

July 24, 1923.

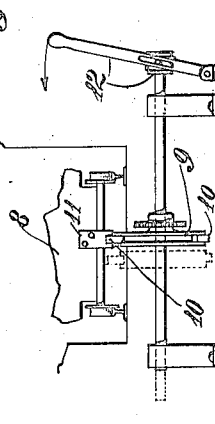
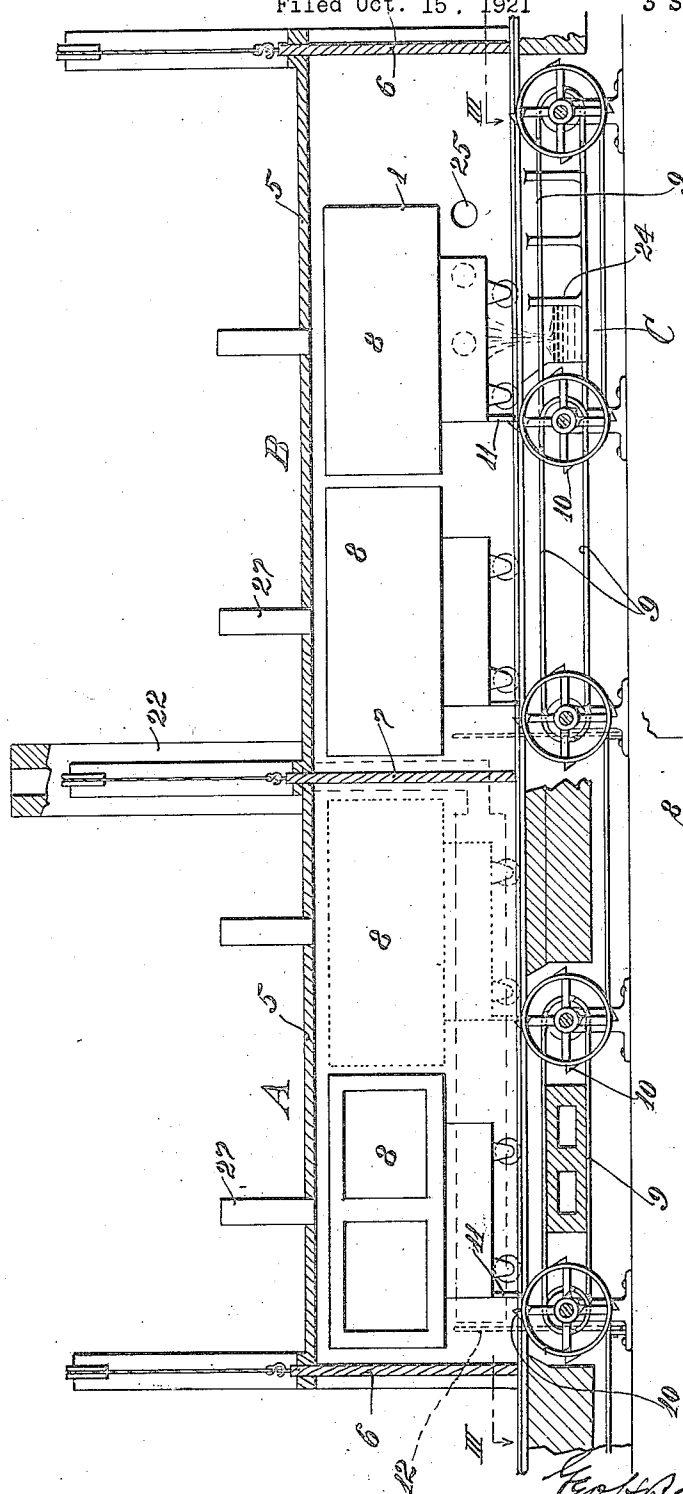
1,462,899

G. H. BENJAMIN

FURNACE FOR MELTING AND CASTING

Filed Oct. 15, 1921

3 Sheets-Sheet 1



Inventor

Georg Benjamin

July 24, 1923.

