Jan. 27, 1925. 1,524,397

A. JONES

SMELTING FURNACE

Filed Oct. 2, 1922 5 Sheets-Sheet 1

Fig.1.

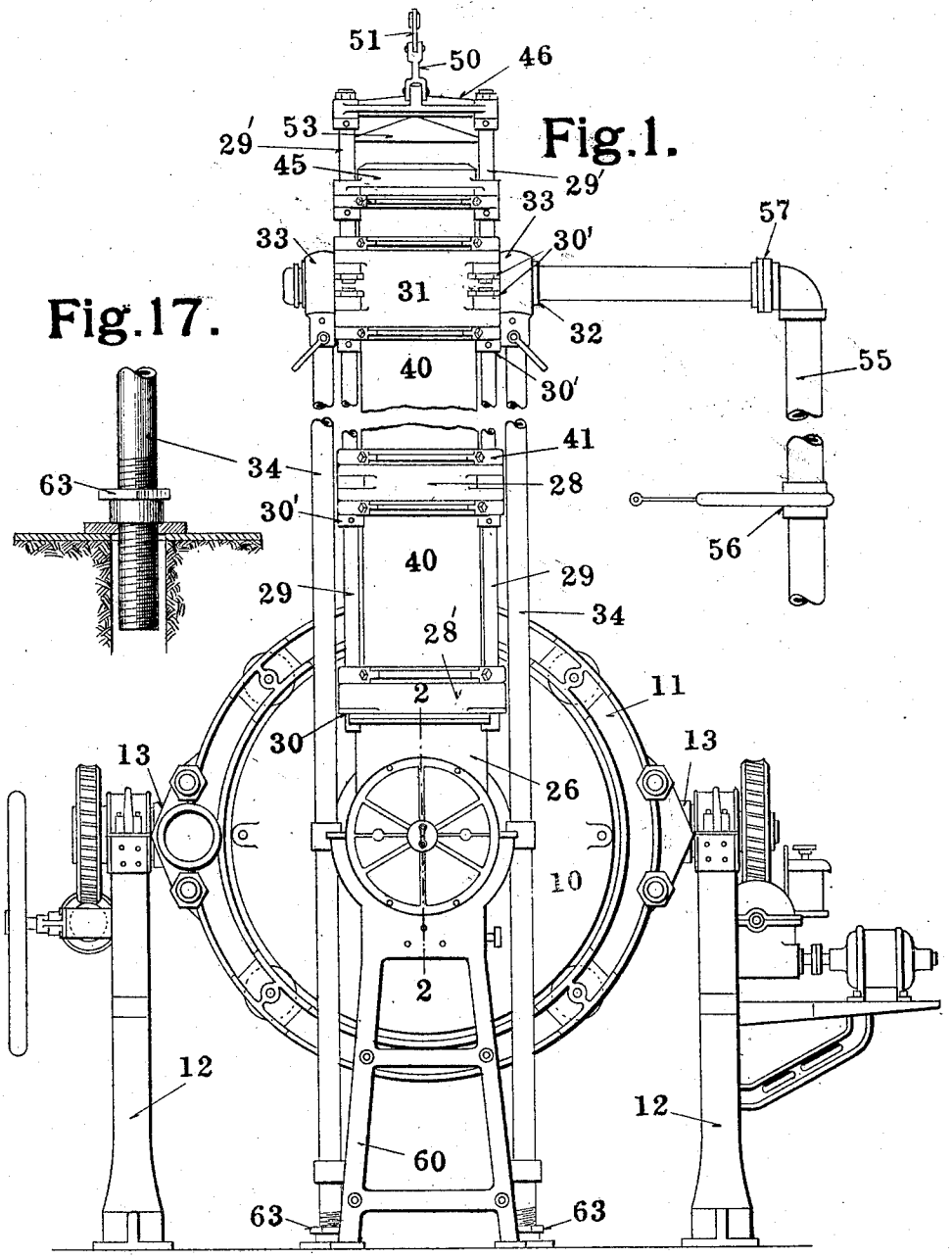


Fig.17.

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Fig.2.

