

Oct. 27, 1931.

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1,828,762

MATERIAL HANDLING APPARATUS

Filed April 3, 1925

4 Sheets-Sheet 1

Fig. 1.

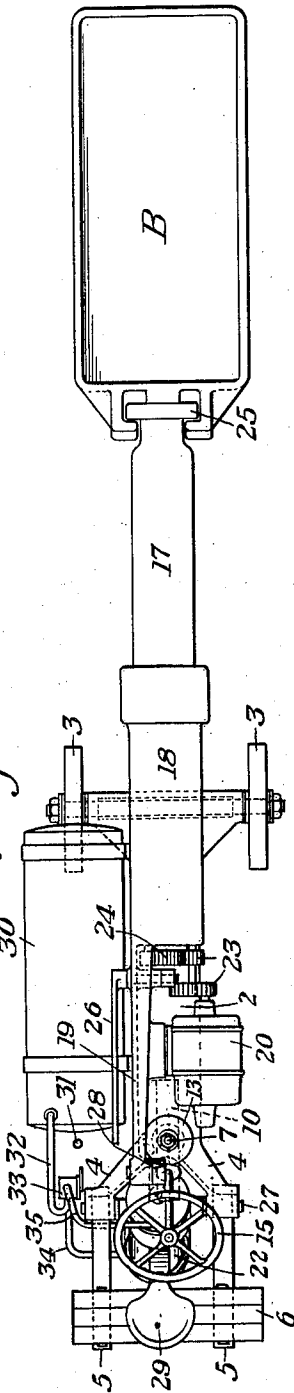
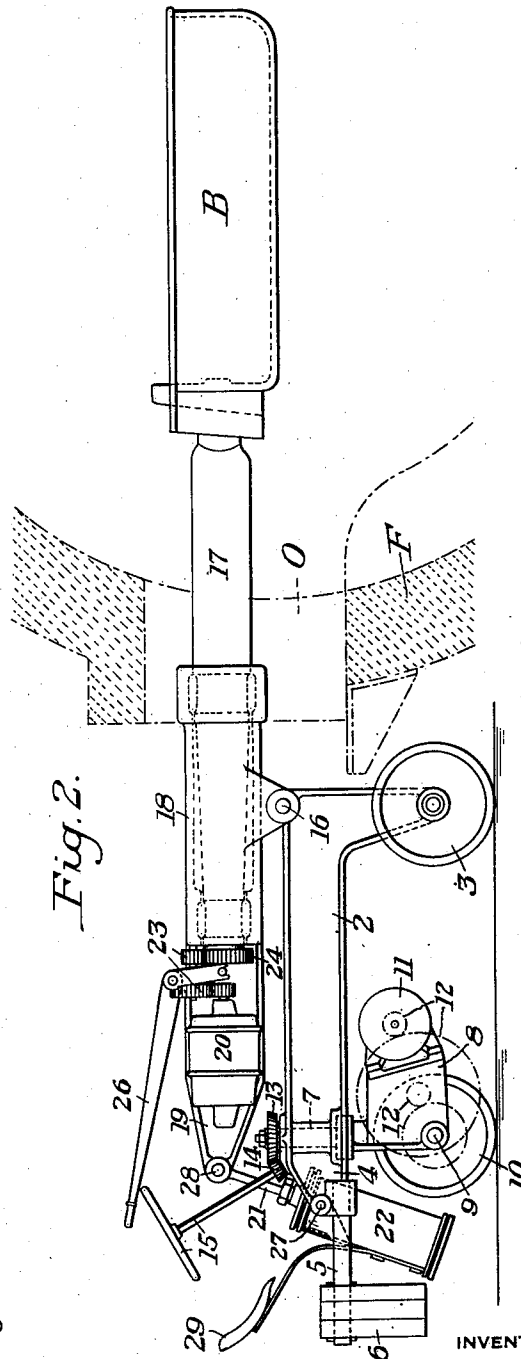


Fig. 2.



