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CHARGING DEVICE FOR A METALLURGICAL FURNACE

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FIG. 1

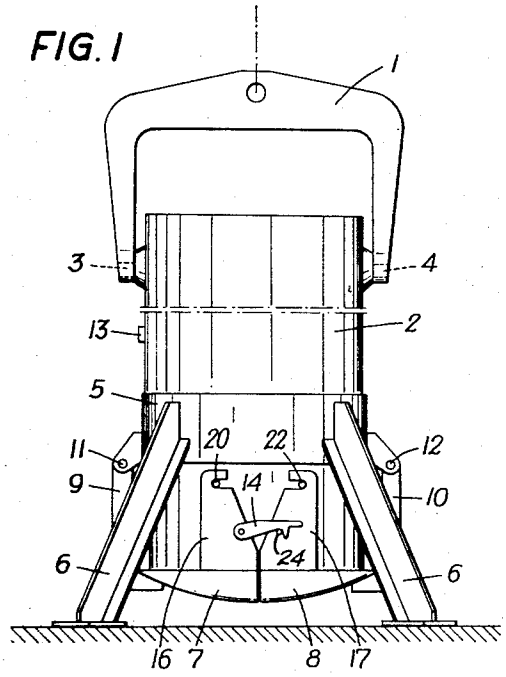
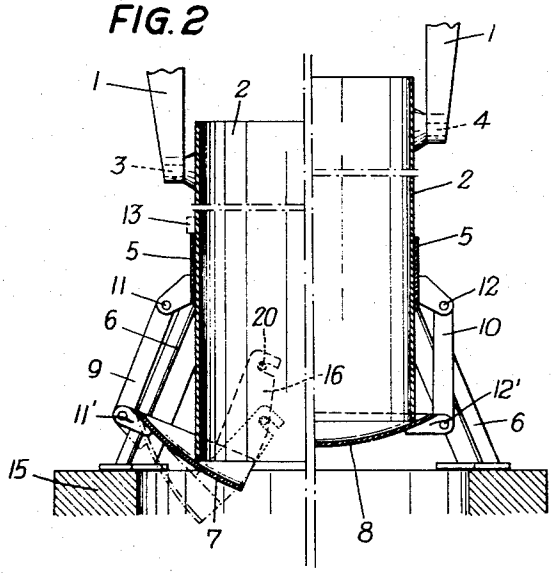


FIG. 2



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CHARGING DEVICE FOR A METALLURGICAL FURNACE

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ABSTRACT OF THE DISCLOSURE

A charging device for a metallurgical furnace comprises a tubular charging shell which is movable within a mounting ring stand. The shell has a bottom closure that will be opened when the shell is moved downwardly relative to the ring stand.

This invention relates, in general, to apparatus for use with metal furnaces and, in particular, to a new and useful charging device for facilitating the charging of metallurgical furnaces.

It is usual to charge metal furnaces from the top by hand. The material to be charged (scrap, chips, recirculated material, etc.) is manually introduced with a shovel directly to the top charging opening into the interior of the furnace provided for melting the metal, or, the material is piled up at the rim of the charging opening of the furnace and it is thereafter thrown in. If the furnace for melting the metal contains some molten material already, the operators while performing the work of charging the furnace are endangered by a possible spattering of the molten metal during the charging process. This danger is not even restricted to definite brief charging periods becaune metallurgical furnaces which operate at high rates require continuous charging by the operators.

In accordance with the present invention, there is provided a charging device for metallurgical furnaces, particularly for induction heated crucible furnaces which include a charging basket comprising a shell and mounting stand therefor which facilitate the charging of large quantities of material into a furnace without danger to the operator.

The apparatus of the invention advantageously includes a basket made up of a carrying frame, a cylindrical shell and two bottom flaps which are pivotally mounted on the shell which may be pivoted outwardly in order to discharge the material from the shell into the furnace. In a preferred arrangement, the bottom closure for holding the material within the shell advantageously includes separable flaps which are made of a curved configuration so that there will be a tendency for the weight of the material within the container to urge the two separable parts outwardly for the dumping of the material into the furnace. The closure flaps are such that they may be interlocked in their closed position and either automatically or manually unlocked when the carrying frame is placed at the rim of the charging opening of the furnace to be charged. The opening defined by the flaps is determined by the height of the basket over the charging opening.

In a preferred form, the complete charging basket including the supporting frame and the shell for the charging materials is formed as an integral unit which may be suspended, for example, from a crane using a lifting arm connected to the upper portion of the shell. In this manner, after the shell is charged, the complete basket may be moved to a position overlying the furnace opening and lowered onto the rim thereof to facilitate the discharge of the products into the furnace.

