W. H. PEIRCE.

METALLURGIC APPARATUS.

APPLICATION FILED NOV. 29, 1909.

987,909. **Patented Mar. 28, 1911.**

3 SHEETS—SHEET 1.

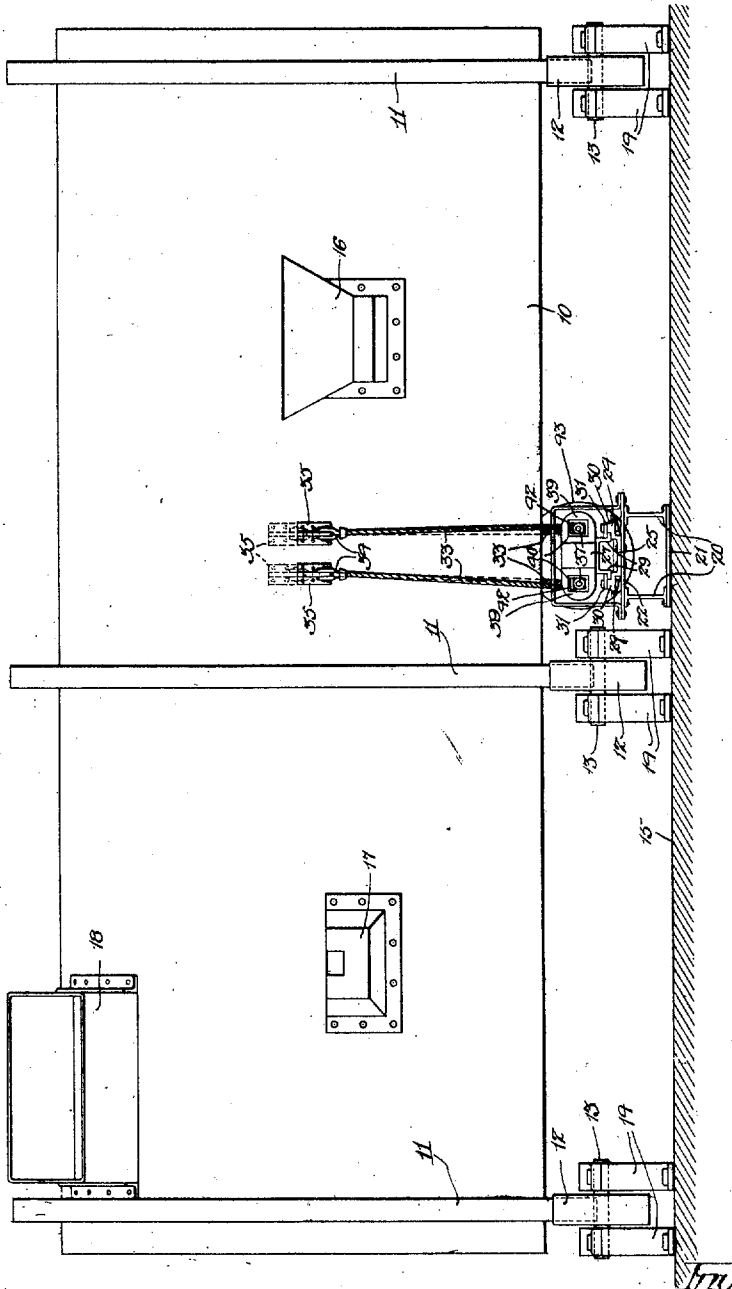

Fig. 1

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3 SHEETS—SHEET 2.