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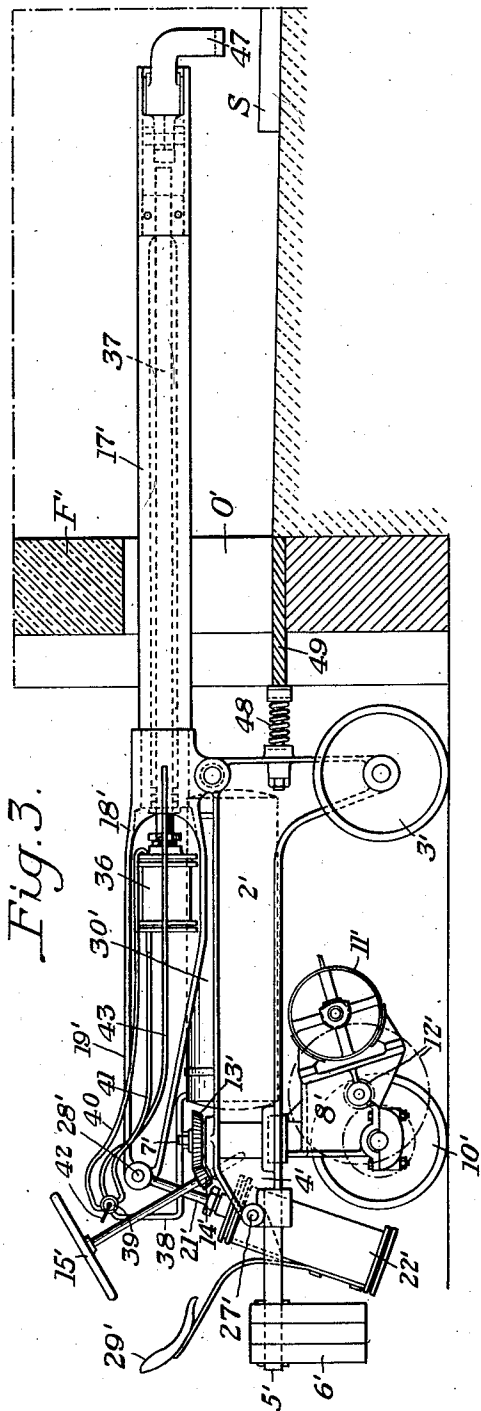
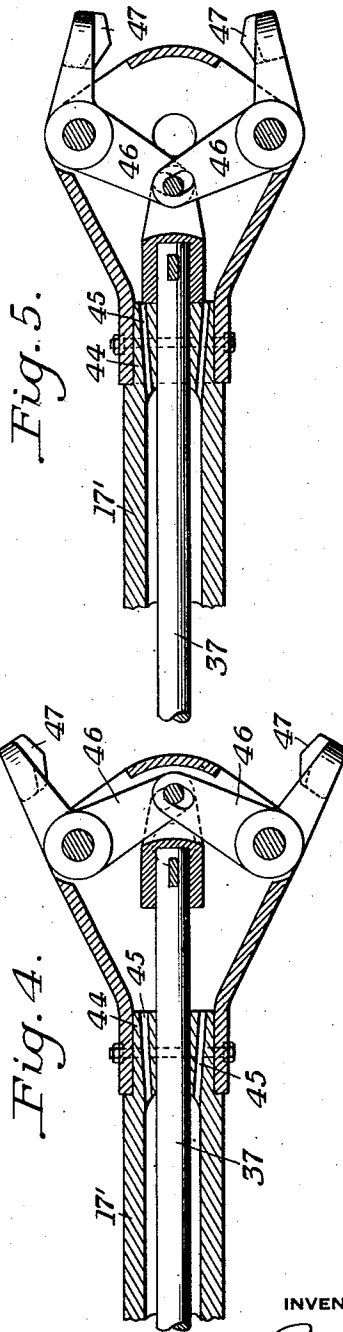
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MATERIAL HANDLING APPARATUS

Filed April 3, 1925

4 Sheets-Sheet 2

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MATERIAL HANDLING APPARATUS

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Fig. 6.

