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 APPARATUS FOR HANDLING MATTE AND SLAG OF COPPER BLAST FURNACES.
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2 SHEETS—SHEET 1.

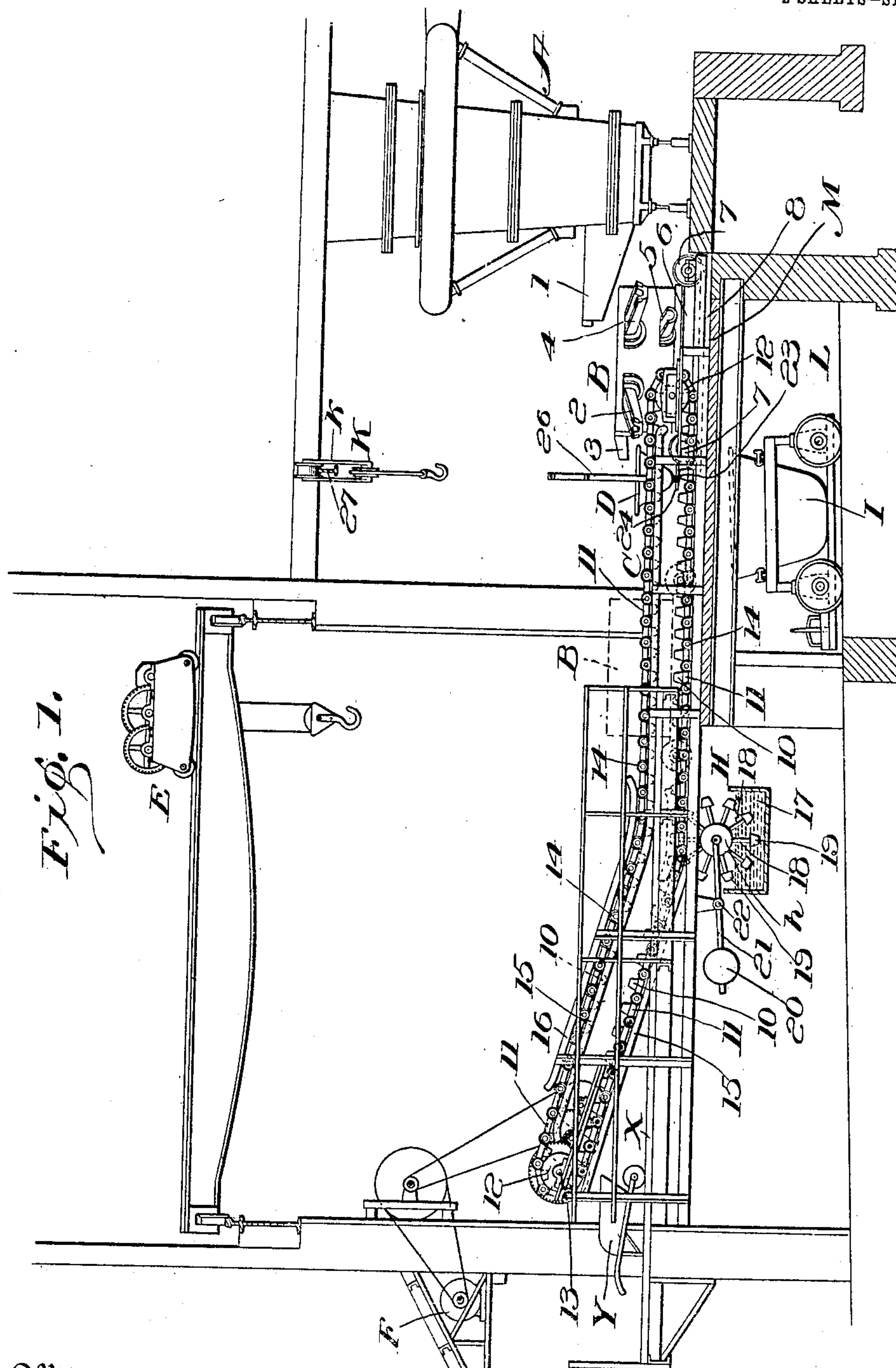


Fig. 1.

Witnesses
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UNITED STATES PATENT OFFICE.

GEORGE K. FISCHER, OF NEW ROCHELLE, NEW YORK.

APPARATUS FOR HANDLING MATTE AND SLAG OF COPPER BLAST-FURNACES.

No. 906,622.

Specification of Letters Patent.

Patented Dec. 15, 1908.

Application filed June 12, 1907. Serial No. 378,477.

