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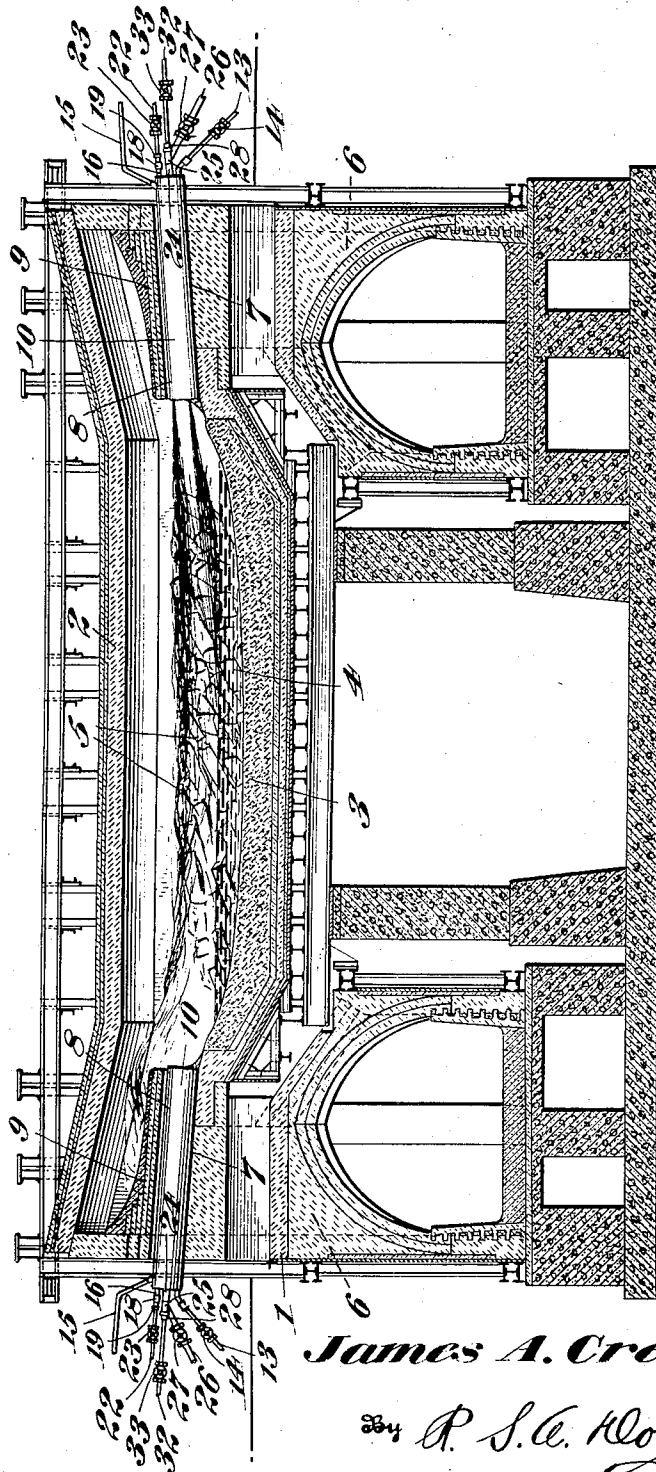
J. A. CREIGHTON