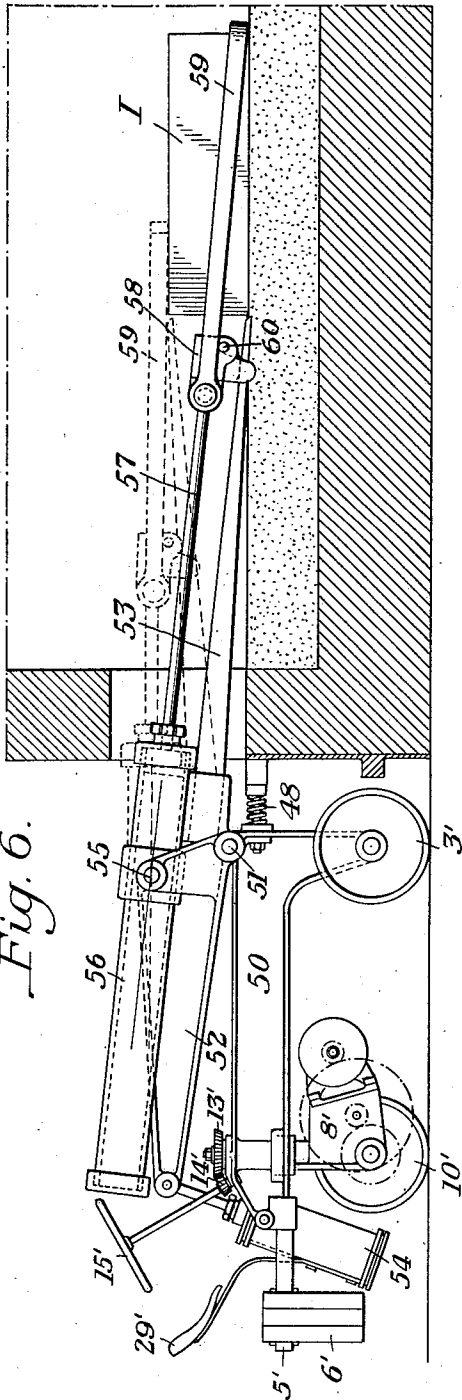
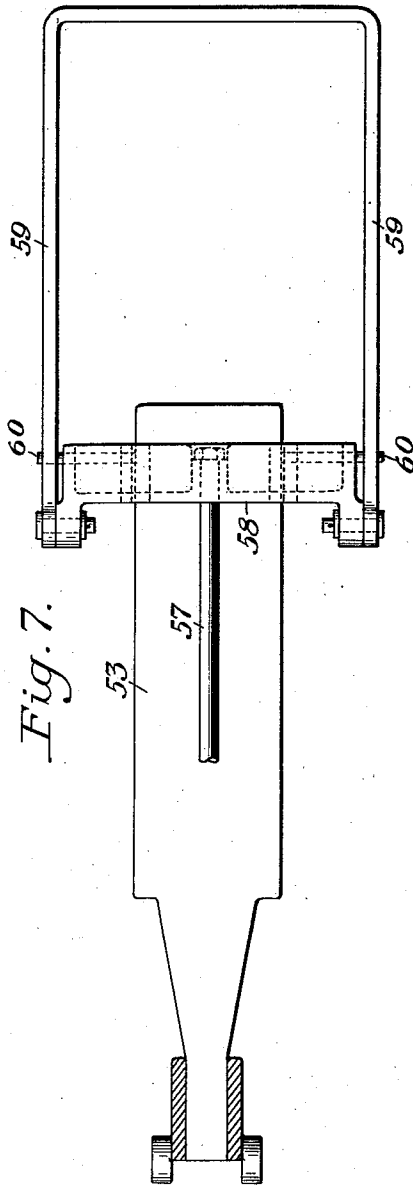


Fig. 7.