To all whom it may concern:

Be it known that I, GEORGE K. FISCHER, a citizen of the United States, and a resident of New Rochelle, county of Westchester, and State of New York, have invented certain new and useful Improvements in Apparatus for Handling Matte and Slag of Copper Blast-Furnaces, of which the following is a specification.

This invention has for its object the provision, in a copper smelter, of a system of handling the matte and slag, which will introduce important economies in the separating of the matte from the slag and the conveyance of each from the settler to predetermined places; the elements of the system herein disclosed being so related to each other as to permit the operations to be performed continuously and to reduce to a minimum all manual labor, and further to maintain a clear working floor around the furnace upon which the workmen may operate without discomfort. In pursuance of this object, a system, as herein shown, has been devised wherein a copper blast furnace delivers its products to a settler which may be of the intermittent, but preferably is of the continuous type; and from the respective slag and matte outlets of which the slag products and matte products are delivered, the latter to an endless series of traveling molds by which they are conveyed from the furnace room, across the main building and to a suitable place of discharge which preferably is contiguous to the cars by which the matte products are to be hauled away; while the slag products are discharged from the settler into a primary slag pot which is arranged over a tunnel having a double track, each for a slag car, the slag pot being adapted to discharge its products into either of the cars, whereby there will be no appreciable intermissions in the delivery of the slag from the settler and slag pot. Along the path of travel of the molds with the matte, cooling means may be arranged whereby the matte is sufficiently cool when at the discharge place to leave the molds freely, and in the path of return travel of the molds there is a mold swabbing apparatus of special form, hereinafter fully set forth.

Having thus in a general way set forth the invention, I will next proceed to describe what I at present regard as the most efficient means for carrying the invention into practice, but it is to be understood that many

other forms than those herein set forth, and many apparently widely different variations of the invention may be made within the scope of the appended claims and without departing from the spirit of the invention, for which reason the forms of devices herein described, or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

In the drawings, wherein like characters of reference designate like parts in the several views: Figure 1 is a side elevation of a system exemplifying the best form of the present invention, and Fig. 2 is a plan view of the same.

A designates a copper blast furnace of usual or suitable construction, from which the products are discharged through the spout 1.

B designates the settler which receives these products and within which the slag and matte are separated by gravity, the matte descending. This settler is provided at suitable places with spouts 2 and 3, of which the spout 2 delivers the overflowing matte to the conveyer C, while the spout 3 discharges the overflowing slag into a primary slag pot D. The preferred construction of the settler is divided by a partition B' into two compartments B² and B³. The partition B' does not extend to the bottom of the settler B. In this construction the material discharges from the spout 1 into the compartment B². The matte being heavier than the slag, descends to the bottom and comes up under the bottom of the partition B' into the compartment B³ free from slag, the slag rising to the top in the compartment B² and passing out through the spout 3. The form of settler preferably used is of the continuous discharge type; that is, one in which both the slag products and the matte products are discharged continuously through the respective slag and matte discharge spouts. The settler herein shown is also provided with an auxiliary matte discharge spout 4 which is intended to be used when the conveyer is out of service, and with a further auxiliary discharge spout 5, which is arranged at its bottom and through which its contents may be withdrawn when it is desired to empty it. This settler is preferably removably mounted upon a truck 6 having wheels 7 which travel upon a track 8, so that it may be moved from its operative position, shown in full lines in Fig. 1, away from the furnace, to the posi-

tion shown in dotted lines in said figure, where it may be lifted from the truck by an overhead crane E and its place taken by another settler whenever such change of settlers is desirable or necessary, the change referred to being thus readily and quickly made.

It is apparent that a crane may be arranged to run directly over the place occupied by the settler when the latter is in operative position, in which event there would be no necessity for mounting the settler for such movement away from the furnace; but I prefer the arrangement illustrated, for the reason that it avoids the necessity of equipping the plant with a special crane, by enabling the use for this purpose of the general crane E which in most modern plants is so arranged that it may be employed when provision is made for the described travel of the settler to and from the furnace.

The conveyer C is composed of a series of flexibly connected molds 10 having provision for causing the same to travel so as to present the molds successively to the matte spout 2 for the supply of matte thereto at the charging station, and successively to discharge the matte at the discharging station. As herein shown, the conveyer is of the chain type, having a series of links 11 at each side thereof, pivotally connecting the molds 10 and running over sprockets 12, the shaft of one of which, as for example the shaft 13, is suitably geared or belted with a source of power which preferably is an electric motor F. The pivots of the links are provided with wheels 14 which run on tracks 15 and cause the conveyer to operate with a minimum of friction and support it against tendency to drag. At the discharge end, the conveyer travels in an upwardly inclined plane, affording a space beneath it, upon the floor X for a wheel barrow Y, which is shown as placed to receive the matte automatically discharged from the molds when the latter turn around the sprocket 12 to the position in which they open downward. By means of these barrows the matte may be carried from the conveyer to the cars or other places intended to receive the same. While this is a desirable arrangement, it will be apparent that it will not be a departure from the spirit of the invention to arrange the conveyer to discharge directly into a railroad car, or a bin or other receptacle for the matte.