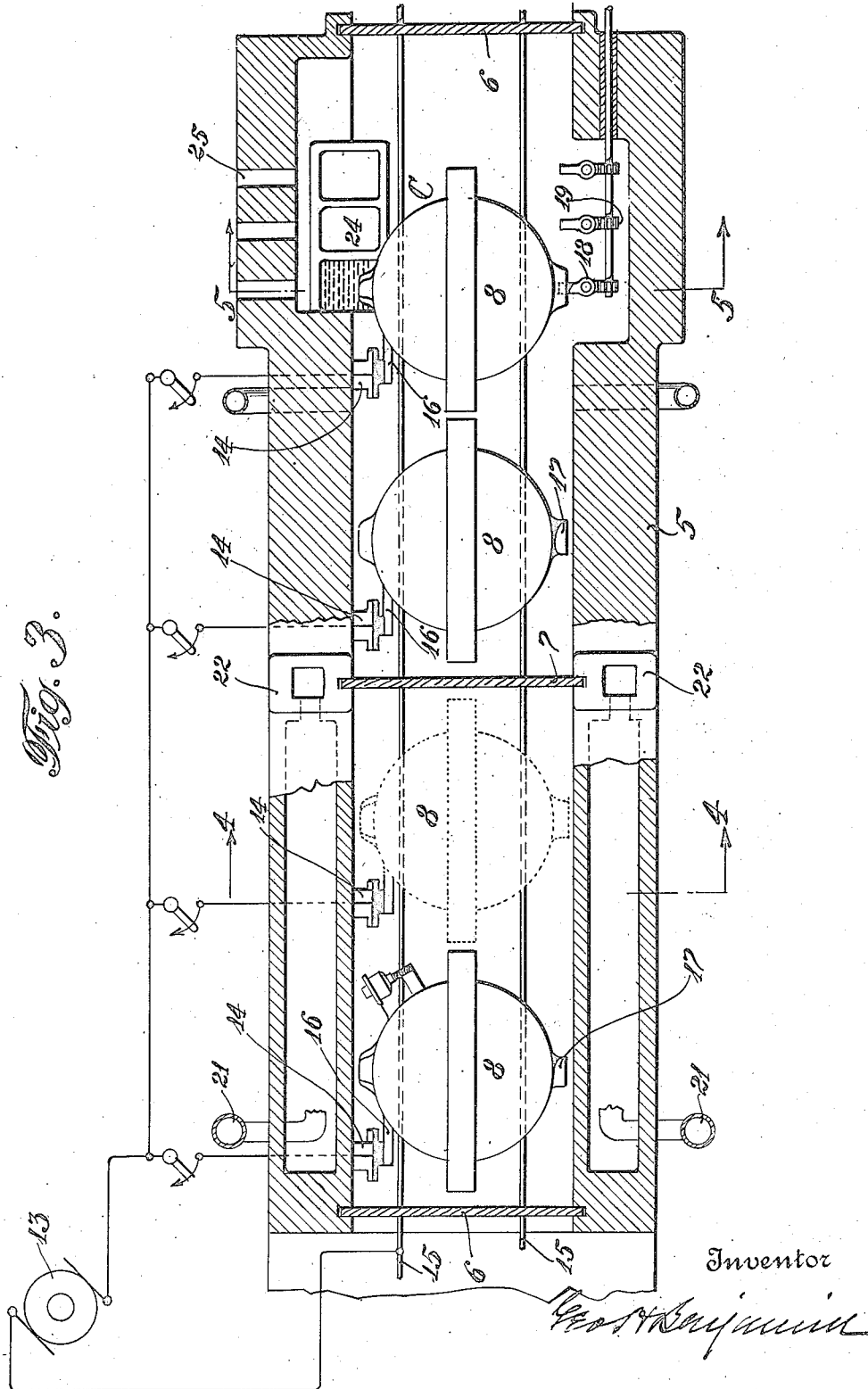
1,462,899

G. H. BENJAMIN

FURNACE FOR MELTING AND CASTING

Filed Oct. 15, 1921

3 Sheets-Sheet 2



Inventor

Geostrophium

July 24, 1923

1,462,899

G. H. BENJAMIN

FURNACE FOR MELTING AND CASTING.

Filed Oct. 15, 1921

3 Sheets-Sheet 3

Fig. 4.

