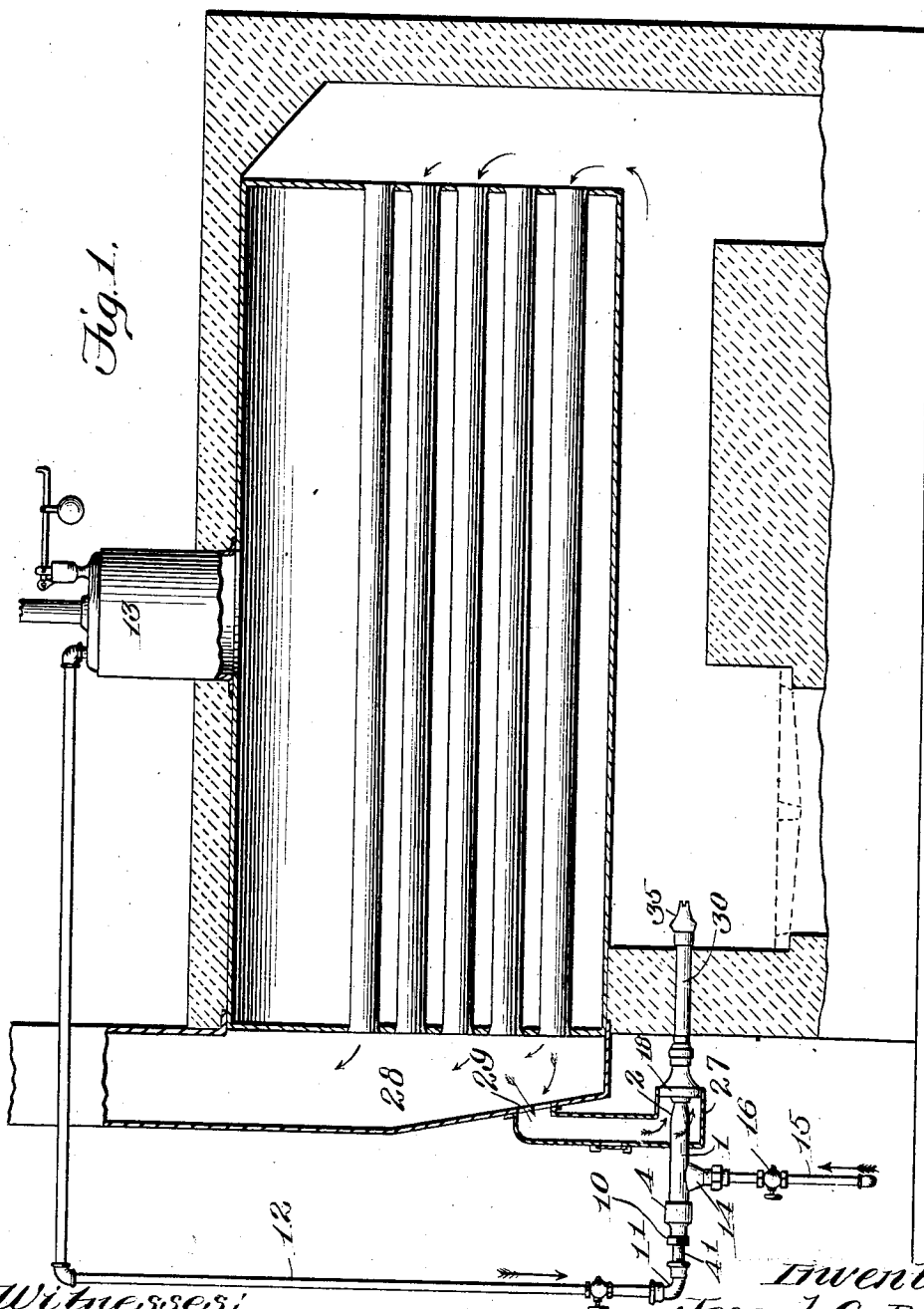
J. G. BRANCH.
VAPOR BURNER.

