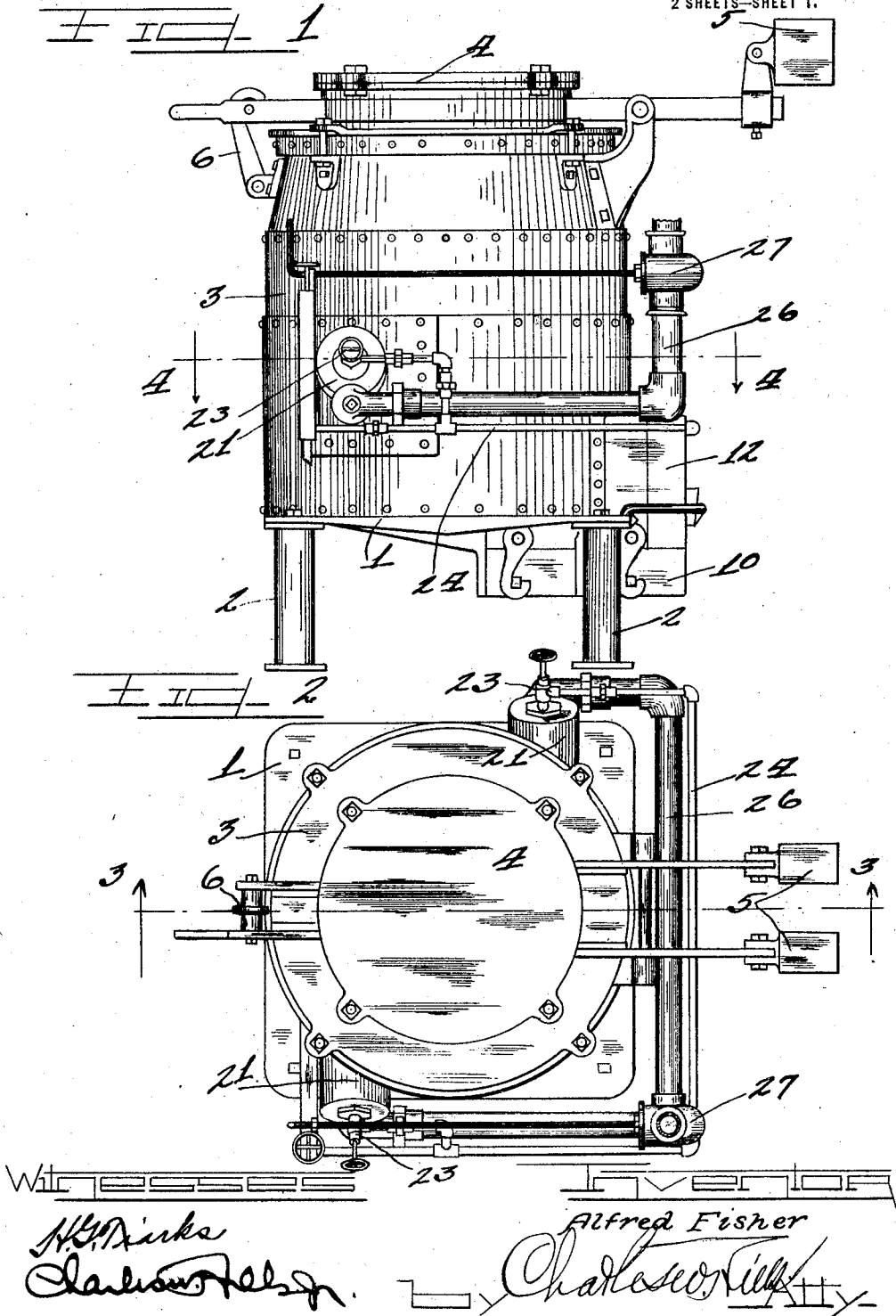


A. FISHER.
STEEL FURNACE.
APPLICATION FILED FEB. 24, 1920.

1,389,346.

Patented Aug. 30, 1921.