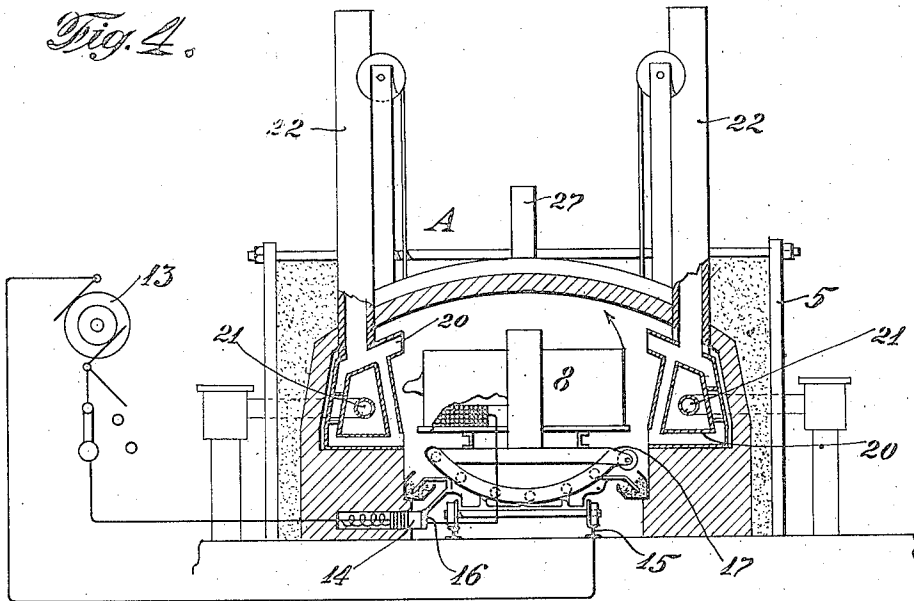
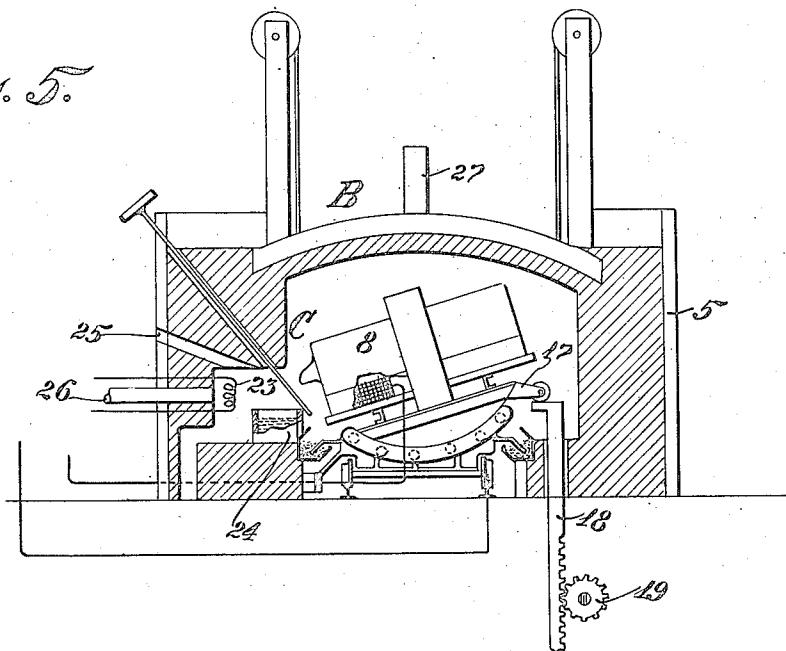


Fig. 5.



Inventor

Inventor
Wm. H. Sullivan

UNITED STATES PATENT OFFICE.

GEORGE HILLARD BENJAMIN, OF NEW YORK, N. Y., ASSIGNOR TO ANATMOS METALS AND FURNACE CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

FURNACE FOR MELTING AND CASTING.

Application filed October 15, 1921. Serial No. 507,960.

To all whom it may concern:

Be it known that I, GEORGE HILLARD BENJAMIN, a citizen of the United States of America, residing at New York, county of New York, State of New York, and whose post-office address is 25 West 43d Street, New York, N. Y., have invented a certain new and useful Improvement in Furnaces for Melting and Casting, of which the following is a specification.

In U. S. Letters Patent No. 1,354,286, granted to J. H. L. De Bats, there is described a method of melting, pouring and casting, by reason of which the metal is preserved against the deleterious action of the atmosphere or the gases which may be present. The apparatus shown in such patent for carrying the method into effect was designed for operation on a small scale. My present invention relates to a construction adapted to carry the aforesaid method into effect on a commercial scale; that is, for large quantity production, and involves certain features of construction which will be specifically described and pointed out in the claims.

In the drawings, Fig. 1 is a vertical longitudinal section.

Fig. 2 is a detail of the clutch mechanism for controlling the device for moving the melting furnace through the tunnel kilns.

Fig. 3 is a longitudinal section and plan view on the line III—III of Fig. 1.

Fig. 4 is a vertical transverse section on the line IV—IV of Fig. 3.