APPLICATION FILED DEC. 3, 1902. RENEWED DEC. 15, 1903.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
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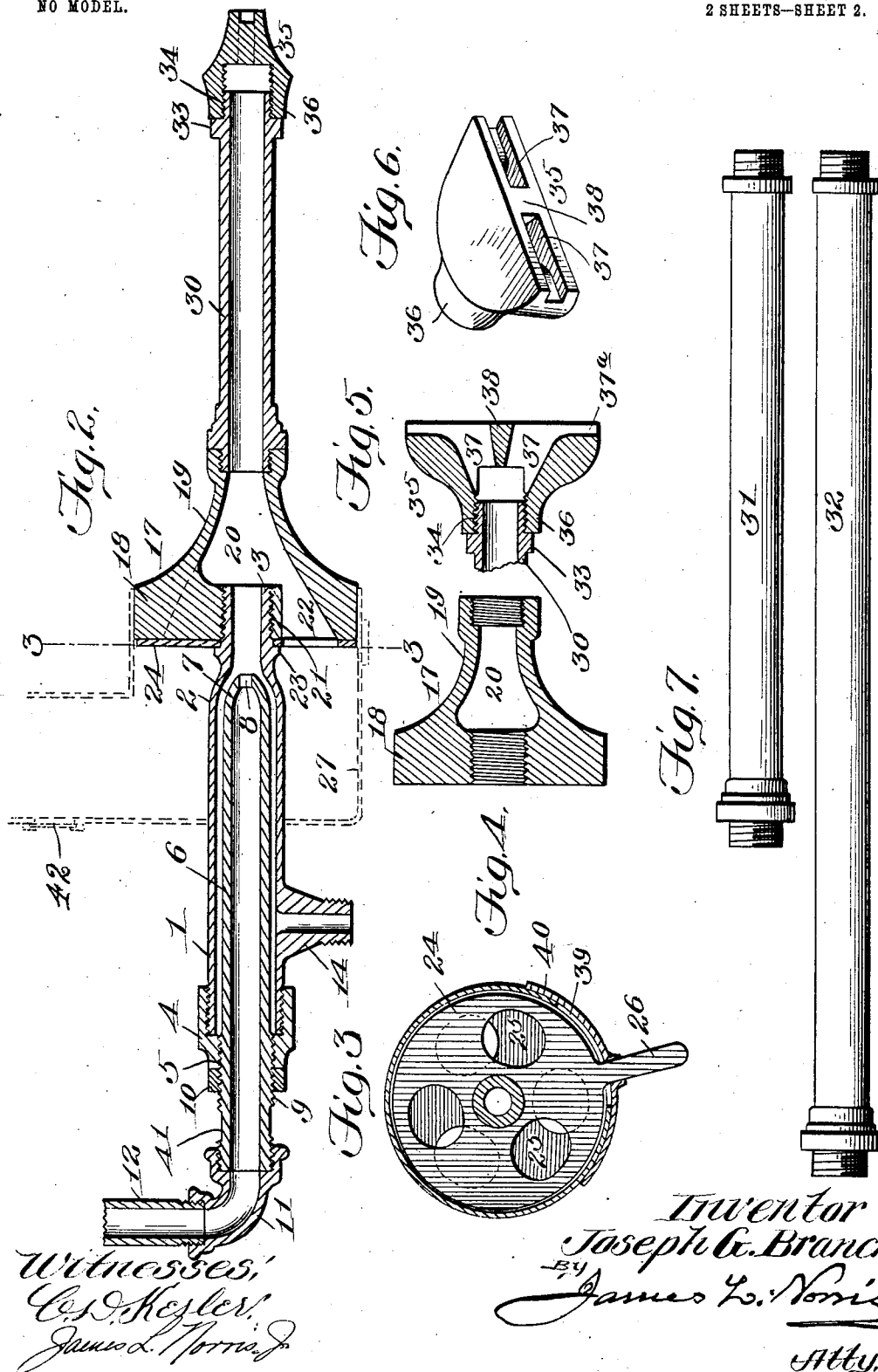
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

JOSEPH G. BRANCH, OF ST. LOUIS, MISSOURI.

