

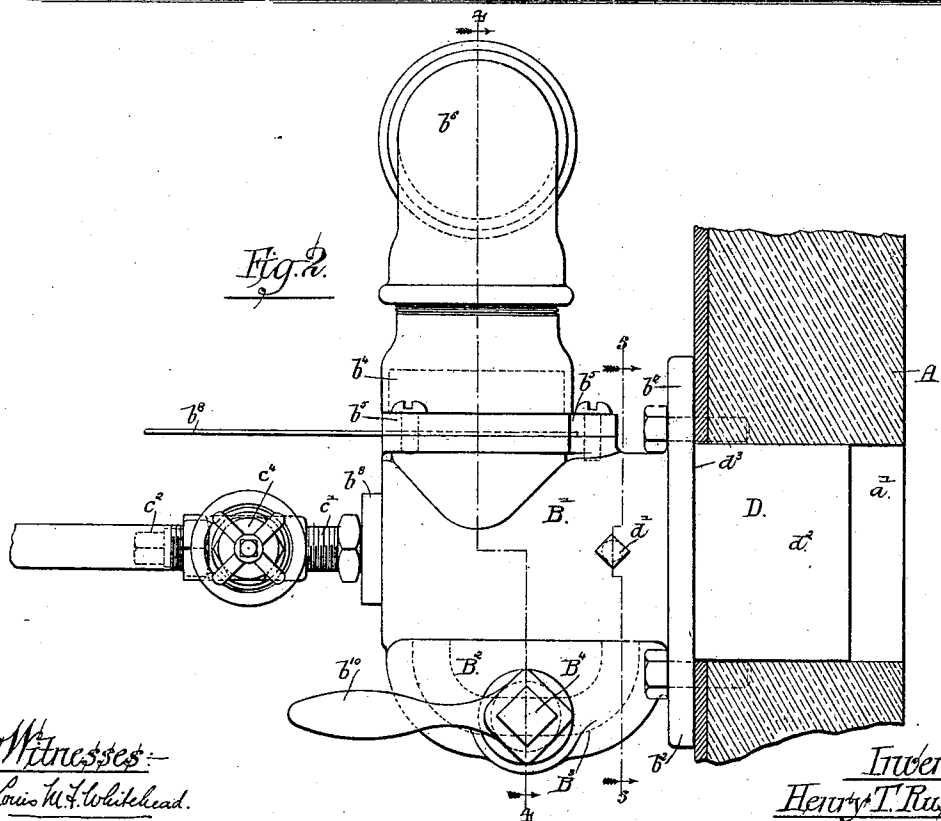
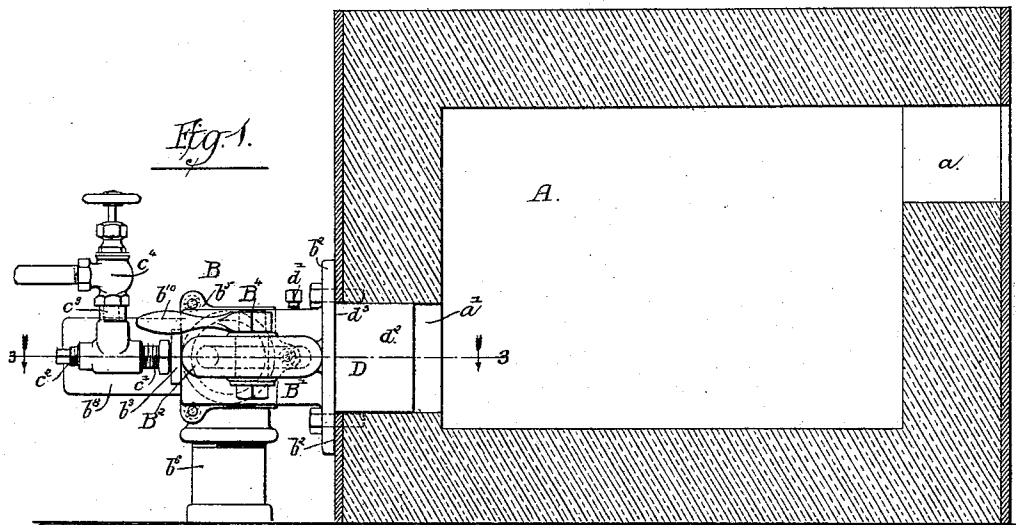
(No Model.)

