

June 18, 1968

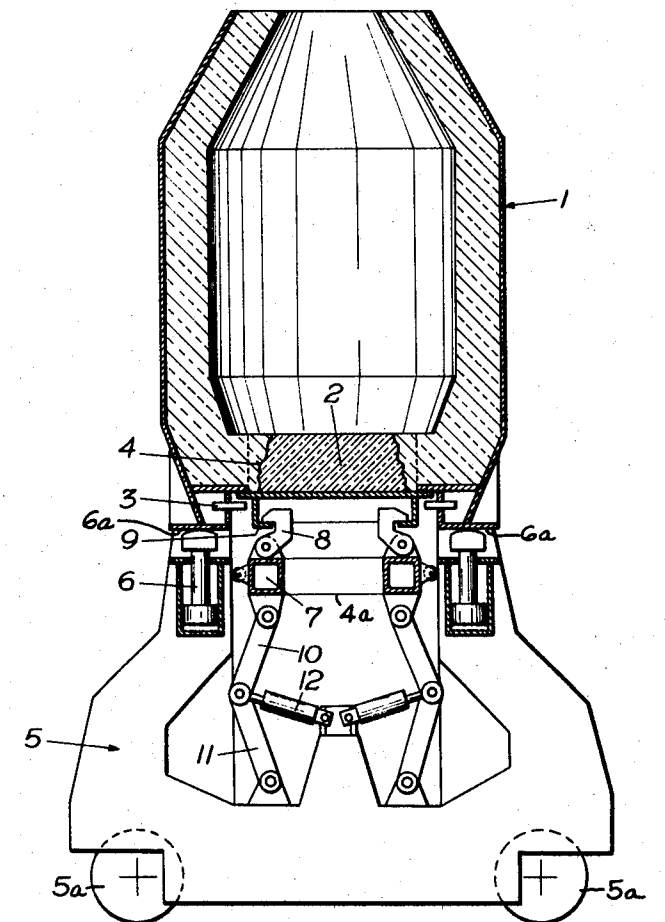
O. PUHRINGER ETAL
APPARATUS FOR REMOVING AND INSTALLING
CRUCIBLE OR CONVERTER BOTTOMS

3,388,501

Filed April 5, 1966

2 Sheets-Sheet 1

FIG. 1



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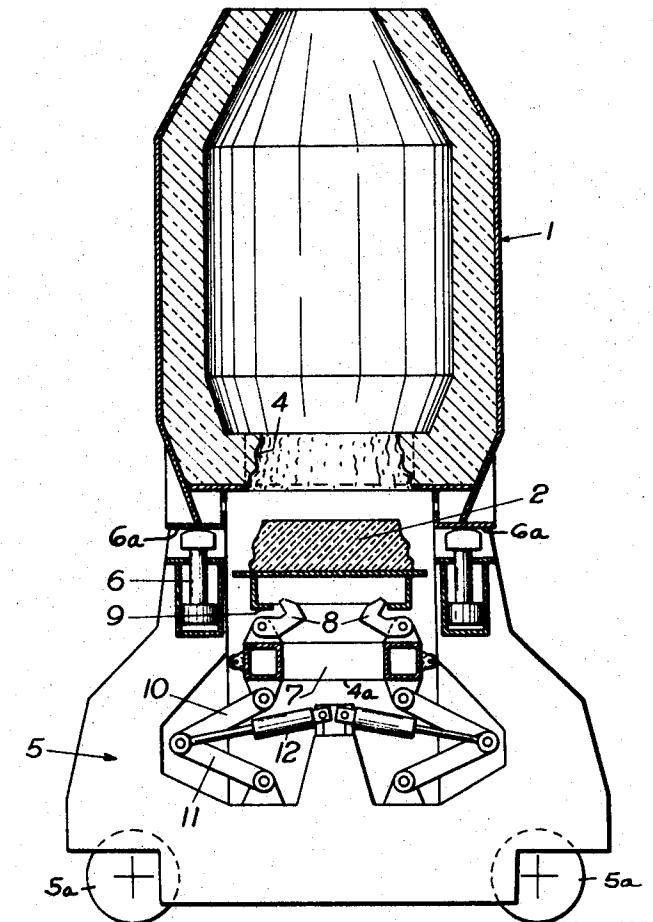
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FIG. 2



