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 [31] **P 15 83 238.9**

3,258,256 6/1966 Brooke..... 266/34
 3,362,548 1/1968 Cunningham..... 214/138
 1,615,284 1/1927 Kennedy..... 214/141

FOREIGN PATENTS

850,235 7/1949 Germany..... 266/37

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[54] **DEVICE FOR SLAGGING OF THE BATH SURFACE OF A MELTING BATH OF A METALLURGICAL FURNACE**

9 Claims, 6 Drawing Figs.

[52] U.S. Cl..... 266/37,
 266/1 R, 209/493, 210/527

[51] Int. Cl..... F27d 23/00

[50] Field of Search..... 266/37, 33,
 34, 1, 38; 214/1.1, 141; 209/493; 210/221, 527

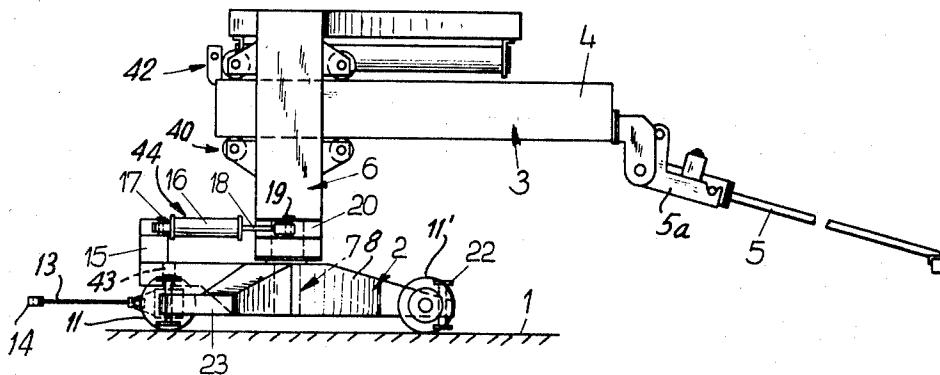
[56] **References Cited**

UNITED STATES PATENTS

3,080,840 3/1963 DeMan..... 214/141
 3,148,788 9/1964 Ferwerda..... 214/141
 3,204,720 9/1965 Eitel..... 214/141

ABSTRACT: A device for slagging of the bath surface of a melting bath of a metallurgical furnace comprises a moving vehicle or car having wheels adapted for movement over the ground or a track surface and including a pivotal column on the car which carries a rake which may be moved outwardly or inwardly in respect to the pivotal column. The column is pivotal about a vertical axis by means of a fluid control piston and cylinder combination which is mounted on the car. The car carries jacking elements adjacent the wheels for lifting the car off the wheels in order to mount it firmly in position during operative raking, for example.

An alternate embodiment includes a fixed mounting adjacent a metallurgical operation which pivotally supports a column carrying a traverse with guide pulleys for a track carrier for a rake which moves inwardly and outwardly thereon. The column is pivotal with the track carrier about a vertical axis and the track carrier carries a car, which may be movable backwardly and forwardly therealong, and which supports the inner end of the rake.