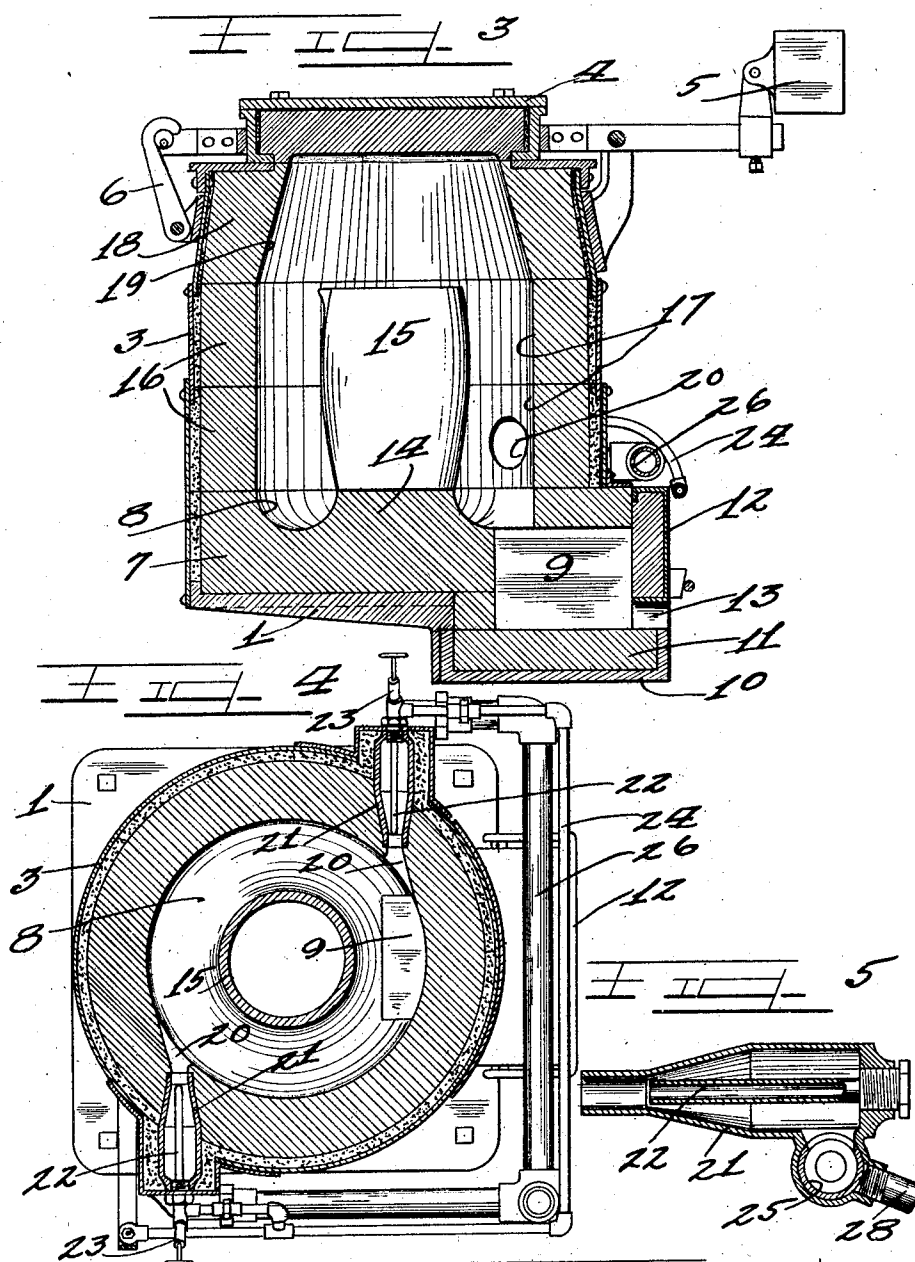
2 SHEETS—SHEET 1.



A. FISHER.
STEEL FURNACE.
APPLICATION FILED FEB. 24, 1920.

1,389,346.

Patented Aug. 30, 1921.
2 SHEETS—SHEET 2.



Witnesses

Alfred Fisher
Charles W. Viles

Alfred Fisher

Charles W. Viles

UNITED STATES PATENT OFFICE.

ALFRED FISHER, OF CHICAGO, ILLINOIS.

STEEL-FURNACE.

1,389,346.

Specification of Letters Patent. Patented Aug. 30, 1921.

Application filed February 24, 1920. Serial No. 360,679.

To all whom it may concern:

Be it known that I, ALFRED FISHER, a citizen of the United States, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steel-Furnaces; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the numerals of reference marked thereon, which form a part of this specification.

This invention relates more particularly to an improved type of a melting furnace wherein the fire-brick lining has the fire-pot constructed with the side walls vertical starting on a level with the lower end of the furnace crucible and extending upwardly a slight distance above the upper end of said crucible, from which point the fire-brick walls converge toward the top of the furnace thereby affording a fire-pot adapted to produce a very high temperature for melting steel.