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APPARATUS FOR REMOVING AND INSTALLING CRUCIBLE OR CONVERTER BOTTOMS

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A 3,648/65

6 Claims. (Cl. 49—324)

ABSTRACT OF THE DISCLOSURE

Devices for removing the bottom from a metal-refining vessel in which a carrier for the bottom is attached thereto by hooks and keepers and the bottom is severed and withdrawn from the vessel shell by the flexing by hydraulic runs of toggle linkages having upper ends coupled to the carrier. The lower ends of the linkages are coupled to a frame in turn coupled by hydraulic props to the vessel shell so as to convert the pulling force on the bottom into a pushing force on the shell. The frame may be provided by a wheeled support carriage.

This invention relates to an apparatus for removing and installing crucible or converter bottoms, which apparatus comprises a means, which is adapted to be lowered and lifted and to carry the crucible bottom.

Crucibles or converters for refining crude iron comprise a cylindrical or pear-shaped vessel, which is provided with a refractory lining. The bottom may be integral with the shell or be detachable. When the crucible is to be relined, i.e., when the refractory lining is to be renewed, a crucible having a detachable bottom is more favorable than a vessel in which the bottom is integral with the shell. When the detachable bottom has been removed, the hot brickwork cools more rapidly and apparatus may be used for feeding refractory material to the free bottom opening and for introducing the refractory material into the vessel from below, from the mill floor.

Known apparatus for removing and installing detachable bottoms are movable on rails to a position under the crucible and comprise a device, which is adapted to be lowered and lifted and to carry the crucible bottom. Such apparatus has previously been employed for removing and installing the bottoms of basic and acid Bessemer converters. As has been stated, it was adapted to lower and lift the bottom but were incapable of forcibly tearing off the bottom. With basic and acid Bessemer converters it was not necessary forcibly to tear off the bottom from the converter because the consumption is considerable so that the adhesive forces between the linings of the bottom and of the shell of the converter are very small when the bottom is to be removed.

As contrasted therewith, the lining in an oxygen top blowing converter (LD-crucible) is consumed in a different pattern so that the crucible bottom is often sintered to the crucible shell. Besides, residual steel often forms an arch on the bottom of the crucible so that very large forces are required to separate the bottom from the rest of the vessel.

It is an object of the invention to provide an apparatus which enables a lowering and lifting of the crucible bottom to be removed or installed and to tear the bottom with great force from the crucible wall when the refractory lining of the bottom has become sintered to that of the shell after prolonged usage of the crucible.

This object of the invention is accomplished in that the carrier means which is adapted to be lowered and

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lifted and to carry the crucible bottom is further adapted to be interlocked with the crucible bottom.

The carrier means is suitably provided with pivoted hooks, which are adapted to be hooked into keepers of the bottom.

The carrier means is preferably actuated by toggle linkage means. The toggle linkage means may be arranged to be substantially extended when the bottom is installed.

In a preferred embodiment of the invention, the carrier means is mounted by support means in the form of a frame, which bears on the crucible, preferably with hydraulic props interposed.

The invention will be explained with reference to an embodiment shown by way of example in vertical sectional views on the drawing. FIG. 1 of the drawing shows a crucible with an installed bottom. FIG. 2 of the drawing shows a crucible with the bottom removed.

A detachable bottom 2 is secured by cotters 3 to the crucible shell 1. To remove the bottom, the same is separated from the crucible lining along the parting line 4.

The carrier means 4a which is adapted to be lifted and lowered and to carry the bottom is mounted in a support frame 5, which is either self-propelled or adapted to be mounted on a mill car having wheels 5a. The frame 5 is provided on its top with hydraulic prop means for reacting on the crucible 1. Such reaction means comprises preferably three or more hydraulic cylinders 6, which are adapted to bear on an annular flange 6a of the crucible wall.