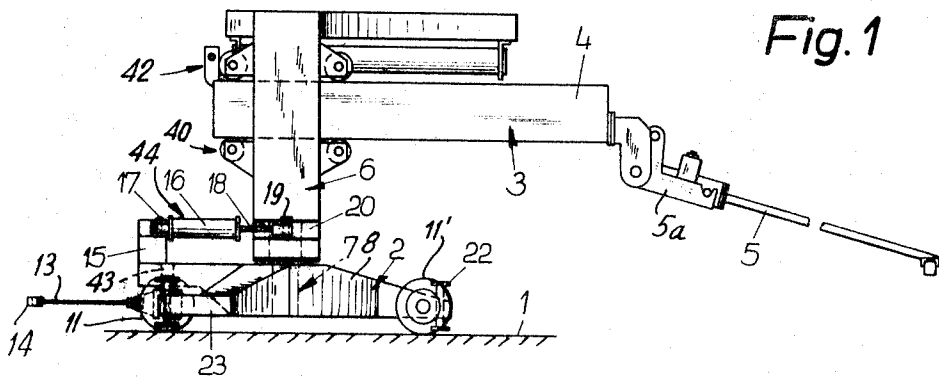


Fig. 1

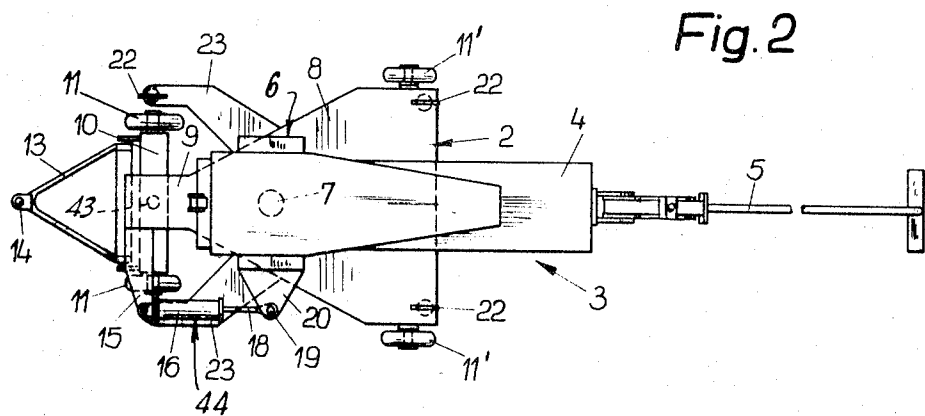


Fig. 2

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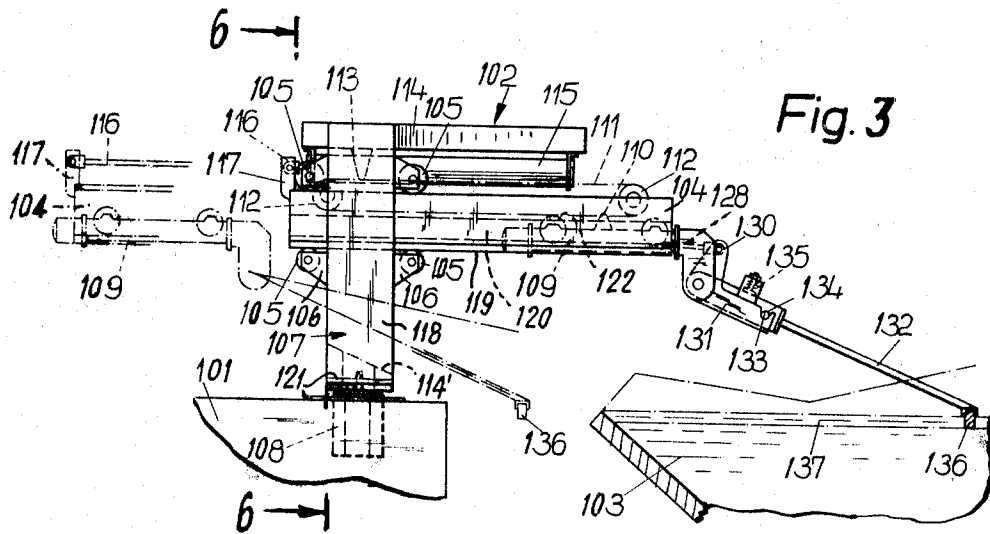