It is an object of this invention to provide a melting furnace wherein the fire-pot is so shaped that a very high temperature may be reached for the purpose of melting steel.

Another object of the invention is to provide a furnace wherein a temperature of approximately a thousand degrees higher can be reached than that obtainable in brass furnaces, thereby producing a furnace adapted for melting steel.

It is furthermore an object of the invention to provide a melting furnace wherein the fire-pot is so shaped that the blast-flames directed into the fire-pot are choked in the upper end of the fire-pot for the purpose of concentrating said blast-flames around the furnace crucible to evenly reduce a charge of steel therein.

It is an important object of this invention to provide an improved type of steel furnace wherein the combustion chamber is of substantially cylindrical form for about the height of the furnace crucible, said cylindrical portion joining a conical upper chamber section and a smoothly rounded grooved lower chamber section.

Other and further important objects of this invention will be apparent from the disclosures in the accompanying drawings and specification.

The invention (in a preferred form) is

illustrated in the drawings and hereinafter more fully described.

On the drawings:

Figure 1 is an elevation of a steel furnace embodying the principles of this invention.

Fig. 2 is a top plan view thereof.

Fig. 3 is a vertical section taken on line 3—3, of Fig. 2.

Fig. 4 is a transverse section taken on line 4—4, of Fig. 1.

Fig. 5 is an enlarged longitudinal section taken through one of the blast-burners.

As shown on the drawings:

The furnace proper comprises a supporting or base plate 1, supported by legs 2. Mounted upon the base plate 1, is a metal furnace casing or shell 3, adapted to be removably closed by means of a lid 4, provided with a counterweight 5, and with a latch device 6.

The metal casing 3, is provided with a fire-brick lining, the various elements of which are so constructed to afford a fire-pot or combustion chamber adapted to produce very efficient results whereby a temperature of approximately four thousand degrees Fahrenheit may be obtained for melting steel in the furnace crucible. The furnace lining may be constructed of fire-clay, fire-brick or any other suitable highly refractory material, and said lining embraces a fire-brick floor or bottom layer 7, provided with a rounded annular channel or groove 8, which at one side of the furnace opens into a lower or slag chamber 9, for receiving slag or molten metal should a crucible break in the furnace. As shown the slag chamber 9, is formed by extending the base plate 1, downwardly on one side to a distance below the bottom of the main portion of the furnace and providing therefor a removable dumping door 10, having a fire-brick lining 11. The front of the slag chamber 9, is closed by means of a removable shutter or door 12, having an outlet opening 13, therein to permit the molten metal or slag to flow therethrough. As shown in Fig. 3, the groove 8, forms a boss or pedestal 14, within the furnace for the purpose of receiving a crucible 15. Mounted upon the fire-brick floor 7, are a plurality of fire-brick rings 16, disposed one above the other and extending upwardly to a short distance above the top of the crucible 15. Each of the fire-brick rings or elements 16, is provided with a cylindrical central opening 17, the walls of which

are vertical and afford a straight chamber section the lower end of which connects with the rounded groove 8. Supported on the upper fire-brick ring 16, is an upper layer
 5 of fire-brick 18, provided with an upwardly tapering or conical choke chamber or opening 19, the diameter of the lower or widest portion of which is the same as the diameter of the openings 17, in the fire-brick rings 16.

10 Projecting through the metallic casing 3, and through passages or openings 20, in the lower fire-brick ring 16, are two inwardly and downwardly inclined blast-burners which are substantially tangential with respect to the walls of the combustion chamber or fire-pot for the purpose of directing
 15 the blast-flames downwardly into the annular groove 8, of the fire-pot, to cause said blast-flames to flow spirally around the crucible 15. Each blast-burner embraces a tapered twyer 21, having a fuel pipe or tube 22, axially disposed therein and controlled by a needle valve 23. Connected
 20 with the needle valve 23, is an oil or hydrocarbon feed pipe 24. Air under pressure is supplied to each blast-burner through a plug valve 25, which is connected with an air blast pipe 26, having a control valve 27, therein. The air blast pipe 26, may be connected
 25 with any suitable type of blower. Each blast-burner is provided with an air exhaust pipe 28, to permit the escape of the air when the plug valve 25, is turned to prevent air from entering the blast-burner
 30 twyer 21.