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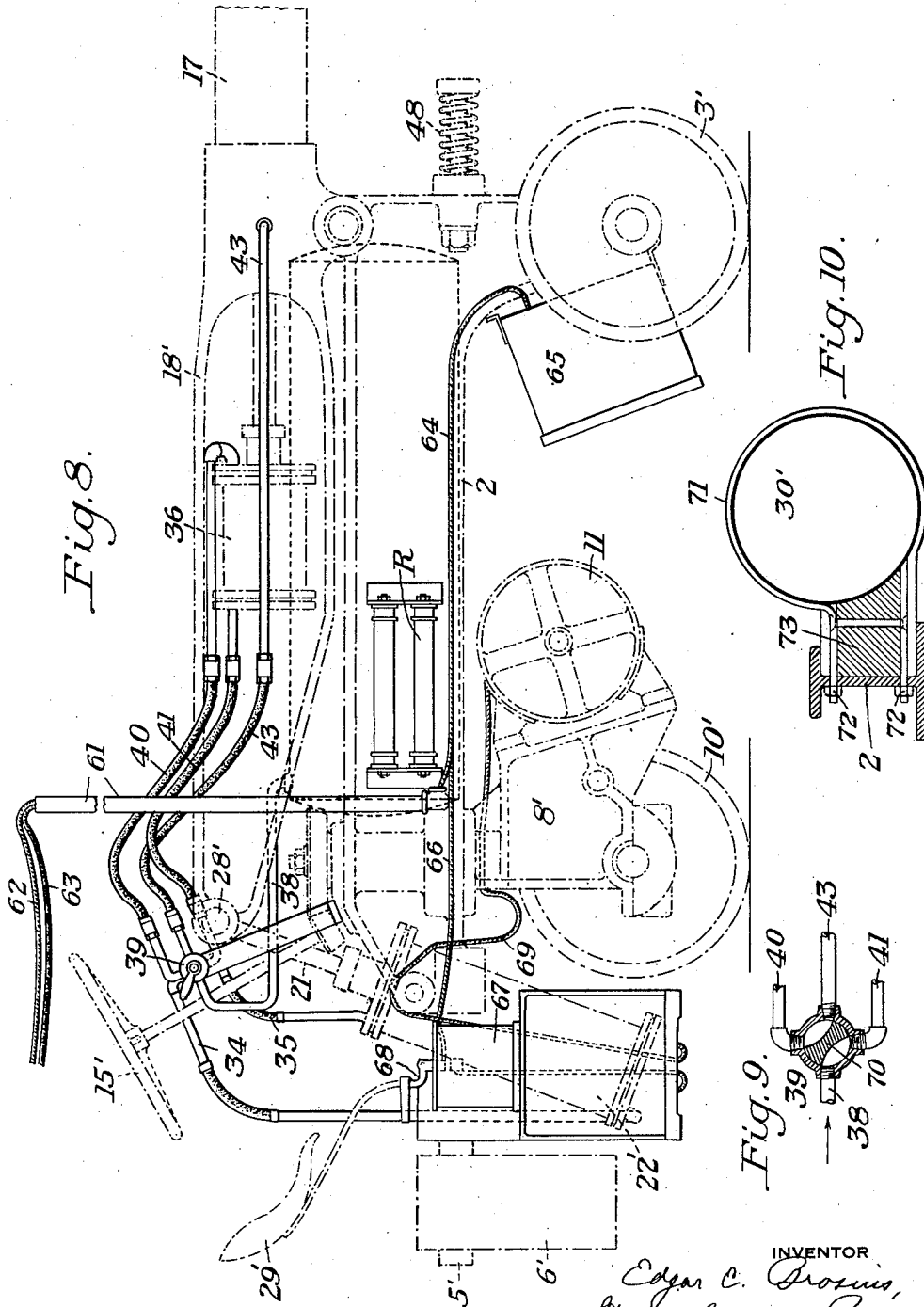
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MATERIAL HANDLING APPARATUS

Filed April 3, 1925

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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MATERIAL HANDLING APPARATUS

Application filed April 3, 1925. Serial No. 20,378.

The present invention relates broadly to material handling apparatus, and more particularly to apparatus of this general character adapted for use in the charging and discharging of furnaces and the like, although the utility of the invention is not limited with respect to such use.

Heretofore in the art to which the present invention relates it has been customary to provide charging machines having a limited range of travel and operation by reason of the fact that the field of operation has necessarily been limited by the track on which the machines have had to travel. Such charging apparatus has, therefore, not only necessitated the installation of a special system of track, thereby materially increasing the cost of the complete installation, but has also restricted the flexibility, or the field of operation of the apparatus.

It is one of the objects of the present invention to provide a charging machine adapted to be utilized to perform all of the operations heretofore performed by standard charging machines of the character ordinarily utilized, and having universal freedom of movement permitted by reason of a novel type of construction in which the machine travels directly over a floor or other supporting surface independently of any rails or other guiding or controlling means.

In the accompanying drawings there are shown, for purposes of illustration only, certain preferred embodiments of the present invention, it being understood that these drawings do not define the limits of the invention, as changes in the construction and operation disclosed therein may be made without departing either from the spirit of the invention or the scope of my broader claims.