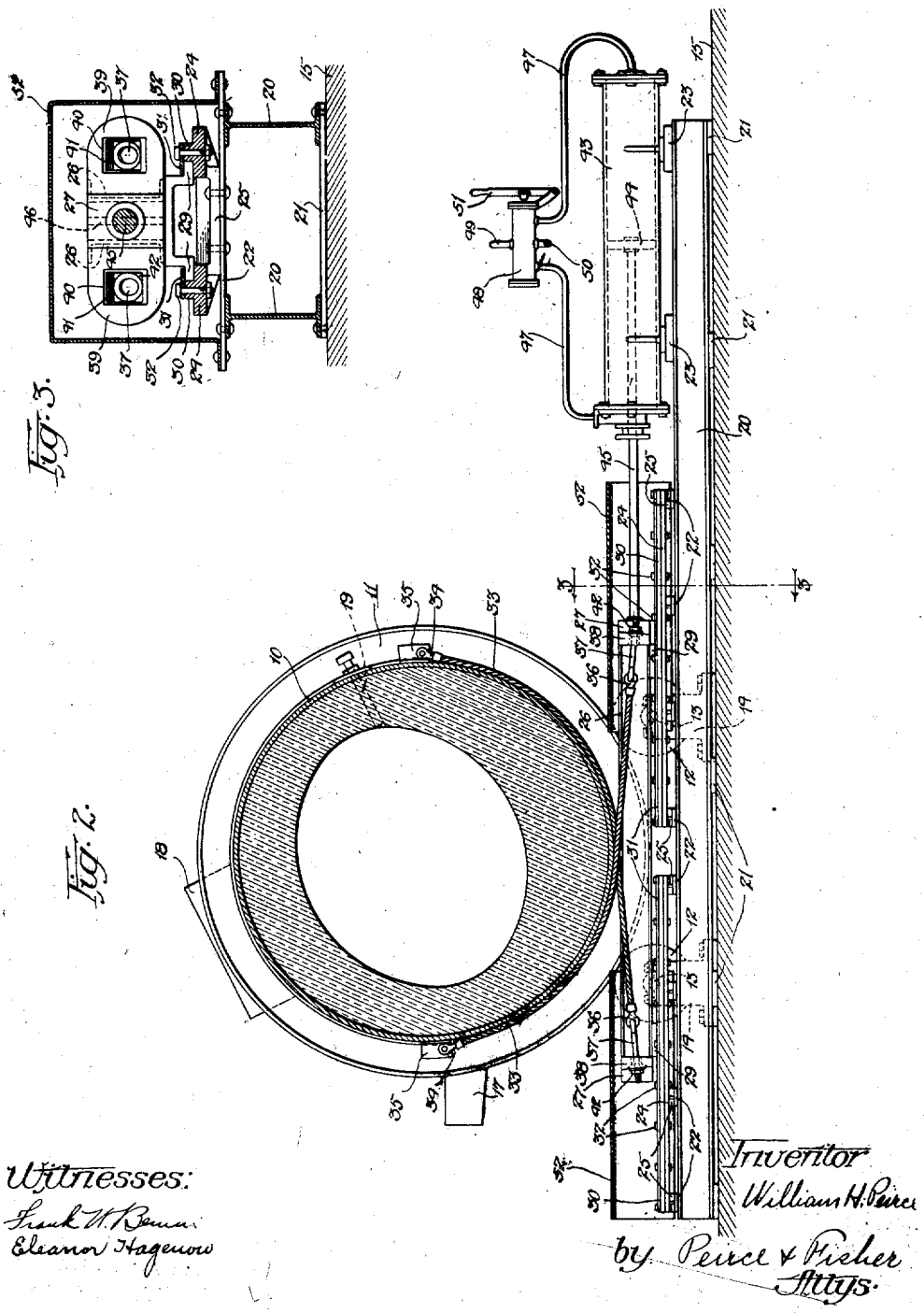

Fig. 3.

Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 4.