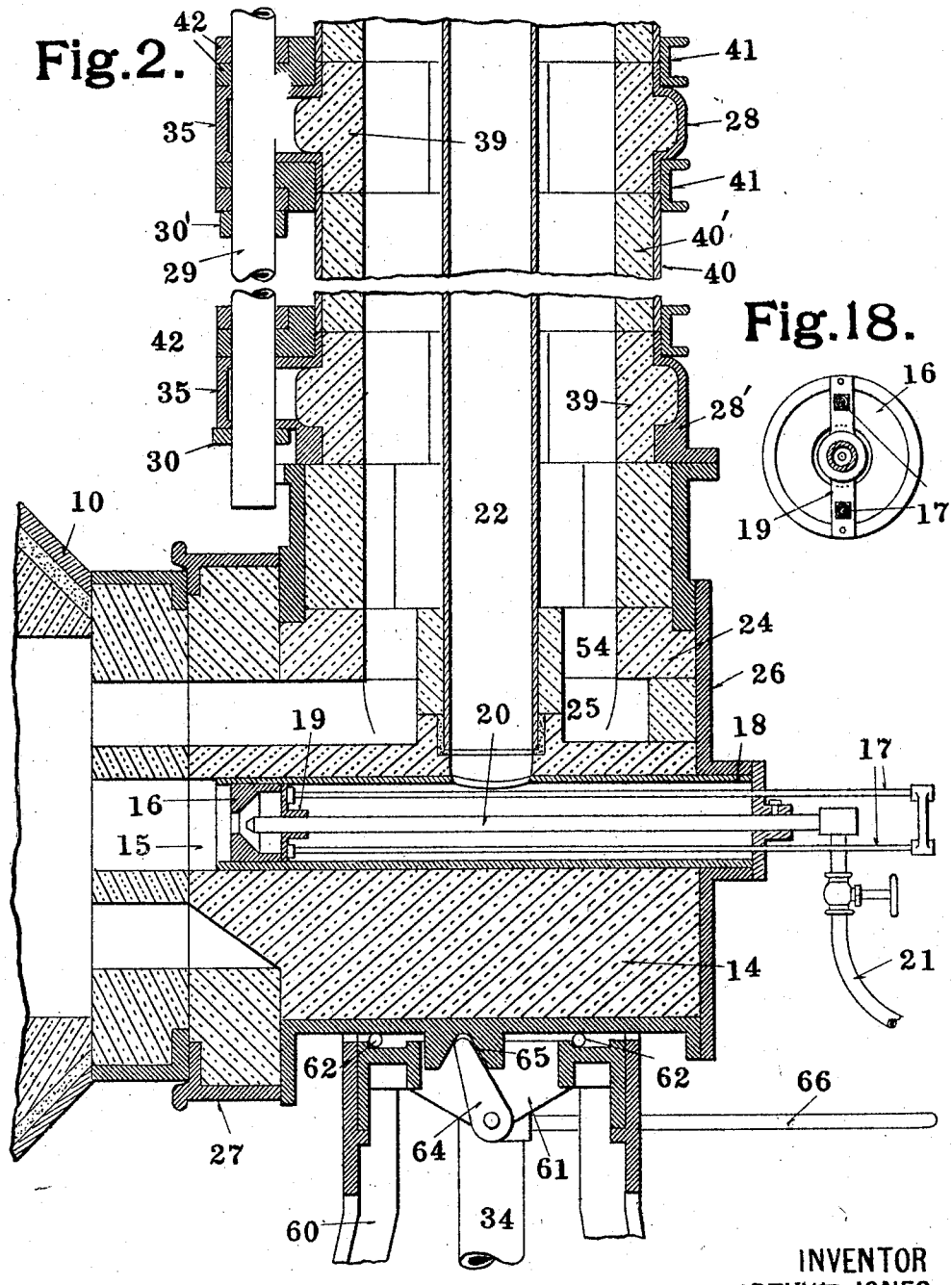


Fig.18.

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Fig.3.

