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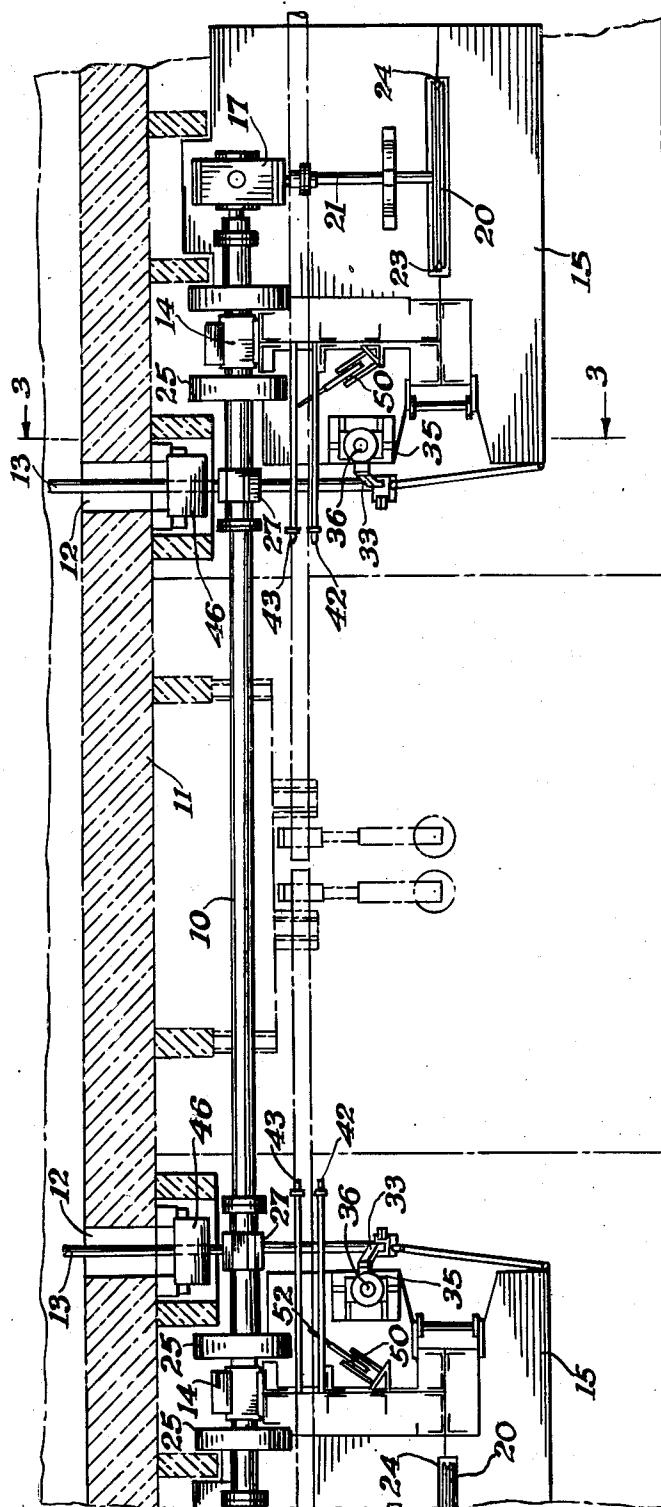


Fig. 1

INVENTOR.
GLENN E. WHEELER.
BY *Pichey & Watts*
ATTORNEYS.