VAPOR-BURNER.

SPECIFICATION forming part of Letters Patent No. 762,129, dated June 7, 1904.

Application filed December 3, 1902. Renewed December 15, 1903. Serial No. 185,314. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH G. BRANCH, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented new and useful Improvements in Vapor-Burners, of which the following is a specification.

This invention relates to vapor-burners, and especially to that type of such burners that are disposed in the fire-box of a steam-boiler furnace and which burn oil—such as crude petroleum, for example—in connection with steam or compressed air; and it has for its object to provide an improved burner of the class referred to which will be simple and inexpensive in construction and efficient and economical in operation.

It also has for its object to provide with such a burner interchangeable front nozzles, whereby the burner is adapted to be fitted to boiler-furnaces having different thicknesses of front walls and fire-linings.

It has for a further object to provide improved means for adjusting the parts for controlling the feed of the oil to the burner and for locking the parts in their adjusted position, whereby the adjustment cannot be disturbed by a careless or inefficient engineer or other attendant. It also has for its object to dispense in such a burner with all valves and packings.

It has for another object to provide an improved spreader for spreading the flame in a broad sheet which will extend across the entire area of the combustion-chamber.

Finally, it has for its object to provide novel means for feeding the unconsumed gases and products of combustion from the offtake or smoke-stack to the burner in a heated state and means for conveniently observing same.

To these several ends my invention consists in the features and in the construction, combination, and arrangement of parts hereinafter described, and particularly pointed out in the claims following the description, reference being had to the accompanying drawings, forming a part of this specification, wherein—

Figure 1 is a vertical sectional view of a steam-boiler furnace, showing my improved burner in place. Fig. 2 is an enlarged longi-

tudinal sectional view of the burner. Fig. 3 is a sectional view taken on the line 3 3 of Fig. 2. Fig. 4 is a longitudinal sectional view of a slightly-modified form of the casing forming the mixing-chamber. Fig. 5 is a similar view of the spreader. Fig. 6 is a detail perspective view of the spreader, and Fig. 7 is a detail view of two of the interchangeable front nozzles.

Referring to the drawings, the numeral 1 indicates a cylindrical tube, which is tapered or contracted near its forward end, as at 2, and terminates in a cylindrical nipple 3, which is exteriorly threaded, as shown and for a purpose hereinafter made apparent. On the rear end of the tube 1 is screwed a collar or reducer 4, which is interiorly threaded on its reduced portion, as indicated at 5, and in said threaded portion is screwed a steam or air nozzle 6, which is of less diameter than the tube 1 and is provided with a conical forward end 7, which corresponds in shape to the inner reduced end 2 of the tube 1, and is provided at said conical end with an aperture 8 for the discharge therethrough of the jet of steam or compressed air. On the threaded portion 9 of the nozzle 6 and immediately in rear of the reducer 4 is screwed a lock-nut 10. On the rear end of the nozzle 6 is screwed an elbow 11, to which is connected the pipe 12 for feeding steam or compressed air to said nozzle. In the present instance the pipe 12 is shown as leading from the steam-dome 13 of the boiler and operates to feed steam to the nozzle 6.

On the under side of the tube 1 is formed a nipple 14, to which is connected the oil-supply pipe 15, which is provided with a regulating-valve 16. The oil may be fed to the burner through the pipe 15 by any suitable pressure or by gravity, but preferably by means that will exert at least forty pounds pressure on the oil.

The numeral 17 indicates a casting having an enlarged cylindrical rear end 18 and a tapered front portion 19, the interior of said casting being funnel-shaped, as indicated at 20. The cylindrical portion 18 of the casting is provided centrally with the threaded aperture 21, in which is screwed the threaded end 3 of the

tube 1. Formed in the rear enlarged end of the casting is a plurality of openings 22, which communicate with the funnel-shaped interior 20 of the casting, said portion 20 constituting a mixing-chamber, as will be hereinafter explained.