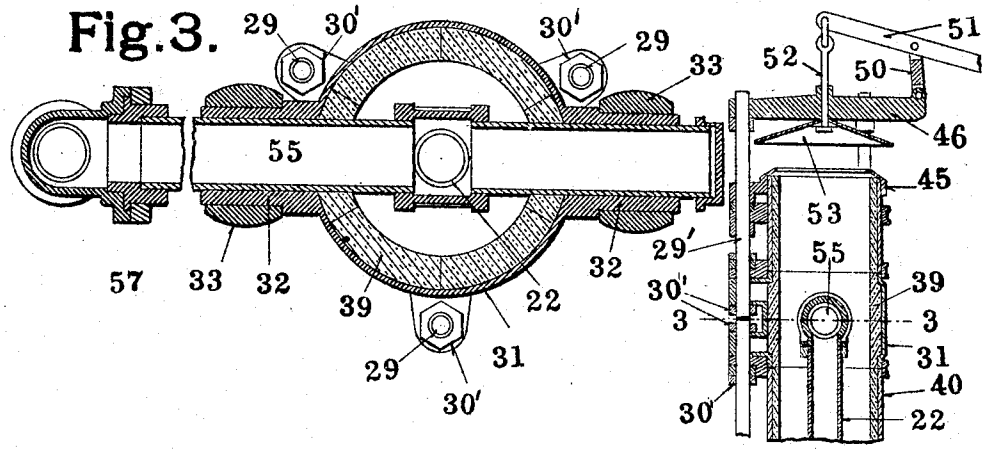
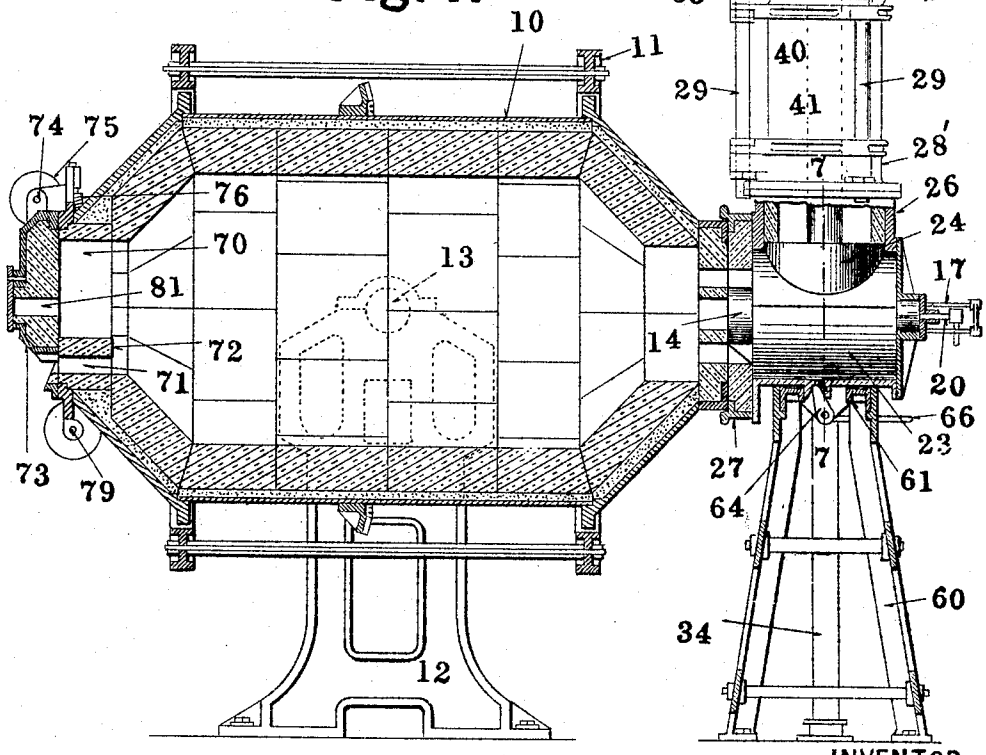


Fig.4.



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Fig.5.