In the drawings:

Figure 1 is a top plan view with certain of the parts omitted for the sake of clearness, illustrating one form of charging machine embodying the present invention;

Figure 2 is a side elevation of the machine illustrated in Figure 1;

Figure 3 is a view similar to Figure 2, il-

lustrating a slightly modified embodiment of the invention;

Figures 4 and 5 are longitudinal sectional views, illustrating more in detail the gripping jaws in open and closed position respectively;

Figure 6 is a view similar to Figure 2, illustrating still another embodiment of the invention;

Figure 7 is a top plan view of a portion of the apparatus illustrated in Figure 6;

Figure 8 is a side elevational view of a portion of a charging machine, illustrating more in detail certain of the operating features, the main constructional features of the machine which are shown in Figure 3 in full lines being shown in Figure 8 in chain lines;

Figure 9 is a detail sectional view of one of the operating valves; and

Figure 10 is a transverse sectional view, illustrating one form of mounting for a pressure tank.

In carrying out the present invention there may be provided a truck the frame of which may conveniently comprise an elongated central casting 2 widened at its front end to provide a suitable mounting for the wheels 3. At its rear end the truck frame is preferably bifurcated to provide angularly diverging arms 4 to each of which may be secured a support 5 adapted to extend rearwardly and carrying a counterweight 6, the purpose of which will be hereinafter more fully pointed out.

Adjacent its rear end, the truck frame is machined to receive a vertically extending stud shaft 7 projecting upwardly from a steering wheel frame 8. This steering wheel frame carries a transversely extending shaft 9 for the wheel 10, the wheel being adapted to be driven, as, for example, by a motor 11 through suitable gearing 12. This driven third wheel is adapted to constitute the control or steering wheel for the guiding of the truck, whereby it may be rapidly swung from one position to another without limitation such as imposed by tracks of the character ordinarily used with charging machines, and this operation may conveniently be accomplished by securing to the upper end of the

shaft 7 a bevel gear 13 with which meshes a similar gear 14 secured to the steering wheel 15. By reason of this construction it will be apparent that the driving wheel 10 may be quickly turned to any desired angular position whereby the entire truck may be bodily advanced along an angular line, or whereby the rear end of the truck may be moved laterally at any desired angle without materially changing the position of one of the front wheels 3. The provision of a single wheel at the rear of the frame which constitutes both the driving means and the steering means has been found to be decidedly advantageous, as it enables the position of the entire truck to be quickly changed and the range of operation of the entire machine thereby made substantially universal.

In the form of the invention illustrated particularly in Figures 1 and 2, the charging machine is shown as being of the type adapted for bodily picking up a charging box B and projecting it into a furnace F through a suitable charging opening O. For this purpose the truck 2 may be provided adjacent its front end with a pivotal mounting 16 for a peel 17, the peel being rotatably mounted in a bracket 18 having a portion 19 extending rearwardly. This rearwardly extending portion provides a support for a peel rotating motor 20 and also provides a convenient point of attachment for the piston rod 21 of a peel elevating motor 22.

The peel rotating motor is conveniently a standard electric motor of any desired construction adapted to rotate the peel through a suitable gear train 23 which drives a gear 24 secured in any desired manner to the rear end of the peel. By reason of this mechanism the peel may be quickly rotated so as to empty the box after it has been projected into the furnace the desired amount, and for returning the box to its normal position. The peel may be constructed with a box engaging portion 25 of standard construction and may be provided with the usual form of locking mechanism, not shown, adapted to be operated as well understood in the art by the lever 26.

The peel elevating motor 22 is preferably of the fluid pressure type comprising a cylinder having a pivotal mounting 27 between the arms 4, thereby permitting the cylinder to assume different angular positions. Such a mounting is required, as the upper end of the piston rod 21 has a pivotal connection 28 with the portion 19 of the peel supporting bracket. By reason of this construction, it will be apparent that by admitting fluid under pressure to the opposite ends of the cylinder, the piston rod may be raised or lowered, thereby correspondingly raising or lowering the rear end of the peel bracket to impart the desired angularity to the peel.

A suitable platform or seat for the operator

may be provided at any desired point to control the various motors provided, one form of seat 29 being illustrated in Figures 1 and 2 as directly carried by the motor 22.

The truck frame may have secured thereto in any desired manner a fluid pressure tank 30 having an inlet connection 31 adapted to receive fluid under pressure from any desired source, and having an outlet connection 32 leading to a valve 33 having connections 34 and 35, respectively, to opposite ends of the motor 22, whereby movement of the piston in either direction may be obtained at will. The valve 33 may be located at any desired position so as to be readily accessible to the operator and may be of any desired construction, a suitable location and construction being hereinafter more fully pointed out.