The operation is as follows:

By releasing the latch 6, the lid or cover 4, may be opened to permit a charge of steel to be placed within the crucible 15. The
 40 blast-burners are ignited and the lid is locked in closed position by the latch 6. The amount of oil or hydrocarbon, and the air entering the blast-burners is adapted to be regulated by adjustment of the air valve
 45 27, the needle valves 23, and the plug valves 25. The blast-flames entering the furnace fire-pot, are directed tangentially and downwardly into the fire-pot bottom groove 8, and striking the fire-pot walls flow centrifugally around the crucible 15.

Should a crucible be broken the molten or partly molten metal may be removed from the furnace slag chamber 9 by removing the bottom or dumping door 10, or by
 55 opening the front door 12. If the metal or slag is in a thoroughly molten condition, it may be drawn off through the outlet opening 13.

The peculiar design of the furnace combustion chamber or fire-pot is the important feature of this invention. In ordinary melting furnaces of the type herein described a maximum temperature of approximately
 60 three thousand degrees Fahrenheit is obtainable, which is sufficient for melting

brass, bronze and similar metals, but is not sufficient for melting steel. By the use of a fire-pot shaped as described and shown, a maximum temperature of approximately
 70 four thousand degrees is obtainable, thus permitting the improved type of furnace to be used for melting steel. The intense degree of heat is obtained by directing the blast-flames from the blast-burners tangentially into the fire-pot groove 8, from which
 75 position the flames flow centrifugally upwardly in the cylinder chamber 17, around the crucible to evenly heat all parts of the same and thereby cause an even reduction of the charge contained within the crucible. 80
 The walls of the chamber 17, are vertical and extend upwardly from the top of the pedestal 14, to a point a short distance above the top of the crucible. The upper
 85 end of the fire-pot comprises a choking chamber 19, which is of conical shape so that the inclined walls forming the same act to choke or concentrate the centrifugal blast-flames in the lower section of the fire-pot around the crucible. This arrangement
 90 permits a high temperature to be reached sufficient to melt steel, which cannot be done in similar types of furnaces having fire-pots of shapes different from that shown in
 95 Fig. 3.

I am aware that numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I therefore do not purpose limiting the patent granted
 100 otherwise than necessitated by the prior art.

I claim as my invention:

1. In a furnace of the class described a combustion chamber floor having a concave annular bottom groove affording a crucible
 105 support, a cylindrical intermediate combustion chamber portion having vertical walls extending from the top of the crucible support to a point slightly above the upper end of a crucible placed on said support, and a
 110 conical upper section above the cylindrical portion adapted to choke the blast-flames and concentrate the same in said cylindrical portion of the combustion chamber around the crucible. 115

2. In a furnace of the class described a fire-pot embracing a floor having a rounded annular groove, a cylindrical intermediate section of a height approximately equal to that of the furnace crucible, and an upwardly converging upper fire-pot section for
 120 choking the blast-flames, and retaining the same in said cylindrical section around the crucible.

3. A furnace casing fire-brick lining comprising a fire-brick floor having a rounded annular groove therein forming a pedestal for receiving a crucible, a cylindrical intermediate fire-brick section on said floor having
 125 vertical inner walls extending from the 130

top of the pedestal upwardly above the upper end of the furnace crucible, and an upper fire-brick section on said cylindrical section provided with an inner upwardly converging conical wall for choking the blast-flames and keeping the same in said cylindrical section around the crucible.

4. A furnace fire-pot having a cylindrical intermediate portion joining a conical upper portion and a grooved lower portion.

5. A steel furnace comprising a supporting frame, a casing supported thereon, a cover for said casing, and a fire-brick lining for said casing comprising a fire-brick floor having a rounded annular groove therein overlapping a slag chamber also formed in said floor, an intermediate fire-brick section on said floor having a cylindrical chamber therein with vertical walls which join said groove, and an upper fire-brick section on said intermediate section, said upper section having a conical chamber the greatest diameter of which is equal to the diameter of said cylindrical chamber.

6. A steel furnace comprising a supporting frame, a casing mounted thereon, a cover for said casing, blast-burners projecting into said casing, and a fire-brick lining for said casing comprising a floor having a rounded annular groove therein forming a crucible pedestal for supporting a crucible, said floor having a slag chamber therein communicating with said groove, an intermediate lining section on said floor having a cylindrical chamber therein with vertical walls which join the outer peripheral edge of said groove, and an upper lining section on said intermediate section, said upper section having a conical chamber which diverges downwardly to join the upper end of said cylindrical chamber at a point above the upper end of the furnace crucible.

In testimony whereof I have hereunto subscribed my name in the presence of a subscribing witness.

ALFRED FISHER.

Witness:

FRED E. PAESLER.