April 1, 1924. 1,489,073

E. FITZGERALD

OPEN HEARTH FURNACE

Filed May 15, 1923 3 Sheets-Sheet 1

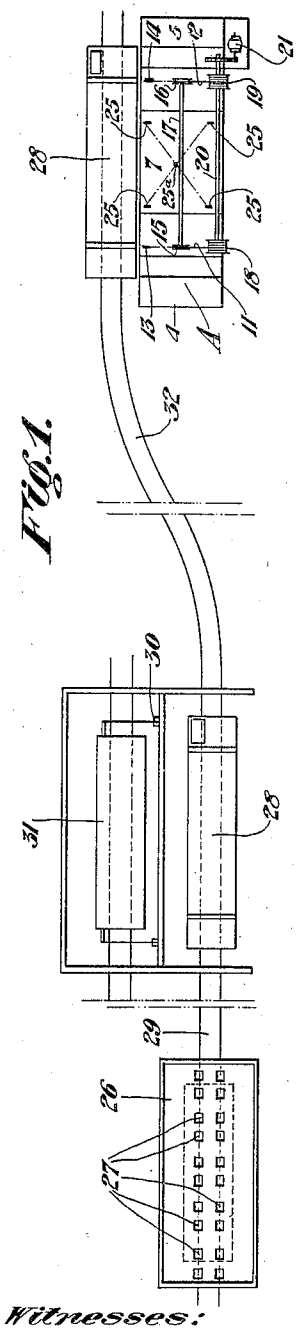


Fig. 1.

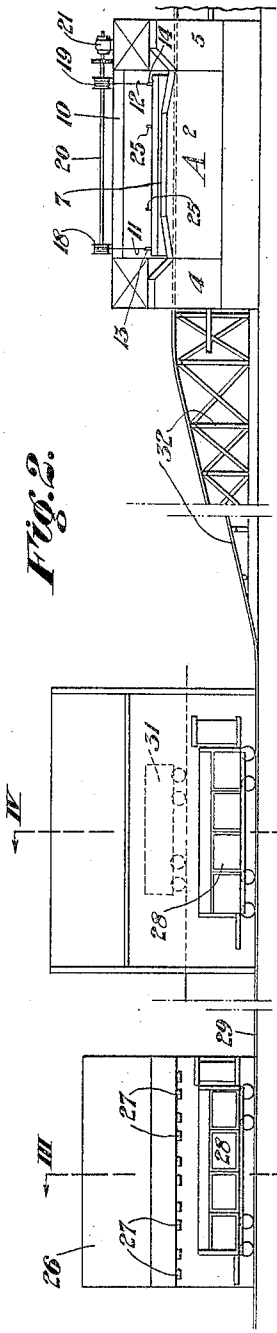


Fig. 2.

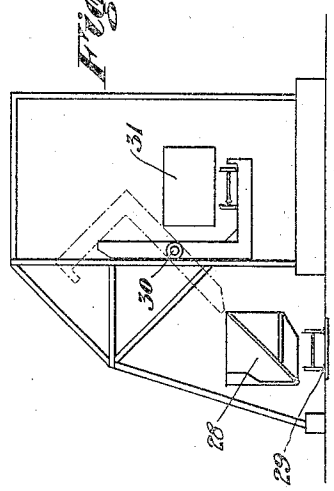


Fig. 4.

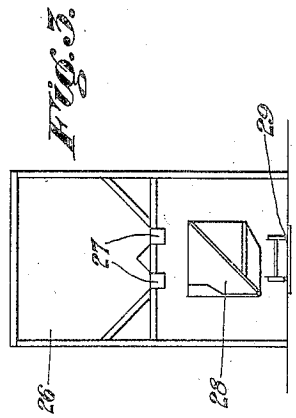


Fig. 3.

Witnesses:
Edwin Trueb

Inventor:
EDWARD FITZGERALD,
by: D. Anthony Jesina
his Attorney.