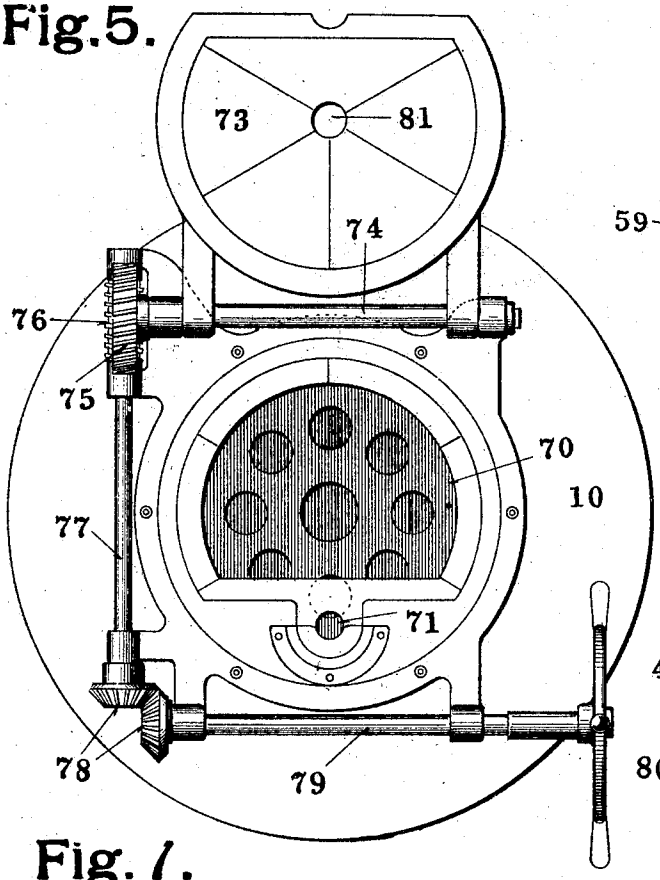
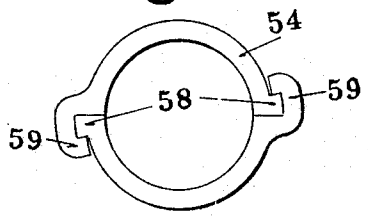


Fig.6.



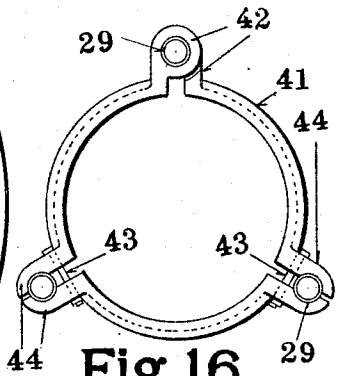


Fig.16.

Fig.8.

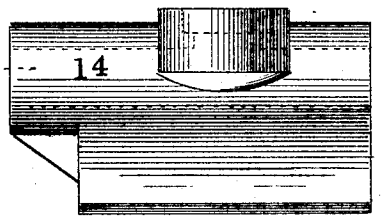
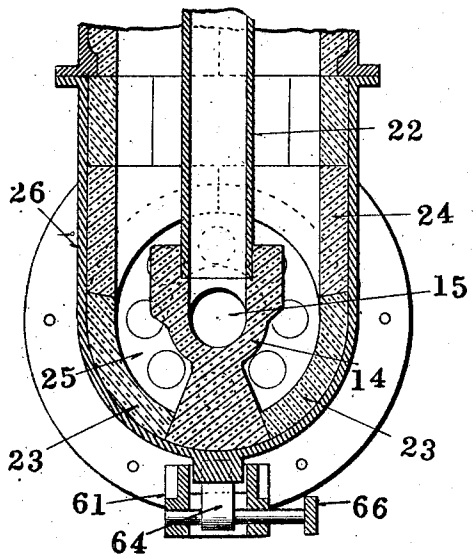


Fig. 1.



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Fig.9.

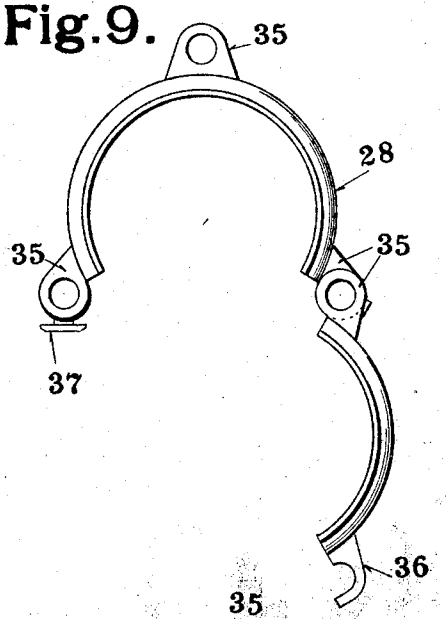


Fig.10.

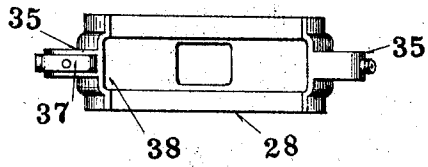


Fig.11.

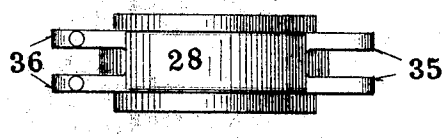


Fig.12.