A further feature of the construction is that the shell

is suspended, e.g., by means of a hook and rope from a lifting gear, e.g., a crane, so that it can be lowered to any desired level over the charging opening of the furnace to be charged. This enables a charging of a predetermined amount of material to the furnace to be charged and consequently an extremely exact charging of relatively large amounts of material. As the material being charged falls centrally through the charging opening of the furnace the ceramic crucible of induction heated furnaces is preserved so that a long life for such a crucible is insured. This is another important advantage of the charging device according to the invention.

In accordance with another feature of the invention, the carrying frame or support is provided with a cylindrical ring into which the shell may be placed which supports the carrying arms for the separable bottom flaps which may be pivoted outwardly on these arms and additional arms pivoted to the shell for discharging the material from the shell. The bottom flaps are formed with a cylindrical or spherical interior surface having a radius of curvature corresponding to the length of the pivoted arms which support the flaps. The depth of the curvature of the bottom flaps is about ¼ of the radius of curvature. The shell is normally connected to the ring support through holding arms which are carried by the inner ends of the bottom flaps and pivotally held by respective opposite sides of the shell. In the closed position of the flaps the holding arms extend vertically upwardly from the bottom of the shell and engage over pivot pins to hold the ring bottom flaps and shell together. The bottom flaps may be locked in a closed position by a dog which is pivotally carried on one holding arm and engages over a pin on the other holding arm.

The ring support member is supported on a plurality of legs which may be arranged so that they may straddle around on the rim of the furnace to be charged. The ring platform is secured to the shell through the holding arms so that the shell and the platform may be removed to another location for the filling of the shell with materials to be charged into the furnace. After filling, the holding arms for the bottom flaps are unlocked which permits them to open under the weight of the shell and the charging materials as the shell moves downwardly in the ring support until a stop defined on the exterior thereof abuts the top of the ring element.

Accordingly, it is an object of the invention to provide a metallurgical furnace charging device which includes a shell member which is arranged to cooperate with a ring support and wherein there is provided pivotal flap members for closing the bottom of the shell when it is in the support, the flap members being pivotal outwardly to permit dumping of the charge material directly into a furnace over which the support is set up.

A further object of the invention is to provide a device for charging a furnace which includes a charging shell which may be filled with the material to be charged in the furnace and, which includes bottom flaps which are held together below the shell but which include curved inner surfaces which will facilitate the gradual opening of the flaps after they are unlocked.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its opeerating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a side elevational view of a charging device constructed in accordance with the invention; and

FIG. 2 is a transverse sectional view of the charging device indicated in FIG. 1 with the bottom flaps of the device shown in an opened position in the lefthand portion of the drawing.

Referring to the drawings, in particular, the invention embodied therein comprises a charging device which constitutes a basket made up of a cylindrical shell 2 and a support member comprising a ring 5 which is supported on the legs 6. The cylindrical shell 2 is of a size to permit it to be freely moved upwardly and downwardly within the ring 5.

In order to facilitate moving the shell 2 within the ring 5 or lifting of the combined basket including the ring 5 and the shell, the shell 2 is provided with pivot mounts 3 and 4 for a suspension gear or carrying arm 1 which, for example, may be connected to a hook (not shown) of a lifting device.

A feature of the invention is the arrangement for closing the shell 2 to retain the charged materials therein until they are to be dumped into a furnace having a rim 15. In the embodiment illustrated, the bottom of the shell 2 is closed by flaps 7 and 8 which are pivotally mounted by means of rigid bracket elements 11' and 12' adjacent their outer ends on respective arms 9 and 10 which are pivoted on respective brackets 11 and 12 carried by the ring 5. The inner ends of the flaps 7 and 8 are rigidly connected to the lower ends of upstanding holding arms 16 and 17. The upper ends of the holding arms 16 and 17 are pivotally supported on the shell on pivots or trunnions 20 and 22 formed on the exterior of at least one side of the shell. In the closed position indicated in FIG. 1 the holding arms 16 and 17 extend substantially vertically and they are locked together by a pawl 14 which is pivoted on arm 16 and engages over a pin 24 on the arm 17. The combined basket including the shell 2 and the ring 5 are connected together through the bottom flaps 7 and 8 and the pivotal connection of supporting arms 9 and 10 to the ring 5 and the pivotal connection of the holding arms to shell 2.