2 Sheets—Sheet 1.

H. T. RUSSELL.  
HYDROCARBON BURNER.

No. 471,721.

Patented Mar. 29, 1892.



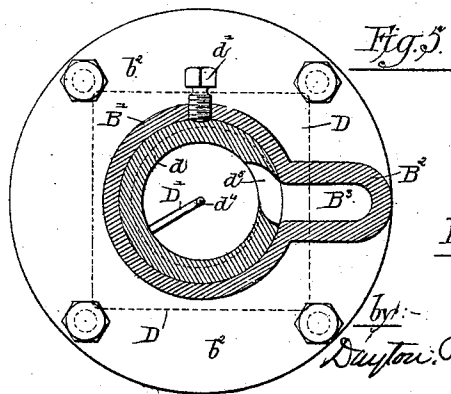
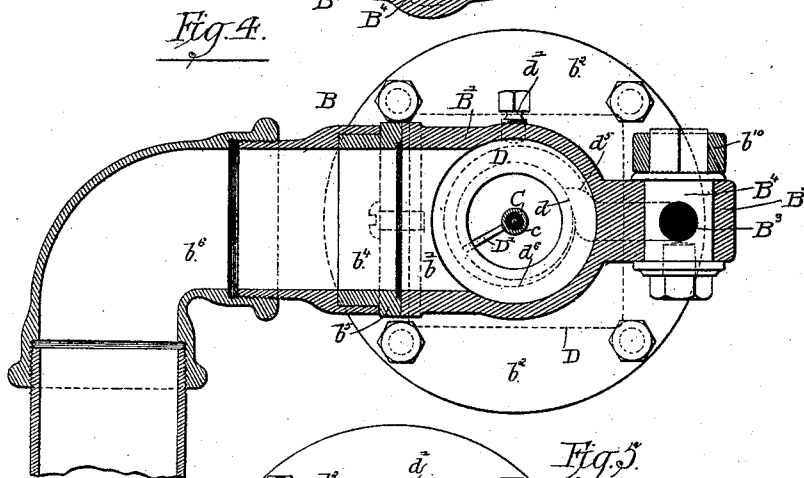
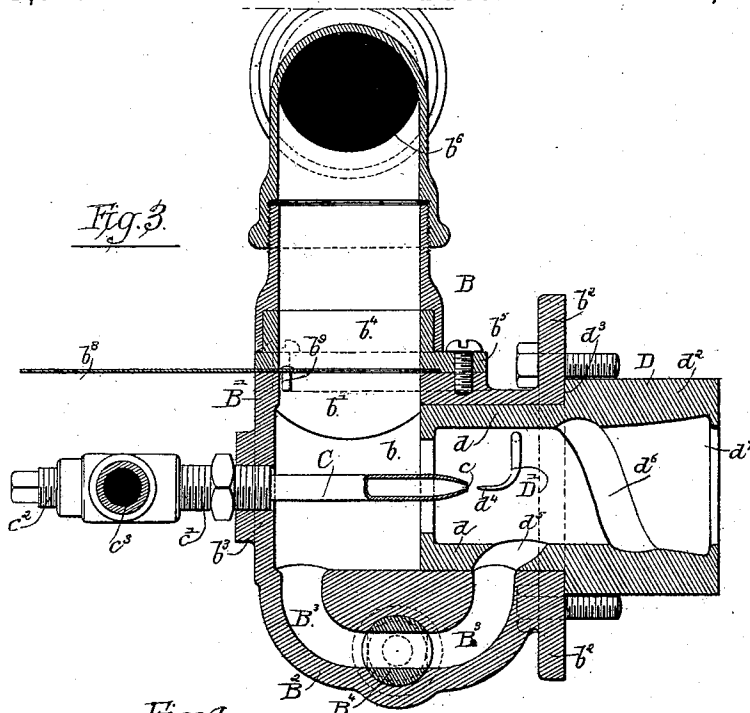
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# UNITED STATES PATENT OFFICE.