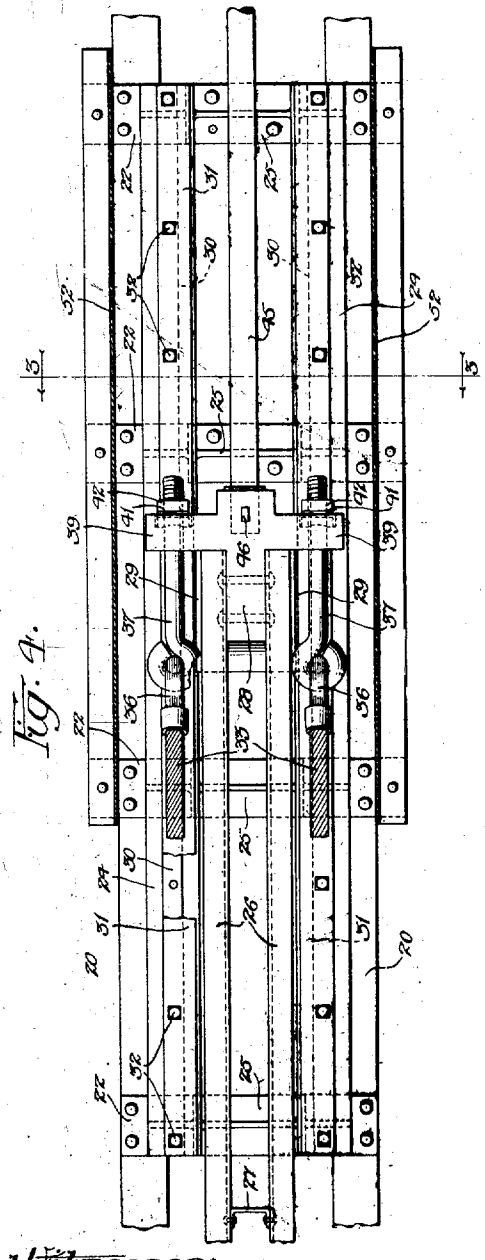
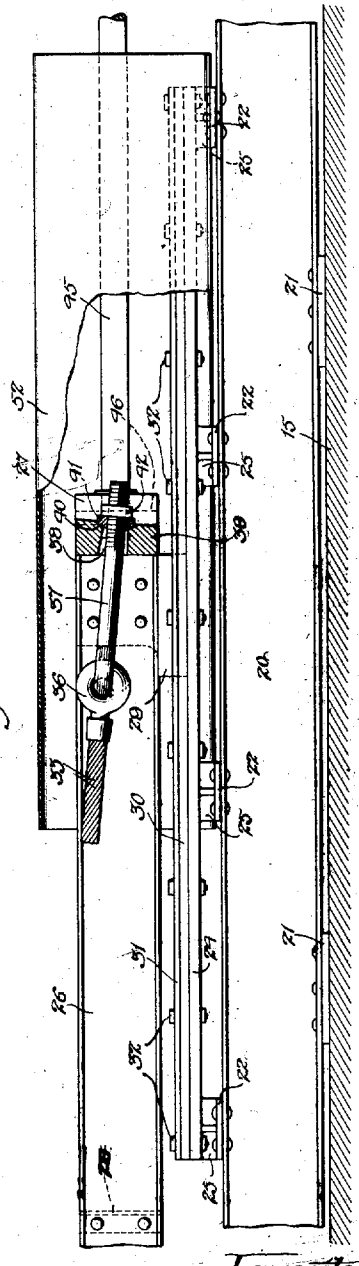


Fig. 5.



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UNITED STATES PATENT OFFICE.

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METALLURGIC APPARATUS.

987,909. Specification of Letters Patent. Patented Mar. 28, 1911.

Application filed November 29, 1909. Serial No. 530,312.

To all whom it may concern:

Be it known that I, WILLIAM H. PEIRCE, a citizen of the United States, and a resident of the city of Baltimore, State of Maryland, have invented certain new and useful Improvements in Metallurgic Apparatus, of which the following is a specification.

The invention relates to metallurgic vessels, furnaces or converters that are mounted to turn upon an axis and such, for example, as are employed for bessemerizing copper matte.

Copper matte converters, to which the invention is particularly applicable, are frequently of large size, so that the combined weight of the converter and its charge is very great, and the converter, in the course of treatment, must be turned to different positions for receiving the charge, immersing the twyers, discharging the slags, and pouring off the white metal or blister copper.

The present invention seeks to provide an improved construction in which simple and effective mechanism is employed for turning the converter during the course of treatment and for securely holding the same in its different positions.

The invention consists in the features of improvement hereinafter set forth, illustrated in the preferred form in the accompanying drawings and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a side elevation of the converter with the improved turning mechanism applied thereto. Fig. 2 is a view in elevation of the turning mechanism with the converter shell shown in section. Fig. 3 is an enlarged, detail view with parts shown in section on the line 3—3 of Figs. 2 and 4. Fig. 4 is an enlarged, detail plan view of a portion of the turning mechanism and Fig. 5 is a view in elevation of the parts shown in Fig. 4 with some of the parts in section.

The furnace or converter comprises, a cylindrical shell 10 provided with external rings or flanges 11 that rest upon the antifriction rolls 12. The shafts 13 of the friction rolls are journaled in suitable brackets 14 which are secured upon a foundation 15. The rollers support the furnace or converter, so that it can be easily rotated about its horizontal axis. The form of converter shown, is provided with a charging hopper 16, a pouring spout 17 and a flue 18 at one end. If employed for bessemerizing copper matte, it will also be provided with a set of twyers 19.