After the shell is charged with material and the basket is located over the furnace rim 15, the holding arms 16 and 17 are unlocked by opening the dog 14 to permit the bottom flaps 7 and 8 to pivot outwardly with the associated arms 9 and 10 in accordance with the downward movement of the shell with pivots 20 and 22. In order to facilitate the outward movement of the flaps 7 and 8, they are formed with concave interior surfaces so that the weight of the material acting thereon has a tendency to force the flaps to an outward opened position.

In accordance with another feature of the construction, the shell is provided with a stop or annular ring projection 13 formed at a location sufficiently above the ring stand 5 to permit the shell to move downwardly against the bottom flaps as the material is being discharged. The lowermost movement of the shell 2 is determined by the location at which the stop 13 contacts the ring stand 5.

In the charging position, the bottoms of the legs 6 are engaged around the rim 15 of the furnace and the shell 2 is centered over the opening defined within the rim. The interlocking means 14 may be released by hand or automatically and the material in the shell will fall centrally into the interior of the furnace through the opening which is defined wihin the two bottom flaps parts 7 and 8 when they are moved apart.

The amount of material to be charged into the furnace will depend on the size of the opening defined between the flaps 7 and 8 and this may be adjusted in accordance with the amount the shell is lowered within the ring 5.

What is claimed is:

1. A charging device for a metallurgical furnace comprising a mounting ring stand, a tubular charging shell within said ring movable upwardly and downwardly relative to said ring stand, a bottom closure for said shell comprising two separate flap members adapted to be positioned together below said shell for closing the bottom of said shell and being separable for opening the bottom of said shell, and means mounting said bottom flap members for movement apart to open said shell bottom and movement together to close said shell bottom, said bottom flap members being pivotally mounted adjacent their one ends on said ring stand and pivotally connected to said shell adjacent their opposite ends, said ring stand including a ring member in which said charging shell is displaceable within the limits of the pivotal connections of said flaps to said shell, said flaps being located below said ring member when in a closing position.

2. A charging device for a metallurgical furnace according to claim 1, comprising a mounting ring stand, a tubular charging shell within said ring movable upwardly and downwardly relative to said ring stand, a bottom closure for said shell comprising two separate flap members adapted to be positioned together below said shell for closing the bottom of said shell and being separable for opening the bottom of said shell, and means mounting said bottom flap members for movement apart to open said shell bottom and movement together to close said shell bottom, said ring stand comprising a ring member, leg means supporting said ring member at a predetermined elevation, said means mounting said bottom flaps including lever means pivotal on said ring member and carrying said flaps adjacent their one ends, said flaps having holding arms connected to their respective inner ends and extending upwardly therefrom and means pivotally holding said holding arms on said shell.

3. A charging device for a metallurgical furnace, according to claim 2, where in said flaps are convexly curved on the interior, the curvature being such that weight acting downwardly on said bottom flaps tends to open them.

4. A charging device for a metallurgical furnace, according to claim 3, including means for locking said charging flaps together to close the area below said shell.

5. A charging device for a metallurgical furnace, according to claim 4, wherein said shell may be lowered downwardly in said ring member against said bottom flaps to open them.

6. A charging device for a metallurgical furnace, according to claim 5, including an annular stop member defined on said shell at a location above said ring member permitting lowering of said shell until said stop member contacts said ring member.

7. A charging device for a metallurgical furnace comprising a mounting ring stand, a tubular charging shell within said ring movable upwardly and downwardly relative to said ring stand, a bottom closure for said shell comprising two separate flap members adapted to be positioned together below said shell for closing the bottom of said shell and being separable for opening the bottom of said shell, and means mounting said bottom flap members for movement apart to open said shell bottom and movement together to close said shell bottom, said ring stand including an annular ring member, a plurality of legs supporting said ring member at a fixed elevation, an annular stop defined on the exterior of said shell above said ring member limiting the lowermost movement of said shell within said ring member to the position at which said annular stop contacts said ring member, a pivot arm pivotally connected to said ring member at diametrically opposite sides thereof and connected to respective ones of said flap members, said bottom flaps having a portion forming a cylindrical surface with a radius of curvature which is equal to the length of said pivot arms, a holding arm connected to each of said bottom flaps and extending upwardly from the ends thereof, means pivotally connecting the upper end of said holding arms to said shell, latch means connected to said holding arms for latching said holding arms together when said flaps are in a closed

position, said shell being adapted to bear against the inside surface of said flaps and being movable downwardly upon release of said latch means and outward pivoting opening movement to said flaps.

8. A charging device for a metallurgical furnace, according to claim 7, including a bracket secured to said ring member on respective diametrically opposite sides thereof pivotally supporting said pivot arm members for said respective flaps.

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