In Figure 3 of the drawings, there is illustrated a slightly modified embodiment of the invention in which parts corresponding to parts already described are designated by the same reference characters as those heretofore used, but having a prime affixed thereto. In accordance with this embodiment of the invention, the peel bracket 18' carries a fluid pressure motor 36 adapted to reciprocate a tong operating rod 37 in either direction through the peel 17'. The motor 36 may be energized in any desired manner, as by means of fluid under pressure, and for this operation the tank 30' has a connection 38 leading to the valve 39, which in turn has a connection 40 leading to one end of the fluid pressure motor cylinder and another connection 41 leading to the opposite end thereof. The valve is provided with a suitable operating handle 42 located in a position so as to be readily accessible to the operator and provided with an exhaust connection 43 discharging into the interior of the peel 17', whereby the discharged air or other fluid for operating the motor 36 serves to cool the peel. In order to permit this cooling fluid to freely discharge, the front bearing 44 of the peel is provided with one or more fluid escape channels 45, as illustrated in detail in Figures 4 and 5.

The tong operating rod at its forward end is connected to the inner arms 46 of the gripping jaws 47, whereby upon movement of the rod 37 in one direction or the other the jaws are moved either to open or closed position.

For positively limiting the movement of the truck frame 2' toward the furnace, it may be provided at its front end with a spring buffer 48 adapted to engage a buffer plate 49 projecting outwardly from the front of the furnace. It will be apparent that the form of charging machine illustrated in Figures 3, 4 and 5 also has a universal movement similar to that before referred to, and that upon operation of the respective motors 36 and 22' it is possible to bring the tongs 47

into the required position to engage a billet or slab S positioned within the furnace. The counterweight provided at the rear of the truck frame is preferably of the order of the maximum load which the peel will lift, thereby preventing any tipping of the truck even under the maximum load.

In Figures 6 and 7, there is illustrated still another embodiment of my invention specifically adapted for the bodily transfer of larger slabs or ingots I. This form of my invention may comprise a truck 50 having the construction illustrated more particularly in Figure 3 and provided with a pivotal mounting 51 for a lifting bracket 52 the front end of which is projected forwardly to form a combined slide and lift 53, and the opposite end of which extends rearwardly for co-operation with the motor 54, as before described. The bracket 52 has its sides extended upwardly to form trunnion mountings 55 for a fluid pressure motor 56 in the form of an elongated cylinder adapted to impart a comparatively long stroke to the piston rod 57. The front end of the piston rod carries a crosshead 58 to the opposite ends of which are pivotally connected the ends of a U-shaped bail 59. The head is preferably provided with stop pins 60 adapted to project below the sides of the bail and limit the downward swinging movement thereof, the lowermost position of the bail being substantially that illustrated in Figure 6. With this embodiment of my invention the truck is manipulated to bring it into the desired co-operative relation to the furnace, whereupon the motor 54 is actuated to bring the parts substantially into the dotted line position illustrated in Figure 6. Thereupon, the motor 56 is actuated to move the bail 59 along the ingot I until it drops beyond the end thereof, as shown in full lines in Figure 6. Thereupon, fluid pressure is turned into the opposite end of the cylinder so as to draw the ingot bodily onto the combined lift and slide 53, whereupon the peel may be tilted to bodily lift the ingot or slab, and the truck backed away from the furnace and the ingot bodily transferred to any desired position.

In Figures 8, 9 and 10, there is illustrated somewhat diagrammatically a system of control for a charging machine of the general type illustrated more particularly in Figure 3. In Figure 8 the constructional features of the charging machine are illustrated in chain lines, for the sake of clearness; the operating mechanism and connections being shown in full lines. In this figure the charging machine is illustrated as having an upwardly extending guide 61 adapted to receive a cable 62 by means of which the operating current for the electric motors may be delivered to the charging machine, and a flexible line 63 by means of which fluid pressure may be delivered to the tank 30' to maintain the desired

pressure conditions therein. From the guide 61 a cable 64 may pass to a suitable switch box 65 which may conveniently be located below the truck frame and directly to the rear of the front axle. From this switch box a second cable 66 passes rearwardly to a controller 67 having on its upper end an operating lever 68 preferably so located as to be operable by the foot of an operator positioned on the seat 29'. From the controller a cable 69 may extend forwardly to the motor 11' which operates the combined steering and driving wheel 10'. At some convenient point, as, for example, on one side of the truck frame, there may be provided resistance units R adapted to be connected in circuit in any desired manner.