The turning mechanism is mounted on a horizontal frame that extends transversely beneath the shell 10. This frame, in the preferred form shown, comprises a pair of parallel, horizontal I-beams 20 mounted upon the foundation 15 and extending beneath the shell 10 transversely to the axis thereof. The beams 20 are connected by a series of cross-pieces 21 secured to their lower flanges and a series of straps 22 secured to their upper flanges. At one end, a pair of heavy straps 23 are secured to the upper flanges of the beams. Beneath the shell 10, the frame beams are provided with a cross-head guide which, in the form shown, comprises two cast metal sections. Each of these sections is formed of longitudinally extending guide-bars 24 connected at intervals by cross-bars 25 that rest upon and are securely riveted to the cross-bars 22 on the I-beams 20. The bars 24 are provided with guideways for an elongated cross-head. This cross-head, in the preferred form shown, comprises a pair of parallel channel-bars 26 secured at their ends to castings 27 and intermediate their ends by a cross-bar 28. The end castings 27 of the cross-head are provided with depending, angular ribs 29 that rest upon the upper faces of the guide-bars 24 and abut against upwardly projecting ribs 30 formed thereon. A set of bars or narrow plates 31 rest upon the ribs 30 and are secured to the guide-bars 22 by bolts 32. These plates project inwardly over the horizontal portions of the angular flanges 29 and thus form gibs for holding the cross-head down upon its guide-way. By the arrangement set forth, the cross-head is held against the transverse movement, either in lateral or vertical direction, but is, of course, free to reciprocate longitudinally within its guideways.

Crossed ropes are connected to the shell, extend in opposite directions over the surface thereof and are connected respectively to the opposite ends of the cross-head. Two pairs of wire ropes 33 are preferably employed, one pair extending from each end of the cross-head to the shell. These ropes are connected at one end by couplings 34 to the shell. U-shaped couplings are shown clamped upon the ropes and pivotally connected to

the projecting flanges of a series of T-shaped clips 35 securely riveted to the cylindrical face of the shell 10 at opposite edges thereof. Couplings 36 are clamped to the opposite ends of the ropes and these couplings are provided with eyes that engage the eyes upon the ends of a series of tie-bolts 37. These tie-bolts extend through openings 38 in laterally projecting lugs 39 on the opposite end casting 27 of the cross-head. These openings flare inwardly, as indicated in Fig. 5, and, at the outer ends of the openings, the inclined faces of the lugs 39 are provided with curved seats 40 that are engaged by similarly shaped washers 41 on the tie-bolts. Adjusting nuts 42 are threaded on the outer ends of the tie-bolts and engage the washers 41 as shown.

A horizontal, hydraulic cylinder 43 is mounted upon the cross-bars 23 of the frame in line with the cross-head. This cylinder is provided with a piston 44 having a piston-rod 45 which is rigidly fixed, at its end, to one of the end castings 27 of the cross-head. In the form shown (see Fig. 4), the piston-rod extends within a socket in the end face of the casting and is secured to the casting by a key 46. Pipes 47 lead from opposite ends of the hydraulic cylinder to a suitable valve casing 48. Supply and exhaust pipes 49 and 50 are connected to the casing and a suitable valve therein operated by a hand-lever 51 is arranged to connect either end of the cylinder 43 to the supply and the other end to the exhaust, so that the piston 44 therein can be shifted in one or the other direction. Or the valve can be positioned to cut off the opposite ends of the cylinder from the supply and exhaust so that the piston 44 will be securely held against movement by the liquid in the opposite ends of the cylinder.

The mechanism is extremely simple and efficient and will withstand great strain. By means of the hydraulic motor, the cross-head can be shifted back and forth to turn the shell 10 of the converter in one or the other direction through the medium of the crossed wire ropes 33. The nuts 42 on the tie-bolts 37 are adjusted to take up all slack in the ropes 31. The piston 44 of the hydraulic cylinder is connected directly to the cross-head and, when the flow of liquid to and from the opposite ends of the cylinder is cut off, the piston will be held against movement and, since there is practically no slack or lost motion between the piston and the heavy converter or furnace shell 10, the latter will be maintained with great steadiness in the different positions to which it is turned during the operation. The cross-head and the hydraulic cylinder, in the preferred form, are mounted upon the same frame, so that the cross-head and the piston of the cylinder are properly held in line, notwithstanding the strain of the ropes upon the cross-head. Notwithstanding the great weight of the furnace or converter and its charge, it can, by means of the improved mechanism, be readily turned to the different positions as required in the course of treatment and steadily held in the different positions. The curved seats 40 and washers 41 form oscillating or ball-and-socket connections between the tie-bolts 37 and the end of the cross-head to allow for the different angular positions of the ropes as the cross-head is shifted.