Fig. 3

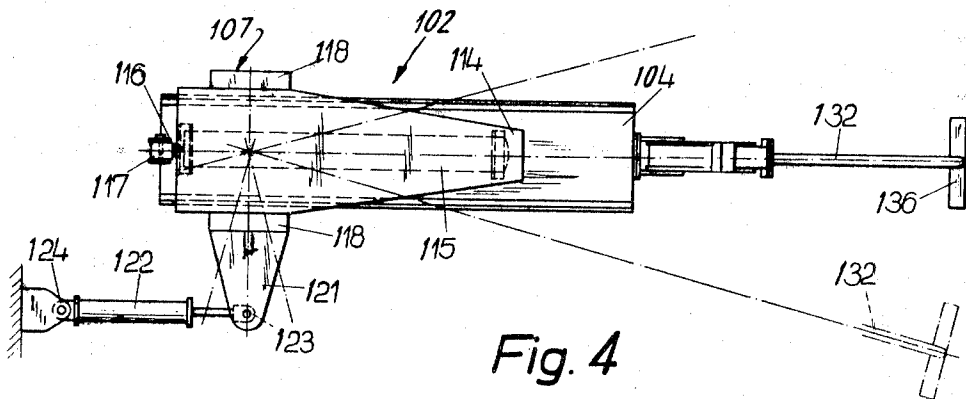


Fig. 4

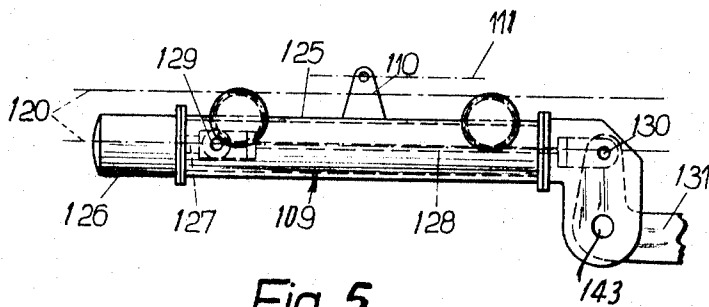


Fig. 5

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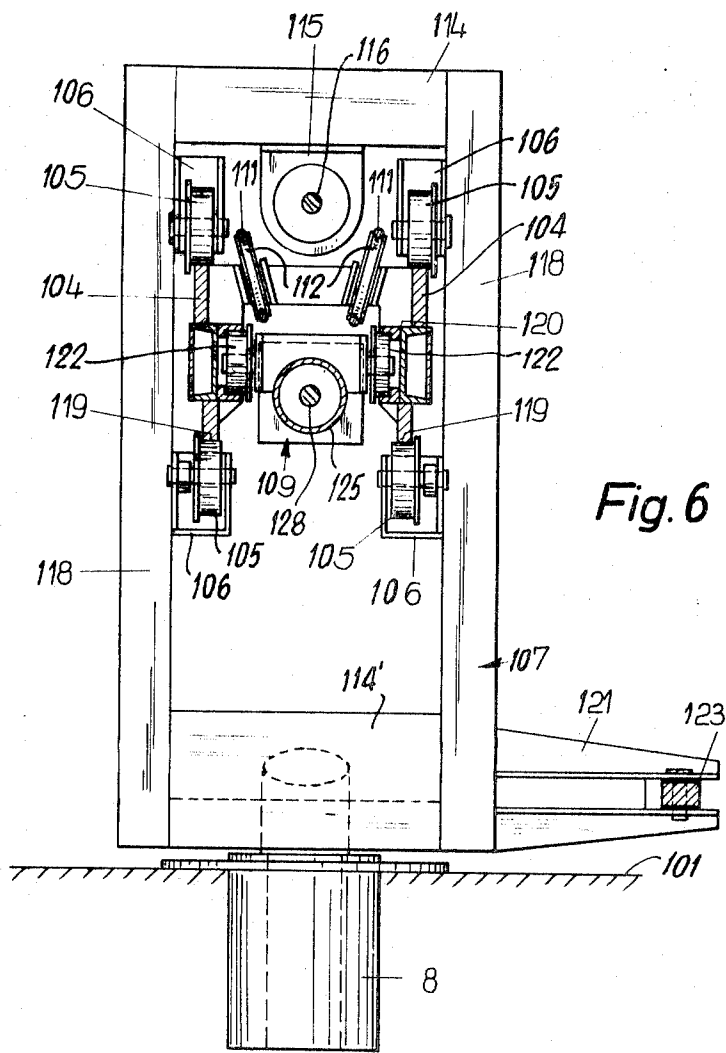


Fig. 6

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DEVICE FOR SLAGGING OF THE BATH SURFACE OF A MELTING BATH OF A METALLURGICAL FURNACE

This invention relates in general to metallurgical furnace accessory equipment and, in particular, to a new and useful device for slagging off the bath surface of a melting bath tank which includes a rake which moves in the slag skimming direction or transversely thereto and is carried on a vehicle which is movable backwardly and forwardly in respect to the furnace.

In order to slag a metallurgical furnace, the furnace haul crane of a steel mill brings the ladles into the range of the furnace. In planning a steel mill, the material flow is particularly important, and this can vary from one mill to the other due to the different sorting arrangements and quantities of materials which are handled. The arrangement of the metallurgical plate halls, their layout as well as the position of the tracks for traveling auxiliary devices, is determined to a great extent by the relation of the metallurgical requirements to the transportation requirements. In general, selection of this layout forms the first basis for the principal structure of the plant whether it be a Siemens-Martin steel mill, a Thomas steel mill, or a blast steel mill. A start is made in this determination based on the amount of liquid pig iron and scrap material which is to be handled as well as the composition of the pig iron. The amount of slag also plays a part.