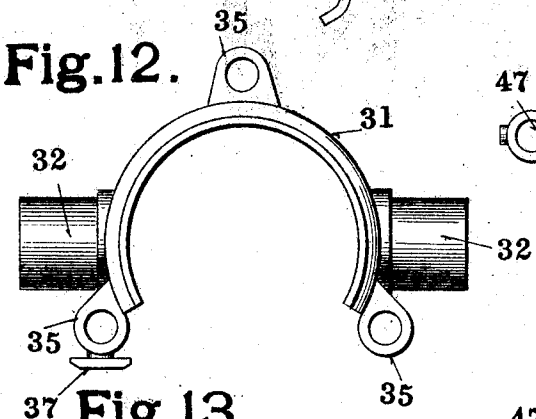


Fig.13.

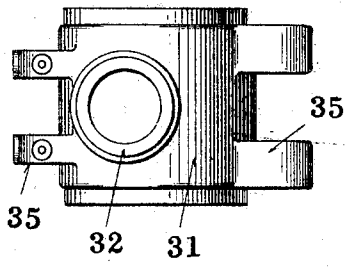


Fig.14.

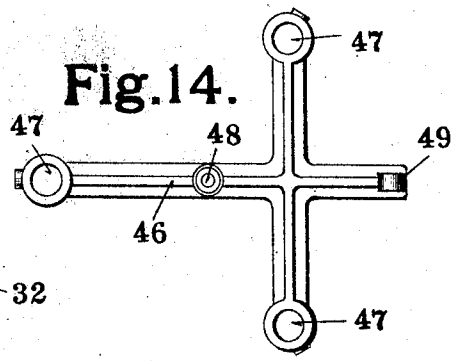
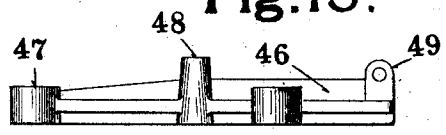


Fig.15.



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Patented Jan. 27, 1925. 1,524,397

UNITED STATES PATENT OFFICE.

ARTHUR JONES, OF BELLEVILLE, ILLINOIS, ASSIGNOR TO U. S. SMELTING FURNACE COMPANY, OF BELLEVILLE, ILLINOIS, A CORPORATION OF ILLINOIS.

SMELTING FURNACE.

Application filed October 2, 1922. Serial No. 591,804.

To all whom it may concern:

Be it known that I, ARTHUR JONES, a citizen of the United States of America, residing at Belleville, county of St. Clair, State of Illinois, U. S. A., have invented a certain new and useful Smelting Furnace, of which the following is such a full, clear, and exact description as will enable anyone skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to a smelting furnace and more particularly to improvements in rotary and tilting furnaces of the type shown and described in Patent No. 1,334,459 granted to me March 23, 1920. The fluid fuel burner, however, which forms one of the principal features of my invention may be applied to furnaces of other types.

In the accompanying drawings which show one form of furnace made in accordance with my invention, Figure 1 is a front elevation, Figure 2 is an enlarged vertical section taken on the line 2—2 of Figure 1. Figure 3 is an enlarged section taken on the line 3—3 of Figure 4. Figure 4 is a vertical longitudinal section. Figure 5 is an elevation of the charging and pouring end of the furnace. Figure 6 is a detail view showing the protective covering for the air heating pipe. Figure 7 is a section taken on the line 7—7 of Figure 4. Figure 8 is a detail view of the central burner block. Figures 9, 10 and 11 are detail views of one of the lining clamps, Figures 12 and 13 are detail views of the lining clamp carrying the trunnions upon which the burner structure swings. Figures 14 and 15 are detail views of the damper support; Figure 16 (Sheet 4) is a detail view of one of the pipe clamps, Figure 17 (Sheet 1) is a detail view showing the means for adjusting the structure vertically and Figure 18 (Sheet 2) is a detail view of the burner nozzle.

The combustion chamber of my furnace, indicated at 10, is cylindrical in form with conical ends and is rotatably supported in a framework 11 which is mounted on uprights 12 so as to turn on a horizontal axis 13 in order to pour the contents. The construction of the combustion chamber (except at the pouring end) and its supporting means are in a general way similar to that in my prior patent above referred to and, as they form no part of the present invention, except in combination, they will not be described in detail.