From the fluid pressure tank 30' there extends rearwardly a fluid pressure connection 38 leading to the valve 39 from which in turn extend the pressure lines 40 and 41, before described in detail. The valve 39 may conveniently be of the construction illustrated in Figure 9, in which the rotatable member 70 is shaped to provide a so-called four-way valve. By reason of this construction, with the valve in the position illustrated in Figure 9, fluid under pressure will pass through the inlet 38 through the casing into the connection 41 for moving the piston in the fluid pressure motor 36 to the right for opening the tongs. At this time the opposite end of the fluid pressure motor will exhaust through the connection 40 and the valve to the exhaust line 43 leading to the peel 17' for cooling the same.

Directly in line with the valve 39 is a similar valve 33, illustrated in Figure 1, having connections 34 and 35 to the fluid pressure motor 22'. Each of the connections 34 and 35 will be constructed so as to permit the necessary swinging movement of the motor 22'.

In Figure 10, there is shown specifically a desirable form of mounting for the pressure tank 30, this mounting being illustrated as comprising straps 71 passing around the tank and having their ends threaded to extend through the truck frame 2, the ends being threaded to receive nuts 72. As a combined spacer and supporting plate, there may be provided a filler block 73 projecting laterally from the truck frame and having its outer end shaped to cooperate with the contour of the tank.

The cylinders 22, 22' and 54 utilized for elevating or tilting the peel are preferably all of the so-called balanced type, having at all times fluid pressure in the opposite ends of the cylinder on opposite sides of the piston. This may be accomplished readily by utilizing four way valves of the character referred to, whereby the rate of exhaust is directly proportional to the opening of the valve, thereby always tending to keep a predetermined volume of air trapped in the dead end

of the cylinder. Preferably, to assist in always maintaining this condition, the exhaust outlet from the valve may be slightly smaller than the inlet, the difference producing a desirable throttling action, as will be readily understood. The use of such a cylinder tends to hold the peel in the desired angular or horizontal position without objectionable accidental movement or deviation therefrom.

The material handling apparatus disclosed herein has the inherent ability to operate more quickly than the heavier and more cumbersome installations, having only a limited operating range. Under all conditions it has been found possible to get three complete cycles of operation per minute, the actual time per cycle in some cases being as low as ten seconds. This speed has heretofore been considered impossible of attainment, and obviously represents a decided advantage over the heavier and more expensive constructions.

Other advantages of the present invention arise from the provision of a material handling apparatus, particularly in the form of a machine for charging and discharging furnaces, in which the truck has a universal movement unhampered by the necessity of traveling on rails or guides.

Further advantages of the invention arise from the provision of a supporting truck having a combined motor driven steering and traction wheel at the rear of the truck frame.

Still other advantages arise from the provision of connections for utilizing the exhaust fluid for cooling the peel.

Still further advantages arise from the counter-weighting of the rear end of the machine, to thereby compensate for the maximum load to be lifted by the peel and prevent undesirable tilting of the apparatus.

I claim:

1. In a furnace charging machine, a supporting frame, a peel carried thereby, fluid pressure operating means for said peel, and means for cooling said peel by the action of said operating means, substantially as described.

2. In a furnace charging machine, a supporting frame, a tubular peel carried by said frame, fluid pressure operating means for said peel, and exhaust connections leading from said fluid pressure operating means to said peel for cooling the same by the exhaust from said operating means, substantially as described.

3. In a furnace charging machine, a peel, operating means for said peel, and means for automatically cooling said peel upon each operation of said operating means, substantially as described.

4. A material handling apparatus, comprising a truck, a peel carried thereby, fluid pressure means for operating said peel, and a pressure tank for said means mounted on

said truck, said fluid pressure means having exhaust connections leading to said peel for delivering a cooling fluid thereto, substantially as described.

5. In a material handling apparatus, an elongated frame having a widened portion adjacent one end thereof, supporting wheels carried by said widened portion, a bifurcated portion adjacent the opposite end, counter-balancing means carried by said bifurcated portion, and material engaging and lifting means operatively counter-balanced by said counter-balancing means, substantially as described.

6. In a material handling apparatus, an elongated frame having a widened portion adjacent one end thereof, supporting wheels carried by said widened portion, a bifurcated portion adjacent the opposite end, counter-balancing means carried by said bifurcated portion, a peel mounted on said frame, and actuating means for said peel located within said bifurcated portion, substantially as described.