Sept. 30, 1952

G. E. WHEELER
APPARATUS FOR CARRYING AND ADJUSTABLY
POSITIONING ELONGATED ARTICLES

2,612,366

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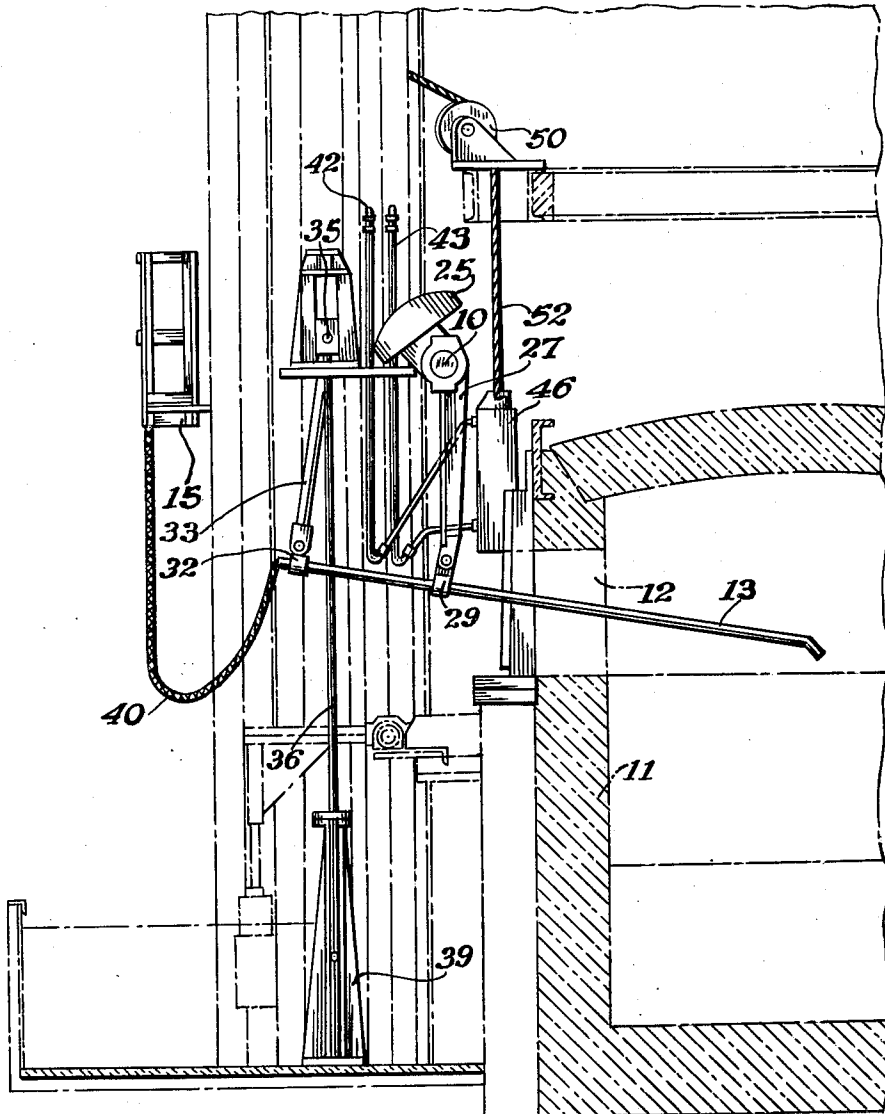


Fig. 3

INVENTOR.
GLENN E. WHEELER.

BY *Rickey & Watts*
ATTORNEYS.

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APPARATUS FOR CARRYING AND ADJUSTABLY
POSITIONING ELONGATED ARTICLES