HENRY T. RUSSELL, OF CHICAGO, ILLINOIS.

## HYDROCARBON-BURNER.

SPECIFICATION forming part of Letters Patent No. 471,721, dated March 29, 1892.

Application filed April 17, 1890. Serial No. 348,379. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY T. RUSSELL, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Hydrocarbon-Burners; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to a novel construction in burners for hydrocarbons or volatile oils; and it consists in the features of construction and combination of parts hereinafter fully described, and pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a view in side elevation of a burner constructed in accordance with my invention and shown as applied to a forge or furnace, said furnace being shown in vertical section. Fig. 2 is a plan view of the burner and showing a portion of the furnace. Fig. 3 is a central vertical longitudinal sectional view of the burner, taken on the line 3 3 of Fig. 1. Fig. 4 is a view in cross-section taken on the indirect line 4 4 of Fig. 2. Fig. 5 is a view in cross-section taken on the line 5 5 of Fig. 2.

In said drawings, A indicates a combustion-chamber, within which combustion of the fuel takes place, and which is herein shown as constituting a furnace or forge adapted for use in heating metal for forging, the wall being provided with an opening *a*, through which the metal to be heated is inserted into the combustion-chamber.

B indicates as a whole the oil-burner or device for delivering an admixture of air and atomized or vaporized oil to the interior of the combustion-chamber through an opening or aperture *a'* in the wall of the furnace. The said burner B consists in its main part of a tubular body, which is preferably made in two parts, to wit: of a casing B', having a chamber *b*, which is open at the inner or front end of the casing, and an inner nozzle-section D, which projects beyond the casing B' and extends into or through the wall of the combustion-chamber. Said casing B' is provided with a lateral air-inlet opening *b'* near the rear or outer end of said casing, and the in-

ner or front end of said casing is provided with a flange *b*<sup>2</sup>, by means of which the said casing can be secured to the wall of the furnace.

C indicates a nozzle or oil-pipe located centrally within the chamber *b* and conveniently sustained in the rear wall *b*<sup>3</sup> thereof. The said nozzle C extends into the chamber *b* to a point beyond the side opening *b'* and is provided with a small opening *c*. The said nozzle C passes through the said rear wall of the chamber and is connected with a short pipe *c'*, which is closed at its outer end by means of a plug *c*<sup>2</sup> and which is connected with a supply-pipe *c*<sup>3</sup>, arranged at right angles with the pipe *c'*. By removing the plug *c*<sup>2</sup> the interior of the nozzle C may be reached by means of a straight tool for cleaning the same. The supply-pipe *c*<sup>3</sup> is connected with a suitable source supplying oil, and is provided with a suitable regulating-valve *c*<sup>4</sup> for controlling the supply of oil to the nozzle.

The nozzle-section D is provided with a rearwardly-extending portion *d*, fitting the opening in the end of the casing B', and which is engaged by a bolt or screw *d'*, passing through a perforation in the walls of the casing for holding said parts together. The external portion *d*<sup>2</sup> of said nozzle-section has a greater diameter than the bearing portion *d*, thereby forming a shoulder *d*<sup>3</sup> between said parts, which rests against the flange *b*<sup>2</sup> when said burner is in position.

D' indicates a pin secured to the interior of the burner-piece and having a pointed end *d*<sup>4</sup> located immediately in front of and in line with the opening *c* in the nozzle C, said pin serving to divide and separate the stream of oil as it issues from the said nozzle. The oil issuing from said opening with considerable force and coming in contact with said pin, is in practice broken up or atomized by it, and is projected into and through the nozzle-section in a finely-divided or atomized state.

Air for supporting combustion is supplied through the side opening *b'* of the chamber *b*.