2,233,916

BURNER

Filed Nov. 22, 1938

2 Sheets-Sheet 1



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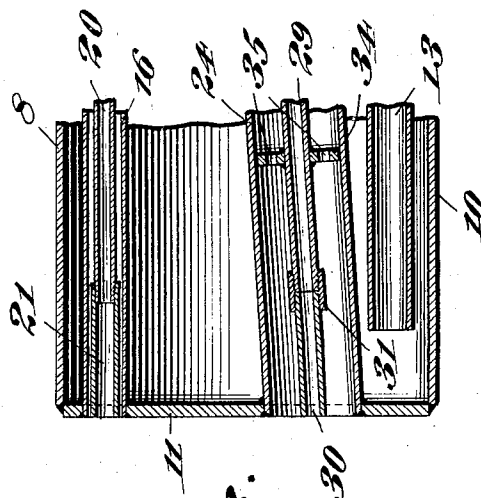
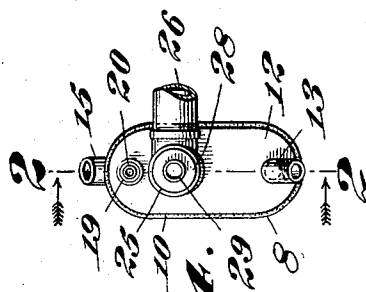
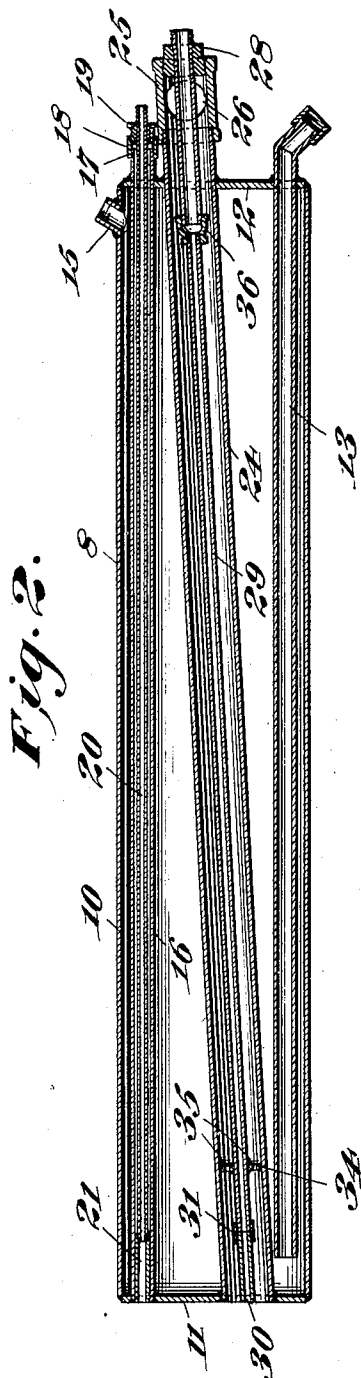
J. A. CREIGHTON

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BURNER

Filed Nov. 22, 1938

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,233,916

BURNER

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Application November 22, 1938, Serial No. 241,601

7 Claims. (Cl. 153-11)

My invention relates to burners for introducing liquid and gaseous fuels into furnaces, and more especially relates to means for introducing fuels into high temperature furnaces, such as open hearth furnaces for melting scrap and the like in the production of steel, and also other high temperature furnaces, in which it is necessary to provide water-cooled jackets through which the fuels are introduced into the melting or heating chambers.

When burners are used in heating open hearth reversing furnaces which have a regenerator at opposite sides of the furnace a burner is located at each end of the furnace. When the burner at one end of the furnace is in operation the burner at the other end of the furnace is shut off. In this manner the flame then passes over the bath and the waste gases of combustion therefrom pass downwardly through the uptakes and through a regenerator at that side of the furnace thereby heating the same, and then pass to the stack.

As the incoming cool air passing through the regenerator for the burner in operation soon cools the regenerator at that side of the furnace this burner is shut off and the other burner opened, and the operation is reversed, all of which is well known in this art.

Heretofore when burners have been used for heating furnaces of this type, it has been the usual practice to have a burner with a single jet at each end of the furnace which had to be adjusted at times to direct the flame at a proper angle over the furnace hearth, which in the case of large furnaces and long burners is not easily accomplished mechanically.

One of the objects of my invention is to provide a burner which is water-cooled and can be set in a fixed position in the furnace and thereby avoid the necessity of adjusting the burner. With this object in view the burner is formed with two oil inlet jet pipes, one of which is parallel to the tubular longitudinally extending wall of the water jacket of the burner and the second is placed in the same vertical plane at an inwardly extending diverging angle to the first, so that with any desired setting of the burner in the furnace the oil stream may be directed at two different angles with respect to the center line of the burner without vertical adjustment of the burner during its operation.