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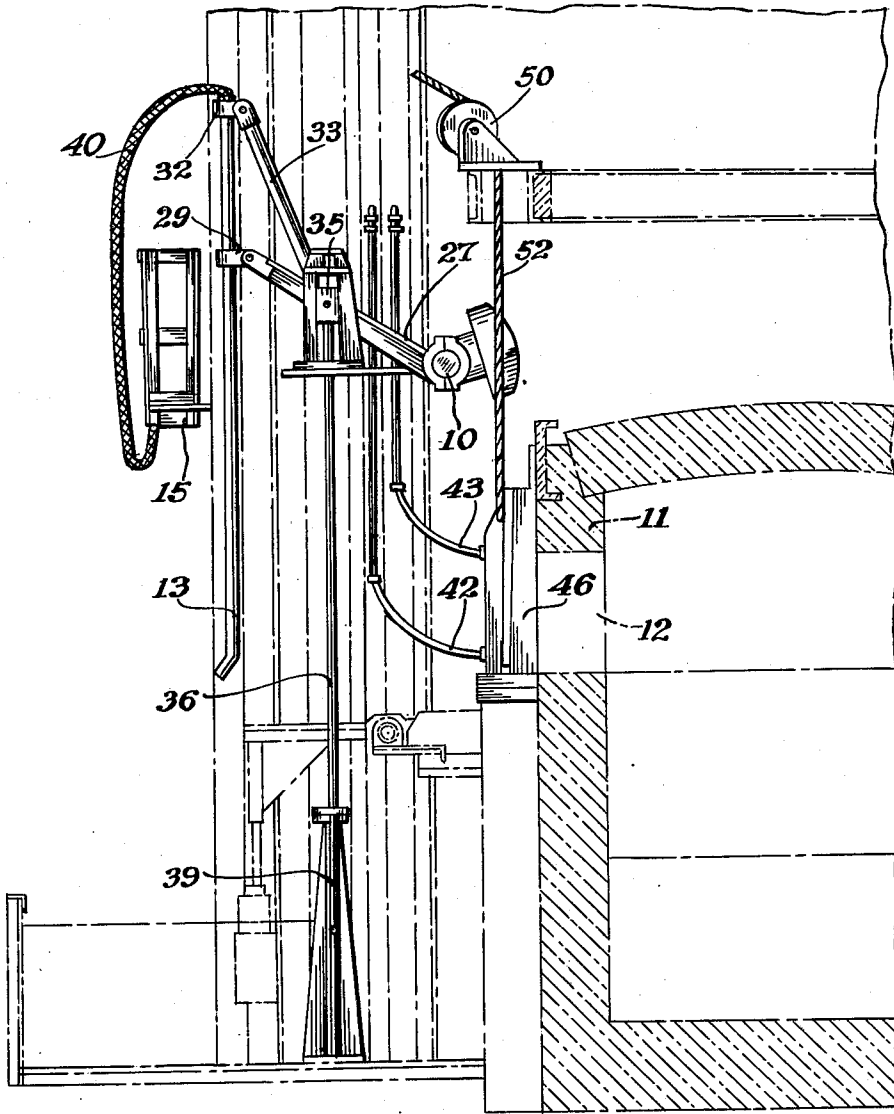


Fig.4

INVENTOR.
GLENN E. WHEELER.
BY *Pichey & Watts*
ATTORNEYS.

UNITED STATES PATENT OFFICE

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APPARATUS FOR CARRYING AND ADJUSTABLY POSITIONING ELONGATED ARTICLES

Glenn E. Wheeler, Hamburg, N. Y., assignor to Republic Steel Corporation, Cleveland, Ohio, a corporation of New Jersey

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3 Claims. (Cl. 266—34)

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The present invention relates generally to lifting and carrying apparatus and is more particularly concerned with novel apparatus for portably carrying and adjustably positioning elongated articles such as conduits for delivering fluids or gases into furnaces and the like.

In the operation of open hearth and electric furnaces it has heretofore been customary in introducing fluid delivery conduits, electric arcs bars and similar articles into the furnaces through openings in their side walls or doors, to employ pedestals or wheeled carriages which rest upon the floor adjacent to the furnace charging doors. Devices of this kind, however, are always in the way to some extent and impair the furnace operators and require frequent movement about at considerable effort. Furthermore, they are of very limited utility because of the difficulty of their adjustment and manipulation to position the conduits, bars, etc. Still further, the external connections to a source of fluid pressure or electricity, depending upon the type of equipment being used, are difficult to make in a manner which will render the devices in any way satisfactory to use and at the same time will not congest the way around the furnaces and interfere with the furnace operators in their work.

In accordance with the present invention all these difficulties can, for the first time to my knowledge, be effectively eliminated by means which are not only economical and practical to install and use, but require a minimum of effort and time for adjustment. The present apparatus is preferably mounted on the side of the furnace above the openings through which conduits, bars or the like carried by the apparatus are to be introduced into the furnace. Thus, the present apparatus is adjustable by an operator standing before the furnace, but at the same time is not in his way as he goes about his other tasks and does not involve the disposition in the operator's way of various electric lines, and fluid lines and reservoirs. Also, in accordance with my preferred practice of this invention, two or more bars, conduits, or the like can be carried by the apparatus for simultaneous introduction into or withdrawal from the furnace, the operation being performed by one actuating means whereby time, labor and effort in the operation of the furnace are materially reduced.