Formed on the end 3 of the tube 1 in the rear of the screw-threads is a circumferential collar 23, and rotably mounted on said end 3 between the enlarged end 18 of the casting and the collar 23 is a disk 24, provided with apertures 25, which are adapted to register with the ports 22 of the mixing-chamber. Said disk or valve is provided with a radially or laterally projecting handle 26, by means of which said disk may be turned to cover or uncover the ports 22.

Fitted around the periphery of the enlarged portion 18 of the mixing-chamber is a shell or casing 27, which also surrounds the forward portion of the tube 1 and nozzle 6 and extends vertically upward and communicates with the smoke-stack or offtake 28 of the boiler, as indicated at 29. Screwed in the forward end of the mixing-chamber is a tube 30, denominated by me as the "front" nozzle. In practice I provide a plurality of such front nozzles, as 30, 31, and 32, of different lengths, and the outer end of each of said tubes is provided with a circumferential collar 33 and a threaded end 34, and adapted to be screwed on said threaded end is a spreader 35, comprising a flat casting terminating at its rear end in a nipple 36, which is internally threaded for its adjustment to the threaded end 34 of the front nozzle. The spreader is provided with two diverging passages 37, which are separated at the outer end of the spreader by a central core or bridge-piece 38, wedge-shaped in cross-section. Each of said passages 37 is preferably of the same cross-sectional area as the front nozzle 30, and said passages at their outer ends extend laterally outward across the front end of the spreader, as indicated at 37^a and as shown most clearly in Fig. 5 of the drawings. The front nozzle extends through the front wall of the furnace and through the fire-linings, and the rear portion of the burner is supported by the pipe connections. The casing 27 is slotted, as at 39, for the passage therethrough of the handle 26 of the valve, and fitted on said handle is a segment-shaped cover-plate 40, that is disposed over the slot 39 and operates to maintain the said slot closed at all times irrespective of the disposition of the valve.

The operation of my improved device is as follows: Steam is fed from the boiler through the nozzle 6, and oil is fed to the tube 1 by the pipe 15. The steam issuing from the nozzle 6 in the form of a jet acts by suction to draw the oil through the tube 1 and to forcibly eject it through the end 3 of the tube and into the mixing-chamber 17. The steam and oil are thoroughly commingled in said chamber and are forcibly ejected through the front

nozzle 30 and into the fire-chamber through the spreader 35, which operates to spread the flame in a broad sheet over the entire area of the fire-chamber. The vapor as it passes out through the passages 37 expands laterally outward in both directions through the horizontal lateral extensions 37^a of said passages. As the oil and steam are fed into and through the mixing-chamber 17 the gases and unconsumed products of combustion are drawn by suction from the offtake or smoke-stack 28 and are fed by the casing 27 through the ports 22 into the mixing-chamber, where they commingle with the oil and steam and are fed with the latter into the fire-chamber, where they are consumed, thereby adding to the more perfect combustion of the oil by reducing the amount of cold air admitted to the furnace. The quantity of gases thus fed to the burner may be regulated by turning the valve 24 or in case that it is not desired to feed any of said gases to the burner the valve may be entirely closed. The rear end of the nozzle 6 is provided with an unthreaded portion 41, which is adapted to be grasped by a wrench, so that by turning the nozzle 6 in one direction or the other the tapered or conical end of said nozzle may be adjusted toward or from the correspondingly-shaped portion 2 of the tube 1, thereby regulating the relative portions of the steam and oil. After the adjustment has been properly effected in the manner described the lock-nut 10 should be screwed up tightly against the rear end of the reducer 4, thus making it impossible for a careless or inefficient attendant to inadvertently destroy the adjustment.

In practice the thickness of the front walls and fire-linings of furnaces vary greatly, and by providing each burner with a plurality of interchangeable nozzles in the manner before described the burner may be fitted to any boiler-furnace on the market. As shown most clearly in Fig. 2, and as before stated, the front nozzle extends through the front wall and fire-lining of the combustion-chamber and in practice the tube is inserted between the fire-doors. In case it is not desired to feed the gases from the offtake or smoke-stack of the furnace to the burner the casing 27 may be entirely dispensed with, and in such case I also prefer to dispense with the valve 24 and construct the rear end of the mixing-chamber solid, as shown in Fig. 4 of the drawings.