The advantage of having a burner with the two oil jets set at different angles is that the burner can be set at a fixed position and when melting down scrap the oil is delivered through

the top jet with the flame directed against the piled scrap in the furnace. After the scrap is melted, the oil may be shut off in the top jet and admitted to the lower jet, which due to its angularity to the first directs the flame so that it sweeps across the bath. I may however in some cases use both of the jets at the same time. Another advantage is that the scrap can be distributed more evenly across the hearth of the furnace, that is, more scrap can be piled in the end doors of the furnace adjacent to the burners since the flame when using the top jet is directed high enough so that it will not impinge upon the scrap near it.

My burner is designed to include an additional pipe for coke oven gas or the like in combination with a liquid in the lower jet. This could also be used with the upper jet if desired. However, the application could be used for a straight oil or gas burner as well as a combination oil and gas burner and could be used on any liquid fuel fired furnaces.

Another object of my invention is to provide means for mounting the oil burner pipes in the upper and lower tubes so they can be easily and quickly removed when they burn out or become defective and new oil burner pipes inserted in place thereof.

Other objects of my invention will hereinafter appear.

Having thus given a general description of the advantages of my invention, I will now in order to make the same more clear refer to the annexed two sheets of drawings forming a part of this specification and in which like characters of reference indicate like parts:

Figure 1 is a longitudinal section taken centrally through an open hearth furnace illustrating the application of my invention;

Fig. 2 is a longitudinal section through the burner taken on the line 2-2 of Fig. 4;

Fig. 3 is a vertical section of the end portion of the burner shown in Fig. 2 but drawn on a larger scale; and

Fig. 4 is a rear end elevation of the burner.

Referring now to the various characters of reference on the drawings, the numeral 1 designates an open hearth furnace as a whole, 2 the roof, 3 the hearth, 4 the bath and 5 the scrap in the furnace to be melted resting on the hearth. Each end of the furnace is provided with the usual air uptakes 6 communicating with the regenerators (not shown) through which the heated air is received for the burner in operation or the waste gases are discharged from the

combustion chamber. An opening 7 is formed in each end of the furnace for the reception of a burner 8 which preferably has a hood 9 of refractory material extending over the burner.

As each of these burners are of the same construction a description of one will apply to both.

The burner has an outer casing 10 formed of a standard pipe which is flattened to form an oval tubular shaped member as indicated in Figure 4, and closed at the front and rear ends by means of plates 11 and 12, respectively, to form a water jacket for the circulation of water which may be supplied through a water inlet pipe 13 having a controlling valve 14 and withdrawn through an outlet pipe 15.

Extending through the upper portion of the water jacket in parallel relation with the side wall is a tube 16 which extends through the end plates 11 and 12 and is welded thereto. The rear end of the tube 16 extends beyond the rear end plate 12 and is screw threaded as at 17 to receive a coupling 18 which has a bushing 19 threaded therein for supporting the rear end of the oil burner pipe 20. This oil burner pipe 20 extends through the tube 16 and is provided with a removable nozzle at its front end as at 21, while the rear end is threaded and coupled to an oil supply pipe 22, controlled by means of a valve 23. Beneath the tube 16 in vertical alignment therewith, but at an angle thereto, is a somewhat larger tube 24 which extends through the end plates 11 and 12 and is welded thereto and adapted to form a gas burner. The rear end of the tube 24 extends beyond the rear wall 12 and is threaded to receive a T-coupling 25 which is coupled to a gas supply pipe 26, the supply of which is controlled by means of a valve 27. The rear end of the T-coupling is threaded to receive a bushing 28 for supporting the rear end of an oil burner pipe 29. This oil burner pipe 29 extends through the tube 24 and is provided at its front end with a removable nozzle 30 secured to the pipe 29 by means of a coupling 31, while the rear end of the oil burner pipe 29 is threaded in the bushing 28 and extends beyond the same and is coupled to an oil supply pipe 32, the supply of which is controlled by means of a valve 33. As the gas burner tube 24 is considerably larger than the inner oil burner pipe 29, said inner pipe 29 is held centrally therein by means of a spacing plate 34 having perforations formed therein as at 35 for the gas to pass through.

As the front end portion of the oil burner pipe 29 is subjected to intense heat and may have to be replaced often, I may form the rear end of the pipe of a separate length of larger section and connect the parts together by means of a coupling 36 as shown in Figure 2 of the drawings.