*b*<sup>4</sup> indicates a coupling-piece provided with a flange *b*<sup>5</sup> on three sides thereof, through which flange *b*<sup>5</sup> are inserted bolts or screws for securing the said coupling-piece to the casing B'. Attached to said coupling *b*<sup>4</sup> is an air-duct *b*<sup>6</sup>, communicating with a source

supplying air under pressure. Air supplied by the pipes  $b^6$  is delivered to the chamber  $b$  around the base of the nozzle C, and passes from said chamber  $b$  through the interior of the nozzle-section D, and thus supplies air to support combustion of the oil issuing from the nozzle C. A gate  $b^8$  is adapted to fit and slide in a suitable guide formed between the casing B' and coupling  $b^4$ , which may be opened to a greater or less extent to regulate the supply of air to the combustion-chamber.

$b^9$  indicates a pin or projection, which serves to limit the outward movement of the gate  $b^8$ .

The casing B' is provided conveniently at its side opposite that at which the supply-pipe  $b^6$  is located with a laterally-extending portion B<sup>2</sup>, which extends from the rear end of the chamber  $b$  to a point near the forward end thereof, and is provided with a passage B<sup>3</sup>, leading from the rear portion of the chamber  $b$  forwardly to a point in front of the nozzle C. The passage B<sup>3</sup> is extended through the rearward extension  $d$  of the burner-piece by means of an opening  $d^5$ , formed in said bearing portion  $d$  adjacent to the forward end of the passage B<sup>3</sup> and communicating therewith. The said opening  $d^5$ , leads obliquely from the forward end of the passage B<sup>3</sup> and communicates with a spirally-arranged groove  $d^6$ , formed in the interior of the burner-piece D. The said spiral groove  $d^6$  is conveniently made to pass around the interior of the burner-piece about one and a half times. The said nozzle-section is provided interiorly at its forward end with an inwardly-projecting annular flange  $d^7$ .

B<sup>4</sup> indicates a suitable stop-cock or valve, located in the passage B<sup>3</sup> and provided with a handle  $b^{10}$  for turning the same. Said stop-cock B<sup>4</sup> serves to limit the supply of air to the burner-piece in an obvious manner.

It follows from the construction of the burner-piece above described—that is to say, the spirally and tangentially arranged perforation  $d^5$  leading from the passage B<sup>3</sup> and the spiral groove  $d^6$ —that the air admitted to the burner-piece through the said passage will be given a spiral or rotary motion in consequence thereof.

The operation of my invention is as follows:

In the drawings I have shown, for example, the parts in the positions they will assume when the burner is in operation—that is to say, when the oil is being supplied to the nozzle C and the air is being supplied through the coupling  $b^4$  to the chamber  $b$  directly to the burner-piece and also through the passage B<sup>3</sup> from the chamber  $b$  to the burner-piece. The oil in escaping from the small aperture in the end of the nozzle comes in contact with the pointed end  $d^4$  of the pin D', and is thereby broken up or divided, owing to the force with which it issues from the said nozzle, and is carried with the air-current from the air-pipe  $b^3$  through the nozzle-section in an atomized state. The stop-cock B<sup>4</sup> being open, a portion of the air in the chamber  $b$ , which is supplied thereto under con-

siderable pressure by any convenient means for this purpose, passes from the said chamber  $b$  through the passage B<sup>3</sup>, the perforations  $d^5$  in the burner-piece, and into the interior of said burner-piece. The said air simply issuing from the spiral perforation  $d^5$ , passes along the spiral groove  $d^6$  in the interior of the burner-piece, and is given thereby a whirling or rotary motion, producing a thorough commingling of the air with the atomized oil. Combustion takes place as the admixture of atomized oil and air is delivered from the nozzle or while within the same. Preferably the air delivered through the duct  $b^6$  is heated, so as to aid in the evaporation of the oil and to promote rapid combustion of the same.