After the mill has been laid out, the slagging operation can take place only at a point in the mill which has been provided for it and which includes a track for a slag car. The use of a slagging device must depend on the original plant layout through minor variations of the plant are possible. To provide any major change, it has been necessary to modify the platform structure of the plant and this solution represents a problem inasmuch as it is apt to lead to a blockage of the equipment with auxiliary devices so that in some instances inspection of the operations is not easily possible.

In Siemens-Martin mills, the planning of a slagging device permits going down to floor level if other working spaces are not available even though such space is very costly in such steel mills just as it is in the Thomas-type steel mills. In most instances, the space in front of and above the furnaces and converters is already occupied. For example, the storage bunkers for lime and other aggregates are arranged above Siemens-Martin furnaces. A conveyer plant is employed for filling the bunkers and, underneath the bunkers, tracks are provided for hopper trucks. The tracks in front of the furnaces are likewise laid out for short conveyer paths.

Similar conditions exist with converters. Practically only the converter platform is available for additional handling equipment because the space above the furnace next to the smelt flue as well as the space for charging bunkers for aggregates is already occupied by blast lances and similar devices. The space around the smoke nave is thus completely utilized. The pig iron arrives at the inlet of the charging hall from the gas furnace car in the ladle and is transported further from there by means of the charging hall crane. The space in front of the furnace hall is also filled by the crane track. The expansion of the structure is not practically realizable.

In accordance with the present invention there is provided a slagging device which makes it possible to carry out the slagging operation very close to the furnace whether it be a Siemens-Martin type or a steel mill converter. The device includes a car which moves at the level of a working surface. The car includes means for locking it in an operating position and it carries a column which is mounted for rotation about a vertical axis and which serves as a support for the slagging rake. The invention utilizes the fact that the converter platform is greatly occupied with the various operations such as charging with scrap and pig iron but a surface is available between the various working sections on the converter platform on which a traveling slagging device of the type of the invention can perform its operation. The car constructed in accordance with the invention is made so that it can be made to move out of the range of the furnace, for example, to one end

of the converter platform and placed there in an unused area when slagging operation is not being carried out. Such an area can be found even if no vacant surfaces are provided in the original planning of the plant layout.

The car constructed in accordance with the invention includes a vertical column which carries the rake in a manner permitting its inward and outward movement. The column is pivotally mounted upon a platform base which carries wheels which may be moved over the ground or over a track structure. The connection between the mounting on the car and the column includes a hydraulic piston and cylinder combination for the control pivotal movement of the column with the rig.

A further improvement in the car is that the car carries lifting jacks, preferably at three points of the car frame by means of which the wheels can be lifted from the track plane and the car supported in a fixed orientation. Thus, the wheels of the car serve only to bring the car into a position for slagging operation or for storage but the jacks are normally lowered to anchor the device when the slagging operation is carried out.

Accordingly, it is an object of the invention to provide a vehicle for the slagging of metallurgical furnaces which includes a column pivotal on a wheeled platform and carrying a telescopically movable rake.

A further object of the invention is to provide a slagging vehicle which is simple in design, rugged in construction, and economical to manufacture.

A further object of the invention is to provide a metallurgical raking device which includes a column which may be pivotally supported at a location adjacent a metallurgical bath and which carries a traverse with guide pulleys for a track carrier which is guided by the pulleys for inward and outward movement and which, in turn, provides a trackway for a car carrying the slagging rake, the column being pivotal about a vertical axis for shifting the position of the rake.

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 disclosure. For a better understanding of the invention, its operating 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 in preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

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

FIG. 2 is a top plan view of the device indicated in FIG. 1;

FIG. 3 is a view similar to FIG. 1 of another embodiment of the invention;

FIG. 4 is a top plan view of the apparatus indicated in FIG. 3;

FIG. 5 is a side elevational view of the rake car of the embodiment of FIG. 3; and

FIG. 6 is an enlarged vertical section taken on the line 6-6 of FIG. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings in particular, the invention embodied therein comprises a slag car generally designated 2 which is adapted to run over the surface 1. This surface 1 is either at ground level in a Siemens-Martin steel mill or at the level of a working platform.