I have described the burner as being connected with the steam-space of the boiler, whereby the steam is fed to the nozzle 6 and is commingled with the oil; but it will be manifest to those skilled in the art that instead of feeding steam to the burner, as described, compressed air may be employed for the same purpose or the steam may be taken from an auxiliary boiler.

In some types of boilers it may be desired to feed a round flame under the boiler-tubes

instead of the broad flat sheet, as hereinbefore described, and in such cases it is merely necessary to unscrew the spreader 35 from the end of the nozzle and the flame will then be ejected from said nozzle in the shape of a long drawnout stream.

I prefer to provide the casing 27 with a peep-hole 42, covered with mica or other suitable non-combustible transparent material, by means of which the boiler attendant or engineer is able to discern the amount of smoke, if any, issuing from the stack. Of course this will indicate to him more definitely how perfect is the combustion being obtained in the furnace without the necessity of going outside to observe the top of the stack or opening the fire-doors of the furnace to obtain a better view. It will also enable him to discern more readily the amount of unconsumed gases and affords an easy access to the stack should it be desired to take the temperature or analyze the chimney-gases.

By means of my improved burner either coal or oil may be employed without altering any part of the furnace, and, furthermore, in using my improved burner no target or bridge-wall is necessary, thereby avoiding the concentration of the heat toward the front end of the boiler, a great objection to the present burners on the market. I am enabled to do away with the target or bridge-wall or a wall of any description whatsoever, by reason of the perfect combustion obtained by the use of my improved burner and by the even distribution of the heat obtained by my improved spreader and the setting and adjustment of the burner outside the furnace.

Having thus described my invention, what I claim is—

1. In a vapor-burner, the combination with a mixing-chamber, of means for feeding oil and air or steam thereto, a nozzle fitted to the discharge end of the mixing-chamber, and a spreader fitted on the end of the nozzle, said spreader having two oppositely-extending passages communicating at their outer ends with oppositely and laterally projecting channels, substantially as described.

2. In a vapor-burner, the combination with a mixing-chamber, and means for feeding oil and air or steam thereto, of a nozzle fitted in the discharge end of the mixing-chamber, and

provided at its extremity with a spreader comprising a hollow casting having two diverging passages separated by an intervening wedge-shaped core or bridge-piece and two oppositely and laterally extending channels formed in the end of the spreader and communicating, respectively, with said passages, substantially as shown and described.

3. In a vapor-burner, the combination with a mixing-chamber, of means for feeding oil and air or steam thereto, a nozzle fitted to the discharge end of the mixing-chamber, and a spreader mounted on the free end of the nozzle and comprising a flat metallic casting provided with two diverging passages each of which is at least of the same cross-sectional area as the area of the nozzle, and a core or bridge-piece separating said passages, substantially as described.

4. In a vapor-burner, the combination with a mixing-chamber, of means for feeding oil and air or steam thereto, a nozzle fitted to the discharge end of the mixing-chamber, a spreader mounted on the free end of the nozzle and comprising a flat metallic casting provided with two diverging passages each of which is at least of the same cross-sectional area as the area of the nozzle, and a wedge-shaped core or bridge-piece separating said passages, substantially as described.

5. The combination with a steam-boiler and its furnace, of a nozzle projecting through the front of the furnace, a mixing-chamber apertured at its rear end and fixed on the rear end of said nozzle, an injector fitted in the rear end of the mixing-chamber and arranged to inject into said chamber the mixture of oil and air or steam, a casing surrounding the mixing-chamber and injector and leading to the furnace-offtake for conveying the unconsumed products of combustion from the off-take to said mixing-chamber, and a valve controlling the apertures in the rear end of the mixing-chamber for regulating the admission of said unconsumed gases to the mixing-chamber, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOSEPH G. BRANCH.

Witnesses:

CHRISTIE S. GOSHERT,
D. H. DAIDLEY.