The carrier means 4a comprises the guide ring 7. Pivoted hooks 8 are mounted on the top of the ring 7 and adapted to be hooked into or interengaged with keepers 9 provided on the converter bottom 2. The ring 7 and the hooks 8 are adapted to be lifted and lowered by a toggle linkage 10 and 11, which is operated by hydraulic cylinders 12. Such a toggle linkage has the advantage that large forces for tearing off the bottom 2 are available during a movement of the linkage from its extended position whereas the large lowering movement is subsequently obtained while a smaller force is being exerted owing to the characteristics of the toggle linkage.

The large reaction forces which are produced during the tearing of the bottom from the shell are directly transmitted from the frame 5 by the above-described reaction means 6 to the crucible shell so that the apparatus is independent in operation of its own weight and cannot be lifted from the floor under the action of the large tear-off forces.

What we claim is:

1. In apparatus for removing the bottom from a metal-refining vessel by a vertically displaceable carrier means adapted to be attached to and receive said bottom and by mechanism adapted to exert through said attached carrier means on said bottom a pulling force, the improvement comprising, toggle linkage means having upper and lower ends coupled together through hinge joint means, said upper end being coupled to said carrier means, support means to which the lower end of said linkage means is coupled, and which is adapted to oppose upward movement of such end relative to said vessel, and linkage motivating means coupled to said linkage means to produce by forcibly flexing such linkage means a downward movement relative to said lower end of said upper end and carrier means when attached to said bottom and a consequent severing and withdrawal of said bottom from said vessel.

2. The improvement as in claim 1 in which said toggle linkage means comprises a pair of horizontally spaced toggle linkages of which the upper and lower ends of each are coupled together by a hinge joint, and in which said motivating means comprises hydraulic ram means having a primarily horizontal alignment and adapted to

flex said linkages by producing a forcible horizontal relative displacement of the respective joints of such linkages.

3. The improvement as in claim 1 in which said carrier means has thereon a plurality of hooks adapted to be received in corresponding keepers on said bottom to thereby attach said carrier means to said bottom.

4. The improvement as in claim 1 in which said support means comprises a wheeled support carriage for the combination comprised of said vessel bottom, carrier means, linkage means and motivating means.

5. The improvement as in claim 1 in which said support means comprises frame means coupled to the lower end of said linkage means, and hydraulic prop means extending between said frame means and the shell of said vessel, said frame means and prop means being adapted to convert the pulling force exerted by said toggle linkage means on said bottom into a reactive pushing force on the shell of said vessel.

6. In apparatus for removing the bottom from a metal-refining vessel by a vertically displaceable carrier means adapted to be attached to and receive said bottom and by mechanism adapted to exert through said attached carrier means on said bottom a pulling force, the improvement comprising, toggle linkage means having upper and lower ends coupled together through hinge joint means, said upper end being coupled to said carrier means, a plurality of hooks disposed on said carrier means to be receivable in corresponding keepers on said bottom to

thereby attach said carrier means to said bottom, frame means coupled to said lower end of said linkage means, linkage motivating means coupled to said linkage means to produce by forcibly flexing of such means a downward movement relative to said lower end of said upper end and cradle when attached to said bottom and a consequent severing and withdrawal of said bottom from said vessel, and hydraulic prop means extending between said frame means and the shell of said vessel, said frame means and prop means being adapted to convert the pulling force exerted by said toggle linkage means on said bottom into a reactive pushing force on the shell of said vessel.

References Cited

UNITED STATES PATENTS

1,054,557	2/1913	Jensenius	29—252
2,243,006	5/1941	Houston	29—252
2,488,476	11/1949	Pine	29—252
3,010,191	11/1961	McCullough	29—252 X
3,069,761	12/1962	Sommer	29—252
3,193,915	7/1965	Gillie et al.	29—252 X
3,217,395	11/1965	McBroom et al.	29—252

FOREIGN PATENTS

953,535	12/1956	Germany.
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