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OPEN HEARTH FURNACE

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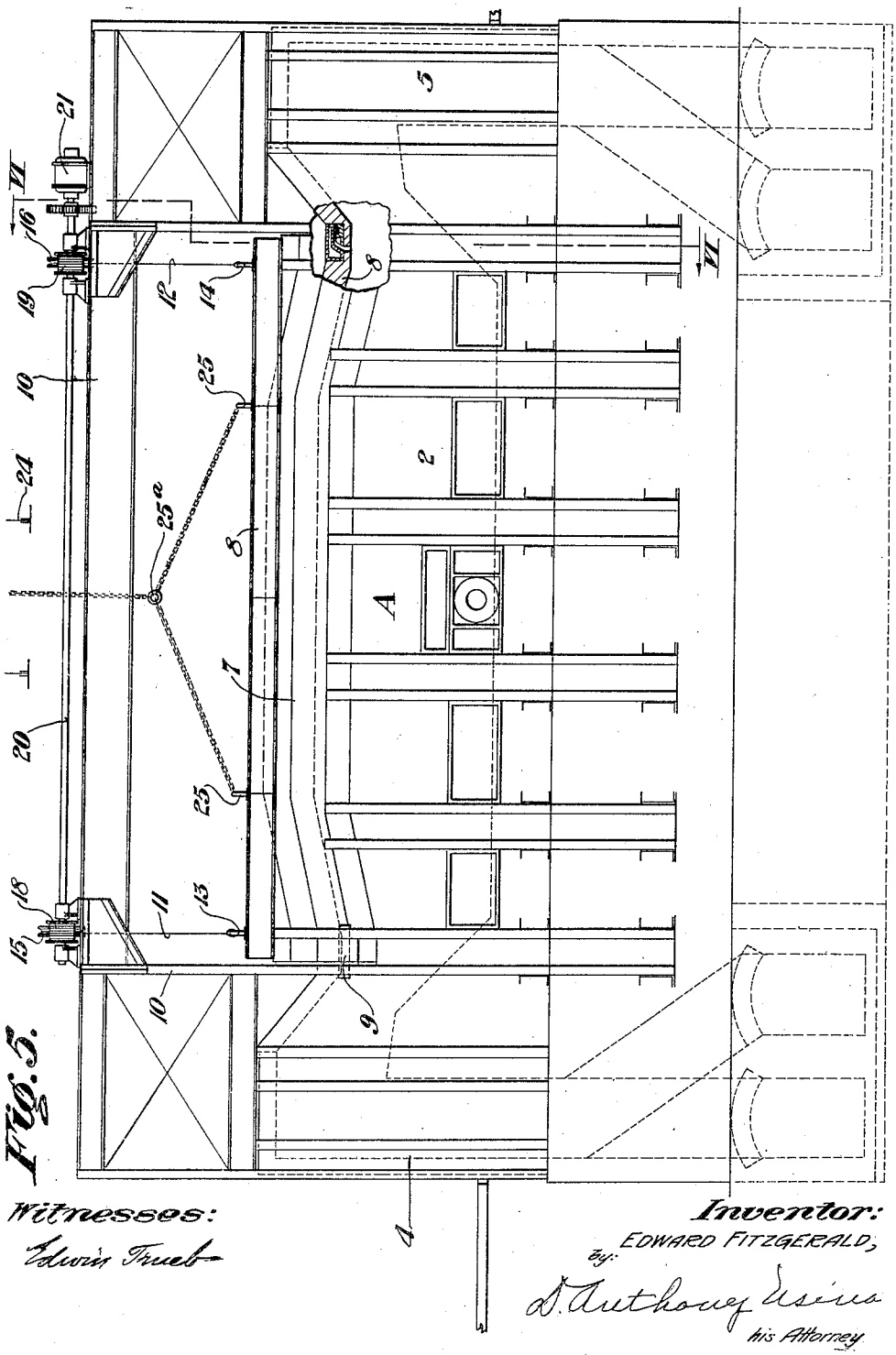


Fig. 5.