14 indicates the central burner block (shown in detail in Fig. 8). This block is provided with a longitudinal passage 15 to receive the burner nozzle 16 (Figures 2 and 18). The burner nozzle 16 is adjustable longitudinally by means of a pair of rods 17 and is preferably provided with a metallic casing 18 to reduce friction. The nozzle is provided with a yoke 19 forming a bearing for the forward end of a central pipe 20 to which the liquid or gaseous fuel is supplied thru a fuel pipe 21. 22 is a vertical air pipe sealed in the block 14 and communicating with the passage 15. Lining blocks 23 and 24 substantially surround the center block 14 and the lower end of the air pipe 22 so as to form a preheating chamber 25 around the burner and the whole is enclosed in a shell 26 provided with a flange 27 adapted to bear against the end of the furnace 10.

The shell 26 is rigidly secured to a bottom ring 28′ provided with a flange for that purpose. The ring 28′ is carried by three pipes or rods 29 from which it is supported by set collars 30. The pipes 29 are carried by a clamping ring 31 provided with trunnions 32. The trunnions 32 turn in bearing 33 on the upper ends of supporting pipes or rods 34 by means of which the burner structure is principally supported. In addition to the lining clamping rings 28′ and 31 the device is provided with one or more lining supporting rings 28, the number depending on the height of the burner structure. The rings 28′ and 31 are quite similar to the ring 28 (shown in detail in Figures 9, 10 and 11) which will now be described.

Each of the rings 28 consists of two parts, one of which is provided with three lugs 35 provided with openings to receive the pipes 29 and the other with a whole lug 35 and a half lug 36 so that it may be swung on one of the pipes 29 as a pivot (as shown in Figure 9). The lugs on the movable parts are doubled so as to straddle the lugs on the fixed part. A turn button 37 or other suitable fastening device holds the swinging member in closed position. The interior of the ring is provided with an annular recess 38 adapted to receive a corresponding annular projection on the enclosed sectional

lining 39. The ring 28′ only differs from the ring 28 in being provided with the flange for securing it in the shell 26 but the ring 31 differs not only in being of greater width and carrying trunnions, but also in having two sets of lugs 35 on the fixed part. The reason for this is that the pipes 29 terminate at this point and are provided with both set collars 30 and nuts 30′ one above and the other below the lower set of lugs while the upper set carry extension pipes 29′. Between the sectional linings 39 are sectional linings 40′ each of which is surrounded by a split pipe 40. The pipes 40 are held in place by clamping rings 41 overlapping the pipes and the lining clamping rings hereinbefore described. The ring 41, shown in detail in Figure 16, consists of three parts, two of which are pivoted to one of the pipes 29 by lugs 42 and the other held in position by bolts 43 passing through half lugs 44 on this part and similar half lugs on the swinging parts. The extension pipes 29′ project upwardly from the ring 31 and carry a clamping ring 41 and a solid top rim 45 enclosing extension pipe and lining, and a damper supporting member 46 (Figures 14 and 15) having openings 47 for the pipe 29′, a central opening 48 for the valve stem and a pivot lug 49 connected by a link 50 to a lever 51 controlling a valve stem 52 carrying the valve 53.

The air for the furnace is supplied from a compressor (not shown) to a pipe 55 containing a regulating damper 56 communicating through the trunnions 32 with the down pipe 22. The pipe 55 is provided with a swivel joint 57 to allow of the necessary movement of the pipe when the burner structure is swung on its trunnions.

In order to protect the lower part of the down pipe 22 from the intense heat at this point, I may surround it by one or more lengths of refractory sleeving 54 (Figures 2 and 6). The sleeve 54 is composed of two parts, each provided with interlocking lugs, 58 and 59 respectively.

60 is a frame, the upper end of which surrounds the lower part of the shell 26 and which carries a bracket 61 having ways for anti-friction rollers 62 which assist in supporting the weight of the burner structure when it is swung to and from the furnace and also serves to support the lower part of such structure when repairs are being made in the same. In order to adjust the trunnions 32 with respect to the rollers 62 the lower ends of the pipes 34 are let into holes in the floor, as shown in Figure 17, and threaded to receive nuts 63; by rotating these nuts the trunnions may be raised or lowered. The bracket 61 also carries a lever 64 engaging with a groove 65 in the bottom of the shell 26 and actuated by a handle 66 to swing the structure on its pivot.