Other desirable features and advantages of the present invention will become clear to those skilled in the art, as will the details of the construction and preferred embodiment of this in-

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vention, upon reference to the following detailed description of my apparatus in one form considered in conjunction with the drawings accompanying and forming a part of this specification, in which

Figure 1 is a plan view of apparatus of this invention carried by and disposed adjacent to a conventional open hearth furnace, a side wall of which is indicated fragmentarily and in outline;

Figure 2 is an elevational view of a portion of the conduit-carrying mechanism of Fig. 1, constituting an operable unit;

Figure 3 is a vertical sectional view taken on line 3—3 of Fig. 1, showing the conduit carried by the apparatus disposed partially within the furnace; and

Figure 4 is a view similar to Fig. 3, but showing the conduit in alternative position and outside the furnace.

Very generally the apparatus of the present invention comprises a rotatable shaft to which is attached a radially extending arm and with which is engaged means for rotating the shaft and thereby moving the arm about it as a pivot. In addition, means are pivotally connected to the arm for engaging and holding between its ends an article to be carried by the apparatus, and means including a lever are secured to the said article and movable relative to the arm for moving the ends of the article relative to the arm and the shaft.

More in detail, as viewed in Fig. 1, the rotatable shaft 10 of the apparatus illustrated herein extends horizontally, paralleling the adjacent furnace wall 11 above openings 12 therein through which tubular articles or lances 13 for delivering oxygen into the furnace are temporarily disposed. Shaft 10 is journaled between its ends in bearing blocks 14 carried by two operators' platforms 15 disposed adjacent to but on opposite sides of openings 12 so that the way between the openings is clear of supporting structures so far as possible. At its ends opposite the center portion of each platform 15, the shaft is received in housings 17 and engaged with a conventional worm-type speed reduction unit which is driven by means of a chain wheel 20 associated with the speed reduction unit through a shaft 21 and rotatable from the furnace charge level by an operator by means of an endless chain 23 carried by the wheel and extending downwardly through a slot 24 provided in the platform to receive the wheel and chain. Adjacent to its ends and on either side of the

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two bearings, shaft 10 is provided with counterweights 25 for a purpose subsequently to be described.

An arm or lever 27 is keyed to the shaft at a point opposite the centerline of each opening 12 so that the arm may be moved through an arc of at least 90° to carry the article from a position such as indicated in Fig. 3 to that shown in Fig. 4. At the lower end of each of the arms 27 a link 29 is pivoted for limited motion relative to the arm under the influence of gravity so that lance 13 extending through the link and gripped thereby between its inner and outer ends will be able to move relative to the arm to assume the positions indicated in said Figs. 1 and 3 and thereby facilitate introduction of the lance into the furnace and removal therefrom. Also connected to the cold or outer end of each lance 13 is a second pivoted link 32 which securely grips and holds the lance and is pivoted to a lever 33 comprising part of mechanism whereby to raise and lower the said cold end of the lance relative to the furnace and shaft 10. Lever 33 is pivoted at its opposite end to a slide block 35, which, in turn, is connected to a pusher rod 36 and is carried by a slide frame 38 defining a vertical slideway and supported by platform 15, a suitable opening being provided in the platform through which the pusher rod extends. The lower end of the pusher rod 36 is received in a pusher stand 39 which is essentially a hydraulic piston cylinder, the pusher rod constituting the piston and the hydraulic fluid being delivered to the cylinder from a suitable pressure source (not shown) under the control of the furnace operators by means of a suitable valve (also not shown). Slide 35 is disposed outside shaft 10, i. e. the shaft is between the slide and wall 11.

Of the various flexible and rigid conduits illustrated in the drawings, 40 indicates hoses connecting lances 13 with a source (not shown) of oxygen, and 42 and 43 identify the lines of the cooling water system for water jacketed furnace doors 46 which close openings 12. The door structure, as well as the means for cooling the door, including lines 42 and 43 and the source of cooling water (not shown), are of conventional form. Likewise, the door lifting and lowering mechanism, including sheaves 50, counterweights (not shown) and cables 52, running over the sheaves and connecting doors 46 and the counterweights, are of conventional design and do not form a part of the present invention.