When it is considered to be necessary to artificially chill the matte in order to insure its proper discharge from the molds cooling means adapted to accomplish such purpose may be arranged at a suitable place or places in the travel of the molds, as usual in this or analogous classes of apparatus.

Above the inclined portion of the conveyer C guide rails 16 are arranged to hold the wheels 14 downward upon the tracks 15.

Contiguous to the returning portion of the conveyer there is arranged a mold swabbing device H, the construction of which constitutes one of the important features of the invention. This swabbing arrangement consists of a tank 17, containing a lime solution and a wheel *h* mounted contiguous to said tank and provided with a series of radiating arms 18, the outer ends of which carry swabs or mops 19 which are approximately of the same shape and size as the interiors of the molds. The relation of these arms and swabs to the molds 10 is such that each mold will be entered by a swab and the travel of the molds will cause the swab wheel to turn automatically, thus causing the molds to be swabbed while they are in motion and each swab to receive a renewed supply of solution between each of its swabbing operations, all without special operating means for the swabbing mechanism. The wheel is yieldably pressed into the path of the flexibly connected series of molds, and thus maintained in proper position for operation thereon; preferably, by means of a counterweight 20 which is mounted upon an arm 21 which is pivoted between its ends, as at 22, and is suitably connected to the wheel. This counterweight may be adjusted to subject the wheel and the swabs to the desired pressure and to permit the pressure to be varied.

As already stated, a primary slag pot D is arranged to receive the slag which overflows thereinto from the settler B, through the spout 3. This slag pot discharges its contents into a secondary slag pot, herein shown as forming part of a slag car arranged beneath it. It is one of the important features of the present invention to make provision for a continuous discharge from the primary slag pot. To this end provision is made for the arrangement of two slag cars I and J, side by side, beneath the slag pot D and for the discharge of the slag into the latter alternately, so that one car may be receiving a charge of slag while another may be carrying off its charge, or is returning to its charge-receiving position or has returned and is in position to receive its supply immediately upon the completion of the filling of the first car. The slag pot D herein shown and preferred, is pivotally mounted at 23 upon a bracket or other suitable support 24, carried by the truck 6 of the settler B. It may thus be turned to present its spout 25 to either of the cars I or J. It is also provided with a bail 26, or other suitable device, for convenience in lifting it from its support and carrying it when it is desired to replace it by a fresh pot. A carrying means for the slag pot, consisting of an overhead trolley K comprising a wheeled carrier *k* mounted on a track 27, is shown in Fig. 1. It is apparent that this trolley may be employed not only to transport the primary slag pot D, but may

also be employed to hold it while it is in use, thus dispensing with the necessity of pivotally mounting the pot on a support such as that hereinbefore referred to. The slag pot 5 D also serves as a secondary settling pot, and in it the matte which may not be caught in the settler B is collected and saved. In this pot there is a tendency to form, when the pot is filled, a crust over the top of the slag, except at the place where the hot stream flows into the pot from the spout 3. In order to avoid the necessity of breaking the crust each time the pot is turned to deliver from one car to the other, it thus becomes important to discharge the slag into the pot at the same place at all times. To this end, the spout 3, as herein shown, is so arranged as to deliver the slag contiguous to the axis of the turning movement of the pot D, whereby the 20 opening maintained by the stream of falling slag is always fixed with relation to the spout 3.

It is one of the important objects of the present invention to so arrange the parts of the system that a clear space for the workmen is provided around the furnace and settler, in which they may work without being interfered with by accumulations of slag and with an entire freedom from the effects 30 of the intense heat which rises from slag pots as now used for the conveyance of slag from the settler. To this end the slag cars I and J are arranged in a tunnel L, over which is a floor or platform M upon which the workmen 35 may stand. This floor has an opening *m* over the cars, through which the latter receive the slag from the pot D, and through this opening all accumulations of slag, run-aways, etc., may be thrown from the floor 40 into the slag cars below. In the bottom of this tunnel is arranged a double track N, N' for the cars I and J and these tracks, in practice, are joined by a switch and eventually join a main slag track which serves all the 45 furnaces of the plant and upon which all the cars are moved to the slag dump, or other place intended to receive the slag. The cars may be moved by any suitable source of power, as for example, an electric locomotive. 50

In large plants there will be a number of furnaces A, and in such case the system herein shown will be provided for each furnace, each system serving its own furnace 55 independently of every other.