Fig. 5 is a vertical transverse section on the line V—V of Fig. 3.

In the drawings, 5 indicates a tunnel kiln, which may be of any desired construction; preferably that generally indicated in the transverse section, Fig. 4, the construction being such as to make the interior of the kiln substantially air tight.

The tunnel kiln is divided into two sections: A, the melting section, and B, the casting section.

The ends of the furnace are closed by vertically movable doors 6, and a door 7 is introduced between the sections A and B.

Located within the tunnel are the melting furnaces 8; four being shown, two in section A and two in section B. Manifestly, by increasing the length of the sections, the number of furnaces included in the section may be increased. The melting furnaces

may be of any desired construction in which melting is carried into effect by the action of electric current. The type shown in the drawing is that disclosed in my prior Patent No. 1,106,486, dated August 11, 1914, which is a resistance furnace. I may, however, use the type shown in my prior Patent No. 1,329,744, dated Feb. 3, 1920, which is a resistance arc furnace, or that shown in my prior Patent No. 1,314,384, dated August 26, 1919, which is an arc furnace. Whatever type of furnace used, it will be such that the material to be melted on the hearth of the furnace is melted in a substantial vacuum, or under conditions where the gases developed or present in melting the charge will not be reabsorbed. Generally, the principle involved being to melt the charge under conditions where it will not absorb oxygen or deleterious gases.

Located in the bottom of the kiln are chain belts 9, carrying projections 10 adapted to co-act with depending projections 11 on the furnace 8, by reason of which the furnaces 8 may be moved along the kiln. The action of the belt is controlled by the clutch arrangement shown at 12, Fig. 2. Any suitable device for moving the furnaces along the interior of the kiln will serve the purpose of my invention, that shown being merely illustrative. A similar arrangement is shown in my prior Patent No. 1,329,744, dated Feb. 3, 1920. Provision is made for supplying electric current to the furnaces, which provision consists of the generator 13, connected through one terminal to contacts 14, arranged along the interior of the kiln, and by another conductor to the rails 15, on which furnaces 8 move. It will be observed that the contacts 14 are placed at uniform distances along the interior of the kiln and that contacts 16 carried by the furnaces are only in contact with a contact 14, when a furnace 8 is at rest. Any other suitable arrangement may be employed to feed current to the furnaces 8, that shown being merely illustrative of one plan. The furnaces 8 are mounted so as they can be tilted as illustrated in Figs. 4 and 5, for the purpose of discharging the metal from the furnace at a given point, for instance, the point C in section B.

To effect tilting of the furnaces, they are each provided with a laterally extending plate 17, adapted to co-act with the laterally

extending arm 18, (in section B) which arm can be moved vertically by means of a rack and pinion 19, Fig. 5. Any other suitable arrangement for tilting the furnaces to discharge their contents, operated from the outside of the tunnel may be used. Located within section A at each side of the kiln are combustion chambers 20, in which gas and air may be introduced in the usual manner, through burners 21, (shown in dotted lines), the products of combustion are carried out through stacks 22, the object of which is to heat to a high temperature the interior of section A of the kiln. In fact it has been found that where section A is heated to a high temperature, the electric current needed to produce the necessary heat to effect melting is materially reduced, and further, as the temperature and atmosphere of the kiln is that of a muffle, the liability of oxidizing gas leaking into the kiln is avoided.

Located in each side of the kiln (section B) are electric heaters 23, each consisting of a coil; the purpose of which is to heat the space immediately surrounding the casting boxes 24, which are located under spout of the melting furnaces 8. At this part of the kiln, there is also provided opening 25, through which testing apparatus may be introduced. 26 indicates opening through which a non-combining gas, such as nitrogen, may be introduced, or through which air or gas in the interior of the kiln may be exhausted.

I wish it understood that all of the features of the construction may vary materially, and yet in no wise depart from the intention of my invention. The drawings are largely diagrammatic and are only presented for the purpose of illustrating such an apparatus as may carry the method into effect.

The method of operation is as follows:

The material to be melted is put on the hearth of the furnaces 8; for instance, that shown in dotted lines in Fig. 1, and is introduced into the kiln. Further material is put into the furnaces 8; for instance that shown in full lines at the left of section A. The door 6 at the left hand side of the furnaces is then closed, as also the door 7 between the sections A and B. The melting operation takes place in section A. When the melting operation in furnace 8, shown in dotted lines, is completed, the door 7 is opened, and this furnace is moved into section B and the door closed; the movement taking place by reason of the moving apparatus in the bottom of the kiln. When the furnace is introduced into section B, it is allowed to rest in the first position therein for sufficient time to allow the metal to settle or plane.