In the operation of the device illustrated, with the lances in the positions indicated in Figs. 1, 2 and 3, to change the position of the nozzle ends of the lances with respect to the furnace melt, it is only necessary to raise or drop slides 35 by opening the appropriate valves controlling the hydraulic pressure in the pusher stand cylinders and thereby causing rods 36 to move upwardly or downwardly the desired distance. Such a pusher rod and slide motion will result in vertical motion of levers 33, links 32 and the extremities of the lances, the amount of movement of the lance nozzles being multiplied because of the relative proximity of the pivots, i. e. links 29, to the cold ends of the lances. If, in addition to, or instead of, such vertical motion, it is desired to move the nozzles of the lances transversely of the furnace, the operator may easily and quickly do this by pulling down on the right-hand or left-hand throw of one or the other of the chains 23, depending upon the direction in which the shaft is to be rotated and how the nozzles are to be

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moved. When there are two or more operators or the controls for this apparatus are placed conveniently for simultaneous operation by one operator, these motions may be effected simultaneously, thus enabling sharp control over furnace operation, an important consideration in connection with the use of elemental oxygen in jet form on baths of molten steel. When it is desired to remove the lances from the furnace and dispose them out of the way, as at the time that the furnace is being charged or prepared to receive a new heat, the operator may pull one of the other of the chains 23 to rotate shaft 10 and move arms 27 through furnace wall openings 12 from the position shown in Fig. 3 to the position shown in Fig. 4. Due to weight and position the relationship between counterweights 25 and arms 27 and the way in which the counterweights are secured to the shaft, the mass of said counterweights becomes effective as an aid to moving and lifting apparatus, including the arms, links and levers, as well as the lances themselves when weight thereof becomes burdensome in the course of shifting the lances about. Consequently the control and operation of this apparatus may be handled readily by a single operator without demanding of him very much physical effort. At the same time that the shaft is being rotated, the slide may be run up to its maximum height, as indicated in Fig. 4, so as to bring the nozzle that much higher than the charging level and assure the removal of the lances from the operator's way around the furnace insofar as possible.

Re-introduction of the lances into the furnace may be accomplished by rotating shaft 10 in the opposite direction through pulling the appropriate throw of one of the chains 23 and possibly also dropping slide blocks 35 by manipulation of the valves controlling the flow of hydraulic fluid out of the pusher stands 39.

Having thus described the present invention so that those skilled in the art may be able to understand and practice the same, I state that what I desire to secure by Letters Patent is defined in what is claimed.

What is claimed is:

1. Apparatus for moving an elongated article in an opening in a side wall of a furnace which comprises a rotatable shaft disposed horizontally above said opening, an arm keyed to and extending downwardly from said shaft, an elongated article connected between its inner and outer ends to the lower end of said arm and disposed at substantially right angles to said shaft, and means to rotate said shaft and move the elongated article endwise.

2. Apparatus for moving an elongated article in an opening in a side wall of a furnace which comprises a rotatable shaft disposed horizontally above said opening, an arm keyed to and extending downwardly from said shaft, an elongated article connected between its inner and outer ends to the lower end of said arm and disposed at substantially right angles to said shaft, a vertically movable slide, a lever connected to the outer end of said elongated article and pivoted at its other end to said slide, and means to reciprocate said slide vertically.

3. Apparatus for moving an elongated article in an opening in a side wall of a furnace which comprises a rotatable shaft disposed horizontally above said opening, an arm keyed to and extending downwardly from said shaft, an elongated article connected between its inner and

outer ends to the lower end of said arm and disposed at substantially right angles to said shaft, a vertically movable slide, a lever connected to the outer end of said elongated article and pivoted at its other end to said slide, means to rotate said shaft and move the elongated article endwise, said means including a speed reducer connected to said shaft, and means to reciprocate said slide vertically.

GLENN E. WHEELER. 10

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,942,925	Jenkins -----	Jan. 9, 1934
2,171,028	Gelb -----	Aug. 29, 1939
2,475,205	Slottman -----	July 5, 1949