Depending on whether a pig iron ladle is to be freed of slag in a pit, the car 2 can be moved on the ground or on one of the known converter platforms. The deposit area of the car is not represented but should be selected according to the characteristics of the plant with which the car would be used.

In accordance with the invention, the slagging device 2 carries a space-saving slag-raking mechanism or slag rake boom generally designated 3 which carries a track member or track

car 4 which may be shifted inwardly and outwardly on wheel guides generally designated 40 and 42 which are carried on a vertical pivotal column member or rake station generally designated 6. The guide track member 4 carries the inner end of the slagging bridge or rake 5 in a manner permitting its backward and forward movement with the guide track member 4 during the slagging operation. The slagging rake 5 is formed as a tube or pipe which is carried on an arm 5a of the rake car similar to that shown in FIG. 3. The overall construction of the slag rake mechanism 3 is characterized by the fact that the parts are telescopically movable or movable inwardly and outwardly in respect to column 6 and pivotal with column 6 about a vertical axis in order to provide the inner and outer extending movement and the lateral shifting of the rake 5 required for the slagging operation.

The column 6 is rotatably supported on a central bearing 7 which is carried on a base frame or platform 8 of substantially triangular configuration. The base frame 8 carries a rearward rectangular projecting part 9 which pivotally supports a steering axle 10 for turning movement about a vertical axis 43 centrally located on the projecting part 9. The axle carries wheels 11, 11 which may be designed for either track or ground travel. The forward part of the platform base 8 carries additional wheels 11', 11'. A fork or yoke member 13 is secured to each end of the axle 10 and it may be coupled by means of a fulcrum connection 14 with a car or tractor which is used in metallurgical plants. In some instances it is desirable to provide a driving unit for the car 2, in which event the axle would be connected to suitable means for affecting the steering.

The column 6, along with its boom 3, is shifted or rotated about the bearing support 7 by means of a fluid pressure operated control device or motor generally designated 44. The device 44 includes a cylinder 16 which is pivoted at 15 to an extension arm member 23 of the platform 8. It carries a piston rod member having a piston (not shown) which is slidable in the cylinder 16 and which is pivotally connected through a pivot connection 19 to an extension 20 of the column 6. When the motor 44 is operated, the column 6 is rotated as desired to shift the position of the rake 5.

According to a further feature of the invention, the car 2 carries a plurality of lifting jacks 22 which in the embodiment illustrated are located at each side of the forward end of the platform base 8 and each side of arm members 23 which extend outwardly from the rear end of the base 8. The invention provides a slagging device in a form of a vehicle which can be moved easily from the deposit area into the expected range of the pig iron ladle and which can be locked in position by lowering the jacks 22 so that it may be anchored for operation in a very short time. The rake 5 is constructed so that it might be moved inwardly and outwardly in respect to its associated support rail 4, or turned with the column 6 for positioning as desired to accomplish the slagging operation.

In the embodiment illustrated in FIGS. 3 to 6, a slagging device, or slag car generally designated 102, includes a fixed installation located in the range of a pig iron ladle 103 or transportable by a crane (not shown) to this range on a carrier or platform 101. The slagging device 102 includes a column or vertical member 107 having a pivot bearing 108, which is mounted on the platform 101 for rotation of the column 107 about a vertical axis. The column carries a traverse or guide pulley brackets 106, 106 having pulleys or guide wheels 105, 105, which support a track carrier 104 for inward and outward movement between opposed sets of pulleys 105, 105. For this purpose, the track carrier 104 is provided with bearing faces or extensions 119, which bear on the respective pulleys 105. As best seen in FIG. 6, the column 107 is composed of spaced uprights or side frame members 118, 118 which are held by cross members 114, 114'. The traverses 106, 106 are secured in position to the uprights 118, 118, respectively.

The track carrier 104 itself is provided with a trackway 120 for guiding the wheels 122 of a track car 109 which is movable backwardly and forwardly along the trackway 120. The car 109 is driven by a cable 111 which runs over pulleys 112 and,

is secured to a projection 110 (FIG. 3) on the car 109 and at its opposite end to a projection 113, which is secured to the top cross frame 114. A fluid cylinder 115 is provided on the frame 114 for driving the track carrier 104 backwardly and forwardly and, for this purpose, it is actuated by a movable piston rod 116 having a projection 117 which is secured to the track carrier 104. When the piston rod 116 is extended, the track carrier 104 and the car 109 are moved to the dotted line end position indicated to the left of FIG. 3.