Witnesses:
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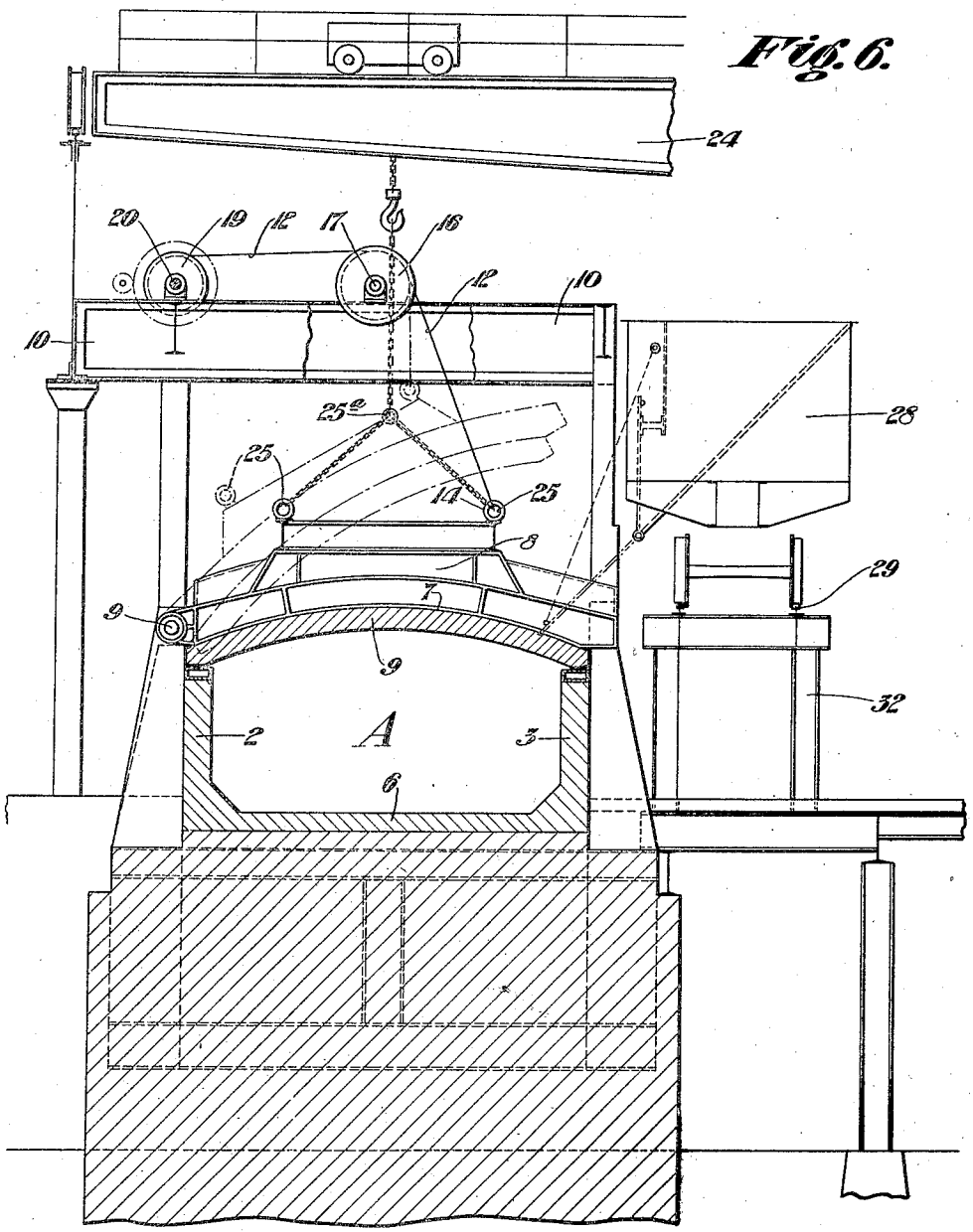
April 1, 1924. **1,489,073**

E. FITZGERALD

OPEN HEARTH FURNACE

Filed May 15, 1923 3 Sheets-Sheet 3

Fig. 6.



Witnesses:
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Patented Apr. 1, 1924. 1,489,073

UNITED STATES PATENT OFFICE.

EDWARD FITZGERALD, OF YOUNGSTOWN, OHIO.

OPEN-HEARTH FURNACE.

Application filed May 15, 1923. Serial No. 639,126.

To all whom it may concern:

Be it known that I, EDWARD FITZGERALD, a citizen of the United States, and resident of Youngstown, in the county of Mahoning and State of Ohio, have invented certain new and useful Improvements in Open-Hearth Furnaces, of which the following is a specification.

This invention relates to open-hearth plants and more particularly to open-hearth furnaces and methods of charging said furnaces, and has for one of its objects the provision of an improved arrangement of apparatus within an open-hearth plant and an improved form of open-hearth furnace which will permit the charging of all the material necessary for a heat at one time.