7. In a furnace charging machine, a truck having forward supporting means and having rear supporting and steering means, a peel pivotally secured to said truck in substantially the vertical plane of said first mentioned means, counter-balancing means secured to said truck rearwardly of said supporting and steering means, and operating mechanism for said peel.

8. In a furnace charging machine, a truck having forward supporting means and having rear supporting and steering means, a peel pivotally secured to said truck in substantially the vertical plane of said first mentioned means, counter-balancing means secured to said truck rearwardly of said supporting and steering means, and operating mechanism comprising a pivotally supported cylinder having a pivotal connection to said peel adjacent one end thereof.

9. In a material handling apparatus, an elongated frame having supporting means adjacent one end thereof and steering means adjacent the opposite end thereof, a peel movably supported by said frame and projecting forwardly therefrom at one end, the opposite end of said peel constituting a continuation of said first mentioned end and overlying the frame throughout substantially the entire length of the frame, and operating means for said peel carried by said frame adjacent the rearward end thereof and operatively secured to said peel adjacent the rearward end thereof.

10. In a material handling apparatus, a truck, elongated material engaging means carried by said truck with the longitudinal axis thereof above the plane of said truck when the parts are in normal position, and mechanism for operating said means to

change the angularity of said axis, said means comprising a pivotally mounted fluid pressure cylinder carried by said truck and operatively secured to said first mentioned

5 means adjacent one extreme end thereof.

11. In a material handling apparatus, a peel, an elongated truck frame underlying said peel and having throughout the major portion of its length a width substantially

10 equal to the width of said peel, and means carried by said truck for operating said peel.

12. In a material handling apparatus, a peel, an elongated truck frame underlying said peel and having throughout the major portion of its length a width substantially

15 equal to the width of said peel, and means carried by said truck for operating said peel, said peel overlying said truck throughout substantially the entire length of the truck

20 frame.

13. In a furnace charging machine, a truck having forward supporting means and having rear supporting and steering means, a peel pivotally secured to said truck, said

25 peel being extended appreciable distances on opposite sides of said pivotal mounting, counterbalancing means secured to said truck rearwardly of said supporting and steering means, and mechanism for tilting said peel

30 having an operating connection therewith rearwardly of said pivotal mounting.

14. In a material handling apparatus, an elongated frame having wheel supporting means adjacent one end thereof, a heat resisting peel pivotally secured to said frame, said peel being extending appreciable distances on opposite sides of said pivotal mounting, steering means for said frame, means for counterbalancing said peel, and

35 means carried by said frame and secured to said peel rearwardly of its pivotal mounting for tilting the peel about said mounting.

15. In a furnace charging machine, a truck having forward supporting means and

45 having rear supporting and steering means, a peel pivotally secured to said truck with the plane of the pivotal mounting appreciably above the plane of said supporting means, counterbalancing means secured to

50 said truck rearwardly of said supporting and steering means, and operating mechanism for said peel.

16. In a furnace charging machine, a truck having forward supporting means and having rear supporting and steering means, a peel pivotally secured to said truck with the plane of the pivotal mounting appreciably above the plane of said supporting means, counterbalancing means secured to said

60 truck rearwardly of said supporting and steering means, and tilting mechanism for said peel, said tilting mechanism having an operating connection to said peel rearwardly of said pivotal mounting.

65 17. In a material handling apparatus, an

elongated frame having supporting means adjacent one end thereof, a heat resisting peel pivotally secured to said frame, said peel extending substantial distances on opposite sides of its pivotal mounting, steering means for the opposite end of said frame, means for counterbalancing said peel, and means carried by said frame and attached to said peel rearwardly of its pivotal mounting for tilting the peel up and down about

70 said mounting.

18. In a material handling apparatus, an elongated frame having supporting means adjacent the front end thereof, a heat resisting peel pivotally secured to said frame, said peel extending substantial distances on opposite sides of its pivotal mounting, steering means for the rear end of said frame, means for counterbalancing said peel, and means carried by said frame and attached

80 to said peel rearwardly of its pivotal mounting for tilting the peel up and down about said mounting, said counterbalancing means being secured to said truck rearwardly of said steering means.

85 In testimony whereof I have hereunto set my hand.

EDGAR E. BROSIUS.

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