It will be noted that by mounting the oil burner pipes 20 and 29 in the tubes 16 and 24 in the manner shown and described, they can be easily and quickly removed when they burn out or become defective and replaced by new oil burner pipes when required. All that is necessary for this operation is to disconnect the oil supply pipes 22 and 32 and then unscrew the bushings 19 and 28 and the oil burner pipes 20 and 29 can then be removed from the rear end of the burner.

With my invention the burners can be installed in the furnace in a fixed position and the oil stream and flame may be directed at two different angles with respect to the center line of the burner; this avoids vertical adjustment of the

burner during its operation which in the case of large furnaces and long burners is not easily accomplished mechanically.

For illustration I have described my invention as a combination oil and gas burner particularly adapted for use in an open hearth furnace, but I wish it understood that it may be used with other kinds of furnaces equally as well and I may use tar or any other desirable liquid fuel instead of oil and use it with or without gas or gas entirely if I so desire.

Although I have shown and described my invention in considerable detail, I do not wish to be limited to the exact and specific details shown and described, but may use such substitutions, modifications or equivalents thereof, as are embraced within the scope of my invention or as pointed out in the claims.

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

1. The combination with a furnace of the class described having a combustion chamber, a burner unit comprising a plurality of tubes arranged at an inwardly diverging angle to each other extending into the combustion chamber, a liquid fuel burner pipe in each tube, and an outer casing for supporting the tubes in fixed relation to each other.

2. The combination with a furnace of the class described having a combustion chamber, a burner extending into the combustion chamber comprising a pair of tubes arranged in spaced relation one above the other, one of said tubes being disposed at an inwardly diverging angle to the other, a liquid fuel burner pipe in each tube, and a water jacket surrounding the tubes and secured thereto for supporting the tubes in fixed spaced relation to each other.

3. The combination with a furnace of the class described having a combustion chamber, a burner extending into the combustion chamber comprising an outer casing, an end plate welded to each of the front and rear ends respectively of the outer casing, a pair of tubes one arranged at an inwardly diverging angle to the other within the outer casing and extending through the end plates and welded thereto, a removable oil burner pipe extending through each of the tubes and secured thereto, and means for circulating a cooling fluid around the tubes within the outer casing.

4. The combination with a furnace of the class described having a combustion chamber, a burner extending into the combustion chamber comprising a water jacket, a pair of liquid fuel burner pipes arranged one above the other in inwardly diverging spaced relation within the water jacket, a gas burner tube surrounding one of the liquid fuel burner pipes in spaced relation therewith, and a removable bushing secured to the rear end of the gas burner tube for supporting the rear end of the liquid fuel burner pipe in the gas burner tube.

5. The combination with a furnace of the class described having a combustion chamber, a burner extending into the combustion chamber comprising a pair of tubes arranged in spaced relation at an inwardly diverging angle to each other, an outer casing surrounding the tubes, end plates secured to the ends of the outer casing and the tubes for supporting the tubes, an oil burner pipe mounted in each of the tubes, and a removable

bushing secured to each of the tubes for holding the oil burner pipes in position.

- 5 6. The combination with a furnace of the class described having a combustion chamber, a burner extending into the combustion chamber comprising a pair of tubes arranged one above the other in spaced relation, an outer tubular casing having end plates welded thereto forming a water jacket surrounding and supporting the tubes, 10 said upper tube extending parallel with the longitudinal side wall of the tubular outer casing and the lower tube being of larger diameter and adapted to form a gas burner extending at an inwardly diverging angle to the upper tube, an 15 oil burner pipe extending through each of the tubes, a removable bushing secured to the rear end of each of the tubes for holding the oil burner pipes in position, and means for circulat-

ing a cooling fluid around the tubes in the water jacket.

7. The combination with a furnace of the class described having a combustion chamber, a burner extending into the combustion chamber comprising a pair of liquid fuel burner pipes arranged one above the other in inwardly diverging spaced relation, a gas burner pipe of larger diameter surrounding and in spaced relation with one of the liquid fuel burner pipes, a tube surrounding 10 the other liquid fuel burner pipe, an outer casing having end plates welded thereto forming a water jacket for surrounding and supporting the tubes and means for supporting the liquid fuel burner pipes independent of the outer casing. 15

JAMES A. CREIGHTON.