The furnace is then moved into the second

position, i. e., the position at the extreme right of section B. The furnace is then tilted and the material in the furnace charged into the casting boxes 24. If desired, any air in the interior of the kiln may be exhausted through the opening 26, or a non-combining gas under pressure may be introduced into section B through this opening; preferably, the gas being under sufficient pressure to prevent the introduction of atmospheric air.

After the operation just described, the door 6 at the right of the kiln is opened and the furnace which has been discharged, removed to be carried over a suitable track back to the left hand end of the kiln.

Situated in the top of the kiln are openings 27 through which the testing apparatus may be introduced to determine the temperature and atmosphere in the sections A and B. It will be understood that chambers A and B are substantially closed to the atmosphere, and that the pressure existing by reason of the heat due to the combustion chambers or the electric heaters will prevent the entrance of air and also tend to drive out any air allowed to enter the sections A and B when the doors are open.

Having thus described my invention, I claim:—

1. In a structure of the class described, the combination of a tunnel kiln, means for heating the interior of the kiln, a series of melting furnaces, means for heating the melting furnaces, said means being independent of the means for heating the interior of the kiln, and means for moving the melting furnaces through the kiln.

2. In a structure of the class described, the combination of a tunnel kiln, means for dividing the interior of the tunnel into two sections, means for closing the ends of the kiln, means for heating the interior of the kiln, a series of melting furnaces, means for moving the furnaces through the kiln, and means for heating and melting furnaces.

3. In a structure of the class described, the combination of a tunnel kiln, means for dividing the interior of the kiln into two chambers, combustion chambers located on opposite sides of one section of the kiln, means for feeding said combustion chambers with gas and air, a series of melting furnaces, means for moving the furnaces through the kiln, and means for heating the melting furnaces.

4. In a structure of the class described, the combination of a tunnel kiln, means for heating the interior of the kiln, a series of electric melting furnaces, means for moving the furnaces through the kiln, and means for supplying electric energy to the melting furnaces while in the kiln.

5. In a structure of the class described, the combination of a tunnel kiln, a series

of melting furnaces, means for moving the furnaces through the kiln, means for heating the melting furnaces, and means for discharging of the contents of the melting furnaces while in the kiln.

6. In a structure of the class described, the combination of a tunnel kiln, means for heating the interior of the kiln by radiant heat, a series of melting furnaces, means for separately moving the furnaces through the kiln, means for heating the melting furnaces, and means for exhausting air or gases from the interior the kiln, or conversely, introducing a neutral gas.

7. In a structure of the class described, the combination of a tunnel kiln of the muffle type, means for heating the interior of the kiln by radiant heat, a series of electrical melting furnaces, means for moving the furnaces through the kiln, means for transmitting electric heating energy to the interior of the melting furnaces, means for discharging the contents of the furnaces, and means for receiving the discharged contents, located in the interior of the kiln.

8. In a structure of the class described, the combination of a tunnel kiln, means for heating the interior of the kiln, a series of electrical melting furnaces of the resistance type, means for moving the furnaces through the kiln, means for transmitting electric energy to the members of the melting furnaces, means for discharging the furnaces of their contents, and means for receiving the material discharged from the furnaces.

9. In a structure of the class described, the combination of a tunnel kiln, movable doors for closing the ends of the kiln, and a movable door for dividing the kiln into two section, means in one end of the kiln for heating the interior of the kiln to a high temperature, means in the other end of the kiln for heating the kiln to a lower temperature, than that of the other sections, a series of melting furnaces, means for moving the furnaces through the kiln, and means for heating the melting furnaces, means in one section for discharging the contents of the furnaces, and means in the same section for receiving the discharged contents of the furnaces.

10. In a structure of the class described, the combination of a tunnel kiln, means in the top of the kiln for testing the temperature of the interior of the kiln, means for dividing the kiln into sections, means in the different sections for heating the interior of the kiln to different temperatures, a series of melting furnaces, means for moving the furnaces through the kiln, means for heating the melting furnaces, means for discharging the contents of the melting furnaces operated from the exterior of the kiln, and means within the kiln for receiving the discharged contents of the melting furnaces.

In testimony whereof, I affix my signature, in the presence of two witnesses.

GEORGE HILLARD BENJAMIN.

Witnesses:

FLORENCE A. CHAPPLE,
HENRY PRICE BALL.