In practice it is found that owing to centrifugal action due, to the rapid spiral motion given the atomized oil within the nozzle-section, the larger or heavier particles thereof may be thrown against the walls of the section, and in such case will come into contact with the flange  $d^7$  at the end of the nozzle-section and will be arrested thereby. It is thus obvious that in the absence of such flange some particles of oil might issue from the mouth of the burner-piece without burning; but by being stopped by said flange such particles will remain on the inner surface of the nozzle-section until vaporized and carried away by the current of hot air passing therethrough. The nozzle-section D, by reason of the intense heat to which it is subjected, often becomes destroyed or "burned out;" but by making it in a separate piece, as shown, it can be readily removed from the burner and a new one substituted.

It will of course be understood that the relative quantity of air delivered through the main air-passage and the branch passage B<sup>3</sup> may be regulated or controlled by the valve B<sup>4</sup> and that the air-supply will be controlled by the gate-valve  $b^8$ , so as to obtain a flame of a desired character, according to the work to be done—as, for instance, when used for a boiler-furnace a flame of great length and volume will be desired—while in the case of a forge—such as is shown in the accompanying drawings—the flame need not be of greater volume than will fill the combustion-chamber.

I claim as my invention—

1. An oil-burner comprising a tubular casing open at its discharge end, an oil-nozzle placed within said casing, a pin having a pointed end located directly in front of and in close proximity to said nozzle, a main air-supply, and an auxiliary air-passage, the latter supplying air under pressure to the casing in front of the nozzle, substantially as described.

2. An oil-burner comprising a tubular casing open at its discharge end, an oil-nozzle placed within said casing, a pin having a pointed end located directly in front of and in close proximity to said nozzle, a main air-supply, and an auxiliary air-passage, the lat-

ter supplying air under pressure to the casing and opening thereinto in front of both nozzle and pin.

3. An oil-burner comprising a tubular casing open at its discharge end, an oil-nozzle located therein, a pin having a pointed end located in front of and adjacent to said nozzle, a main air-supply, an auxiliary air-passage, the latter supplying air to said casing in front of the nozzle, and means for giving rotary or spiral motion to the air within the casing, substantially as described.

4. An oil-burner comprising a tubular casing having an inwardly-projecting flange at its forward end, an oil-nozzle placed therein, a main air-supply, an auxiliary air-passage, the latter supplying air to said casing in advance of the nozzle, and means for giving rotary or spiral motion to the air within the casing, substantially as described.

5. An oil-burner comprising a tubular casing having an inwardly-projecting annular flange at its forward end, an oil-nozzle located therein, an air-passage supplying air under pressure to said casing, means giving rotary or spiral motion to the air within the casing, and a pin having a pointed end located in front of said nozzle.

6. An oil-burner comprising a tubular casing, an oil-nozzle located therein, a removable burner-piece located in one end of said casing, and a pin having a pointed end secured to said burner-piece and having said pointed end located in front of said nozzle, the outer part of said casing being stationary and the inner part removably secured thereto, substantially as described.

7. An oil-burner comprising a tubular casing open at its discharge end, an oil-nozzle located therein, a pin having a pointed end located in front of said nozzle, a pipe or passage supplying air to said casing in the rear of the

point of said nozzle, and an auxiliary pipe or passage supplying air under pressure and communicating tangentially with said casing in advance of the nozzle.

8. An oil-burner comprising a tubular casing divided into two chambers or compartments by an apertured partition, an oil-burning nozzle located in the inner or forward compartment, an air-supply pipe or passage communicating with the rear or outer compartment, and an air-supply pipe communicating with the said inner or forward compartment, substantially as described.

9. An oil-burner comprising a tubular casing divided into two compartments by an apertured partition, an oil-burning nozzle located in the inner or forward compartment, a pipe or passage for supplying air communication with the outer or rear compartment, and a pipe or passage leading from said outer compartment and communicating with the inner compartment at one side thereof, substantially as described.

10. An oil-burner comprising a tubular casing divided into two compartments by an apertured partition, an oil-burning nozzle located in the inner or forward compartment, a pipe or passage for supplying air communication with the outer or rear compartment, a pipe or passage leading from said outer compartment and communicating with the inner compartment at one side thereof, and a valve in said pipe or passage, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

HENRY T. RUSSELL.

Witnesses:

M. E. DAYTON,  
CHARLES T. BROWN.