Another object is to provide an improved and novel form of open-hearth furnace having a movable roof adapted to be opened to permit charging of the furnace through the open top thereof.

A further object is to provide a novel method of charging open-hearth furnaces by the use of larry cars containing the material to be charged, thereby eliminating considerable of the labor now necessary in charging open-hearth furnaces, and reducing the time consumed in making up and charging a heat in a furnace from approximately two hours to approximately thirty minutes.

A still further object is to provide an open-hearth plant having the novel construction and combination of elements hereinafter described in detail and illustrated in the accompanying drawings.

In the drawings, Figure 1 is a diagrammatic plan of an open-hearth plant constructed in accordance with my invention.

Figure 2 is a side elevation thereof.

Figures 3 and 4 are sectional elevations taken on the lines III—III and IV—IV, respectively, of Figure 2.

Figure 5 is an enlarged side elevation of an open-hearth furnace constructed in accordance with this invention.

Figure 6 is a sectional elevation taken on the line VI—VI of Figure 5.

Referring more particularly to the drawings, the letter A designates the open-hearth furnace as a whole, which has the usual side walls 2 and 3, port ends 4 and 5, and hearth 6. The roof or top wall 7 of the furnace is constructed on radically different lines than heretofore followed, in that it is composed of a metal supporting structure or arch 8 from which the brick lining 9 is suspended, and the whole structure is hingedly secured along the one side wall as at 9, so as to permit opening along the other side wall for admitting the charge to the furnace.

An overhead bridge or girder supporting structure 10 is provided above the furnace roof to support the lifting mechanism for the roof. The roof of the furnace is adapted to be raised and lowered by cables or chains 11 and 12 which are secured to eyes 13 and 14, respectively, mounted in the supporting structure 8 of the roof. The cables or chains 11 and 12 are trained over suitable sheaves 15 and 16, respectively, mounted on a shaft 17 journaled on the structure 10, and have their ends secured to drums 18 and 19, respectively, mounted on a shaft 20 and also journaled on the structure 10, which shaft is connected by suitable gearing to an electric motor 21.

The roof of the furnace may be unhinged when it becomes broken, or burnt out, and the entire roof bodily removed and a new roof substituted. For this purpose a crane way is provided above the furnace as clearly indicated in Figure 6, so that a crane 24 may be used to lift the roof from the furnace. In order to facilitate the lifting of the roof from the furnace by a crane, suitable eyes 25 are provided in the supporting structure 8, to which the crane sling 25ª may readily be attached. It will be understood that while only two of the eyes 25 are shown in Figure 6, four are provided, as shown in Figure 1, the other two being on the opposite side of the roof from the ones shown and in line with the eyes 13 and 14.

In order to facilitate the handling of the material in making up a heat charge I provide storage bins 26 adapted to contain a supply of ore and limestone, which are adapted to discharge through bottom outlet ports 27 into self-propelled larry cars 28 traveling on the track 29. The track 29 extends from the bins 26 along the ground level and passes alongside of a car dumper 30, which is adapted to dump loaded railway cars 31 of scrap metal used in making up the heat charge. The track 29 is elevated on a trestle 32 from a point adjacent the car dumper to a point adjacent the furnace A, where it is again extended on a level plane parallel with the ground but in an elevated position slightly above the side walls of the furnace, so as to permit the larry cars 28 to

discharge through the open top of the furnace.

It will be understood that various modifications in the construction and arrangement of the various apparatus may be made without changing the steps of the following method, for instance a plurality of the furnaces A may be provided and the track 29 continue past all of them, and storage bins similar to the bins 26 may be provided to contain the scrap metal to be charged instead of dumping such metal directly into the larry cars from the railway cars.