The ends of the cross-head and guide therefor, are preferably covered, as shown, by dirt shields 52 of inverted U-shape secured at their lower edges to the cross straps 22.

It is obvious that the details of construction set forth can be widely varied without departure from the essentials of the invention as defined in the claims.

I claim as my invention:—

1. In a metallurgic apparatus, the combination with a rotatable shell, of a longitudinally shiftable cross-head, a frame having a guide for said cross-head, said frame and said cross-head extending transversely beneath said shell, oppositely arranged ropes connected to said shell and to the opposite ends of said cross-head at points below the bottom of said shell, means for adjusting the tension of said ropes, a hydraulic cylinder, and a piston therein having a piston-rod connected to said cross-head, substantially as described.

2. In a metallurgic apparatus, the combination with a rotatable shell, of a longitudinally shiftable cross-head, oppositely arranged ropes connected to said shell and to the opposite ends of said cross-head, means for adjusting the tension of said ropes, a frame extending beneath said shell and having a guide for said cross-head, a stationary hydraulic cylinder mounted on said frame in line with said cross-head, and a piston in said cylinder having a piston-rod fixed to said cross-head, substantially as described.

3. In a metallurgic apparatus, the combination with a rotatable, cylindrical shell, of a cross-head, a frame extending beneath said shell and having a guide wherein said cross-head is longitudinally movable and held against transverse movement, crossed ropes secured to said shell and extending in opposite directions over the surface thereof, adjusting tie-bolts connecting said ropes to the opposite ends of said cross-head, and means for shifting said cross-head and for holding it in different positions, substantially as described.

4. In a metallurgic apparatus, the combination with a rotatable, cylindrical shell, of a cross-head, a frame extending beneath said shell and having a guide wherein said cross-head is longitudinally movable and held against transverse movement, crossed

ropes secured to said shell and extending in opposite directions over the surface thereof, devices engaging the ends of said ropes and having oscillating connections with the opposite ends of said cross-head at points below the bottom of said shell and means for shifting said cross-head, substantially as described.

5. In a metallurgic apparatus, the combination with a rotatable, cylindrical shell, of a cross-head, a guide wherein said cross-head is longitudinally movable and held against transverse movement, crossed ropes secured to said shell and extending in opposite directions over the surface thereof, adjusting tie-bolts connected to the ends of said ropes and having ball-and-socket connections with the opposite ends of said cross-head, a hydraulic cylinder and a piston therein having a piston-rod connected to said cross-head, substantially as described.

6. In a metallurgic apparatus, the combination with a cylindrical shell rotatably sustained in horizontal position, of a cross-head extending transversely beneath said shell, a frame extending beneath said shell and having a guide wherein said cross-head is longitudinally movable and held against vertical movement, crossed ropes secured to said shell and extending in opposite directions to the opposite ends respectively of said cross-head, means for adjusting the tension of said ropes, and means for shifting said cross-head and for holding the same in different positions, substantially as described.

7. In a metallurgic apparatus, the combination with a cylindrical shell rotatably sustained in horizontal position, of a cross-head extending transversely beneath said shell, a frame extending beneath said shell and having a guide wherein said cross-head is longitudinally movable and held against vertical movement, two pairs of crossed ropes secured to said shell, extending in opposite directions over the surface thereof and connected respectively to the opposite ends of said cross-head at points below the bottom of said shell, and means for shifting said cross-head, substantially as described.

8. In a metallurgic apparatus, the combination with a cylindrical shell rotatably sustained in horizontal position, of a horizontal frame extending transversely beneath said shell, a cross-head guided on said frame to shift longitudinally but held against vertical movement, crossed ropes secured to said shell and extending in opposite directions over the surface thereof, adjusting tie-bolts connecting the ends of said ropes to the opposite ends of said cross-head, a stationary hydraulic cylinder and a piston therein having a piston-rod connected to said cross-head, substantially as described.

9. In a metallurgic apparatus, the combination of a cylindrical shell having ring flanges, antifriction rollers engaging said flanges and supporting said shell in horizontal position, a horizontal frame extending transversely beneath said shell, a cross-head, said frame having a guide wherein said cross-head is longitudinally movable and held against vertical movement, crossed ropes secured to said shell and extending in opposite directions over the surface thereof, adjusting tie-bolts connecting the ends of said ropes to the opposite ends of said cross-head, a hydraulic cylinder mounted on said frame in line with said cross-head, and a piston in said cylinder having a piston-rod fixed to one end of said cross-head, substantially as described.

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