As best seen in FIG. 4, the column 107 is connected at one of its side parts to a lever arm or extension portion 121, the outer end of which is pivotally connected to a piston rod 123 which moves in a cylinder 122. The cylinder 122 is pivotally mounted on its housing at 124. Changing of the position of the piston rod 123 will cause the pivotal movement of the column 107 about its vertical axis.

As seen in FIG. 5, the car 109 has a cylindrical housing 125, which carries a fluid cylinder 126. A piston rod 127, which is movable in the cylinder 126, is connected by a connecting bar 128 through a pivot joint 129. The opposite end of the bar 128 is pivotally connected at 130 to a crank arm 131 of a slagging rake. Crank arm 131 is pivotally supported at 133 on the car 109. The crank arm 131 is provided with a notch 133 for accommodating a journal 134 of the slagging rake 132. A locking force is provided for the arm 131 by a spring 135, which bears against the arm. A rake insert 136 is carried at the end of the arm 132 and it may be moved over the slag layer 137 from the solid line position to the dotted line position indicated in FIG. 3.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A device for slagging of the bath surface of a melting bath of a metallurgical unit comprising a wheeled platform, a column on said platform mounted for pivotal movement about a substantially vertical axis, a rake carried by said column and having at least a part thereof movable inwardly and outwardly in respect to said column, a fluid cylinder pivotally connected to said platform and having a movable piston rod connected to said column, the piston rod being shiftable in said cylinder for shifting said column about said vertical axis, said rake including a boom portion which is movable backwardly and forwardly in respect to said column, said column having a wheel member guiding said boom for inward and outward movement, said rake having a slagging bridge, said boom portion having a trackway along which a portion of said slagging bridge is movable, said slagging bridge having rails for a slag car.

2. A device for slagging of the bath surface of a melting bath of a metallurgical unit comprising a wheeled platform, a column on said platform mounted for pivotal movement about a substantially vertical axis, a rake carried by said column and having at least a part thereof movable inwardly and outwardly in respect to said column, a fluid cylinder pivotally connected to said platform and having a movable piston rod connected to said column, the piston rod being shiftable in said cylinder for shifting said column about said vertical axis, said rake including a boom portion which is movable backwardly and forwardly in respect to said column, said column having a wheel member guiding said boom for inward and outward movement, said platform is of substantially triangular configuration and having a rear portion of substantially rectangular configuration extending outwardly from the apex of said triangular base portion, and a steering axle pivotally supported on said rectangular rear portion.

3. A device for slagging of a bath surface of a melting bath of a metallurgical furnace comprising, a mounting base adjacent the furnace, a column on said mounting base mounted for pivotal movement about a substantially vertical axis, and rake means carried by said column including at least a part

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thereof which is movable inwardly and outwardly in respect to said column, said rake means including a track carrier, means mounting said track carrier on said column for movement backwardly and forwardly in respect to said column.

4. A device, according to claim 3, including a car movable backwardly and forwardly along said track carrier and a rake carried by said car.

5. A device, according to claim 4, including means pivotally mounting said rake on said car and means for shifting said rake about its pivotal mounting.

6. A device, according to claim 5, wherein said rake is mounted about a substantially horizontal axis for pivotal movement and including fluid drive means connected between said track carrier and said car for shifting said car in respect to said track carrier.

7. A device, according to claim 6, including second fluid drive means connected between said means mounting said

track carrier on said column and said track carrier for shifting said track carrier.

8. A metallurgical furnace slagging device comprising, a rotatable vertical column, means mounting said column for rotation about a substantially vertical axis, a traverse bracket carried on said column and defining spaced sets of vertical guide pulleys, a track carrier supported between said guide pulleys and movable inwardly and outwardly in respect to said column between said guide pulleys, a car guided for inward and outward movement in respect to said track way, and fluid drive means for shifting said track carrier in respect to said column and said car in respect to said track carrier.

9. A device, according to claim 8, including a rake arm, a crank arm defining a support for supporting said rake arm and being pivotal about a substantially horizontal axis on said car, and means for biasing said rake arm against said crank arm.

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