The end of the furnace 10 opposite to the burner is provided with a charging opening 70 and a pouring opening 71 arranged directly below the same so that the part 72 between the two openings will form a skimming bar for holding back slag or dross when the metal is poured. The charging opening 70 is closed by a door 73 carried on a shaft 74 (Figure 5). One end of the shaft 74 carries a worm wheel 75 engaging with a worm 76 on a vertical shaft 77. This shaft 77 is connected by mitre gears 78 with a horizontal shaft 79 carrying the hand wheel 80 by means of which the door 73 is actuated. By this construction the door, which is of considerable weight, is not only easily operated, but will remain in any position in which it is placed until the hand wheel is further moved. The door 73 is preferably provided with a covered sight opening, 81.

The operation of my furnace is as follows: The door 73 is opened and the damper 53 closed when the fire is started, after which the door is gradually closed and the damper opened until substantially the entire products of combustion are forced back under pressure around the burner, through the chamber 25 and thence upward around the down pipe 22. By this arrangement, the products of combustion at their highest temperatures surround the fuel supply passage at the point of discharge of the latter end and, as they cool, travel along the same toward the point of supply so that the maximum amount of heat is extracted from the outgoing gases and the mixture of fuel and air is admitted to the furnace at the maximum temperature.

After the metal in the combustion chamber is melted the fuel and air are cut off and the burner structure swung on its trunnions 32 by operating the handle 66 thus separating the said structure from the combustion chamber so that the latter may be turned on its pivot 13 to pour the contents.

Owing to the intense heat in the burner flue, it will be necessary at times to renew the lining. To accomplish this, the set collars 30 under the injured section are lowered so that the weight of the lower part will rest on the frame 60 and the upper part is raised by means of the nuts 63 so as to sufficiently separate its section. After this, the clamping rings 28 and 41 can be opened to allow of the removal of the pipe and lining.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a device of the class described, the combination with a combustion and smelting chamber, of a fluid fuel burner therefor the point of discharge of said burner being surrounded by protecting walls of refractory

material, and an outlet passage for the products of combustion, said outlet passage surrounding said protecting walls and thus enveloping the burner at its point of discharge into the combustion chamber.

2. In a device of the class described, the combination with a combustion and smelting chamber, of a fluid fuel burner therefor the point of discharge of said burner being surrounded by protecting walls of refractory material, an air supply pipe for said burner also surrounded by protecting walls of refractory material, and an outlet passage for the products of combustion, said outlet passage surrounding said protecting walls and thus enveloping the burner at its point of discharge into the combustion chamber and extending along said air pipe.

3. In a device of the class described, the combination with a combustion chamber, provided with an adjustable door, of a fluid fuel burner therefor, an air supply pipe for said burner, an outlet passage for the products of combustion extending along said air pipe, and a damper for said outlet passage, adapted to cooperate with the door in starting the furnace.

4. In a device of the class described, the combination with a combustion and smelting chamber provided with an adjustable door at one end, of a fluid fuel burner at the other end thereof, an air supply pipe for said burner, an outlet passage for the products of combustion surrounding said burner at its point of discharge into the combustion chamber and extending along said air supply pipe, and a damper for said outlet passage, adapted to cooperate with the door in starting the furnace.

5. In a device of the class described, the combination with a tilting combustion and smelting chamber, of a pivotally mounted burner structure adapted to be heated by the products of combustion from said combustion chamber, means for supplying air through the pivot of said structure, and means for swinging said burner structure on its pivot to connect it to and disconnect it from said combustion chamber.

6. In a device of the class described, the combination with a tilting combustion and smelting chamber, of a pivotally mounted burner structure adapted to be heated by the products of combustion from said combustion chamber, and means for vertically adjusting the pivot of said structure.

7. In a device of the class described, the combination with a tilting combustion and smelting chamber, of a pivotally mounted burner structure adapted to be heated by the products of combustion from said combustion chamber, and an auxiliary support independent of the pivot for the lower part of said burner structure.

8. In a device of the class described, the combination with a tilting combustion and smelting chamber, of a pivotally mounted burner structure formed in separable parts and adapted to be heated by the products of combustion from said combustion chamber, and an auxiliary support for carrying a portion of said parts while the remainder are suspended from the pivot.

9. In a device of the class described, the combination with a tilting smelting chamber, of a charging opening therefor, a pouring opening below said charging opening, a wall between said openings forming a skimming bar for the molten metal, a door for said charging opening, and actuating means for said door, including worm gearing.

In testimony whereof, I have hereunto set my hand and affixed my seal.

ARTHUR JONES.