From the foregoing, the operation and advantages of the system will readily appear, and it will be noted that as already stated, the invention is not restricted to the details 60 shown. I desire it also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention, which, as a matter of language, might be said to fall 65 therebetween.

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

1. A system of the kind set forth, having a means for separating slag and matte, a working floor contiguous thereto, a tunnel arranged beneath said floor and adapted to receive a plurality of slag receptacles side by side, said receptacles mounted to be moved through said tunnel and said floor having an opening to the tunnel, and means for delivering slag from the separator through the opening and to either of the receptacles. 75

2. A system of the kind set forth, having a means for separating slag and matte, a working floor contiguous thereto, arranged to provide a tunnel beneath it, side-by-side tracks in said tunnel, a slag car for each of said tracks, said floor having an opening to the tunnel, and means for delivering slag from the separator, through the opening and to the slag cars, said means adjustable to deliver to either of said cars. 80

3. A system of the kind set forth, having a means for separating slag and matte, a working floor contiguous thereto, arranged to provide a tunnel beneath it, side-by-side tracks in said tunnel, a slag car for each of said tracks, said floor having an opening to the tunnel, and a movable slag pot arranged between the settler and the tunnel and adapted to deliver slag through said opening and to either of the cars. 85

4. A system of the kind set forth, having a means for separating slag and matte, provided with separate slag and matte outlets, a traveling conveyer for the matte, a working floor, a tunnel beneath the floor and adapted to receive a plurality of slag receptacles side by side, said floor having an opening to the tunnel, and movable means arranged between the slag outlet of the separator and the slag receptacles to deliver slag to either of the latter. 90

5. A system of the kind set forth, having a means for separating slag and matte, provided with separate slag and matte outlets, a traveling conveyer arranged to receive the matte from the matte outlet of the separator and adapted to carry the same therefrom, a primary slag receptacle arranged to receive the slag from the slag outlet of the separator, a working floor contiguous to said separator and receptacle, a tunnel beneath the floor, said floor having an opening leading to the tunnel, side-by-side tracks in the tunnel, and slag cars for said tracks, said primary receptacle adapted to discharge into a car on either of the tracks. 110

6. A system of the kind set forth, having a means for separating slag and matte, provided with separate slag and matte outlets, a traveling conveyer for the matte, a primary slag receptacle, a working floor contiguous to the separator and primary receptacle, a tunnel 125

nel beneath the separator and floor, and a movable slag receptacle arranged in the tunnel and adapted to receive the slag from the primary slag receptacle.

7. In a system of the kind described, the combination with a slag and matte separator, of a primary slag receptacle, a plurality of side by side slag receptacles, and means whereby the primary receptacle is thrown into operative relation with either of the other slag receptacles.

8. In a system of the kind described, the combination with a slag and matte separator, of a primary slag receptacle provided with means whereby it may deliver slag to either of a plurality of different places.

9. In a system of the kind described, the combination with a slag and matte separator, of a plurality of slag receptacles, arranged side by side and a movably mounted primary slag receptacle arranged between the separators and said plurality of receptacles and adapted to discharge into either of the latter.

10. In a system of the kind described, the combination with a slag and matte separator, of a pivoted primary slag receptacle, and a slag pot adapted to receive the slag therefrom.

11. In a system of the kind described, the combination with a slag and matte separator of a support connected therewith and a primary slag receptacle pivotally mounted on said support.

12. In a system of the kind described, the

combination with a slag and matte separator, a wheeled support therefor, and a pivoted primary slag receptacle carried by said support.

13. In a system of the kind described, a conveyer comprising a traveling series of molds, in combination with a rotative swabber for the molds, having ends which enter the molds, a pivoted arm carrying the swabber and a counter-weight mounted on the arm and pressing the swabber toward the conveyer.

14. In a system of the kind described, the combination of a receptacle adapted to turn, and a slag and matte separator having means for discharging slag into said receptacle approximately at the axis of the turning movement thereof.

15. In a system of the kind described, slag receptacles, a slag pot mounted above said receptacles and adapted to be turned to deliver to either of the latter, and a slag and matte separator having means for the discharge of slag into said pot at approximately the axis of the turning movement of the latter.

In witness whereof I have hereunto set my hand at Salt Lake City, county of Salt Lake, State of Utah, this fourth day of June, 1907.

GEO. K. FISCHER.

In presence of—

E. B. WICKS,
E. H. JOHNSON.