In operating the above described apparatus in carrying out my method, the larry cars 28 are first placed under the bins 26 and a predetermined amount of limestone and ore, to be used in making up the heat, is discharged into the cars. Preferably the larry cars 28 will be of such size that two will be sufficient to hold all the material charged in one heat, although this is not essential and a greater or less number of cars may be used as desired. The limestone and ore loaded in the cars may be measured in any well known manner, such as weighing, in order to make certain that the correct quantity is deposited in the cars. After the larry cars 28 have received their charge of limestone and ore from the bins 26 they are propelled along the track 29 to the car dumper 30, and the car dumper operated to load a sufficient quantity of scrap metal into the larry cars to complete the heat charge for the furnace. When a sufficient quantity of scrap has been deposited in the larry cars 28 they are propelled along the track 29 and up the inclined end next to the furnace A until they reach the level portion of track alongside the furnace A, where they will be stopped. The motor 21 will then be started to operate the shaft 20 and cause the cables 11 and 12 to be wrapped on the drums 18 and 19, thus raising the roof of the furnace. When the roof of the furnace has been raised the larry cars 28 will be operated to discharge their contents into the furnace and the roof of the furnace again lowered to closed position, and the furnace will be in readiness to be fired.

From the above it will be readily seen that the entire time necessary to make up the heat charge of limestone, ore and scrap and to charge the furnace is reduced to the minimum.

I claim:—

1. The method of charging open-hearth furnaces having top walls adapted to be opened to admit the charge, which consists in making up a heat in suitable conveying means, causing said conveying means to be moved into a position to discharge the heat into the furnace through the open top thereof, opening the top of said furnace and causing said conveying means to discharge said entire previously made up heat into said furnace in one operation.

2. The method of charging open-hearth furnaces having top walls movable relative to the side walls so as to permit the opening thereof to admit the charging of an entire heat, which consists in making up a heat of the materials to be charged in suitable cars, moving said cars into a position to discharge through the open top of said furnace, moving the top wall of said furnace to open position, and then causing said cars to discharge their contents, comprising the heat, into the furnace.

3. An open-hearth furnace plant comprising in combination at least one open-hearth furnace having a roof portion movable relative to the side walls of the furnace, so as to permit sufficient movement of the roof to form an opening through which a heat may be charged, means for moving said roof, a plurality of bins for containing the material to be charged located adjacent to said furnace, a track extending from said bins along the one side of said furnace and elevated at said furnace so that cars traveling on said track may discharge their contents through the open top of said furnace, and cars traveling on said track adapted to receive sufficient materials from said bins to form a complete heat.

4. An open-hearth furnace plant comprising in combination at least one open-hearth furnace having a roof portion movable relative to the side walls of the furnace, so as to permit sufficient movement of the roof to form an opening through which a heat may be charged, means for moving said roof, a plurality of bins for containing the material to be charged located adjacent to said furnace, a car dumper for dumping cars of scrap metal located between said bins and said furnace, a track extending from said bins along the one side of said car dumper and along said furnace, said track being elevated along said furnace so that cars traveling on said track may discharge their contents through the open top of said furnace, and cars traveling on said track adapted to receive sufficient materials and scrap from said bins and car dumper respectively to form a complete heat.

5. An open hearth furnace plant comprising in combination at least one open-hearth furnace having a top wall portion hinged along one side wall and adapted to open along the other side wall to form an opening through which a heat may be charged, means for opening said roof portion, a plurality of bins for containing the materials to be charged located adjacent said furnace, a car dumper for dumping cars of scrap metal, said car dumper being located at a point between said bins and said furnace, a track extending from said bins along the

one side of said car dumper and along the one side of said furnace, said track being elevated along the length of said furnace so that cars traveling on said track may discharge their contents through the open top of said furnace, and self-propelled larry cars traveling on said track adapted to receive sufficient materials and scrap from said bins and car dumper respectively to form a complete heat.

6. An open-hearth furnace comprising a hearth, side and end walls, and a roof hinged along one side wall and adapted to be opened to permit the charging of a heat of material to be melted.

7. An open-hearth furnace comprising a hearth, side and end walls, a roof hinged along one side wall and adapted to be opened to permit the charging of a heat of material to be melted, a suitable supporting structure above said furnace, a pair of shafts journaled in said structure and extending longitudinally of said furnace, drums on one of said shafts, sheaves on the other of said shafts, flexible lifting members carried by said drums and adapted to be wrapped thereon, said members being trained over said sheaves and secured to said furnace top, and means for rotating said shafts to cause said flexible means to be wrapped upon said drums to raise said furnace top to open position and to be unwrapped from said drums to lower said furnace top to closed position.

In testimony whereof, I have hereunto signed my name.

EDWARD FITZGERALD.