

Nov. 28, 1933.

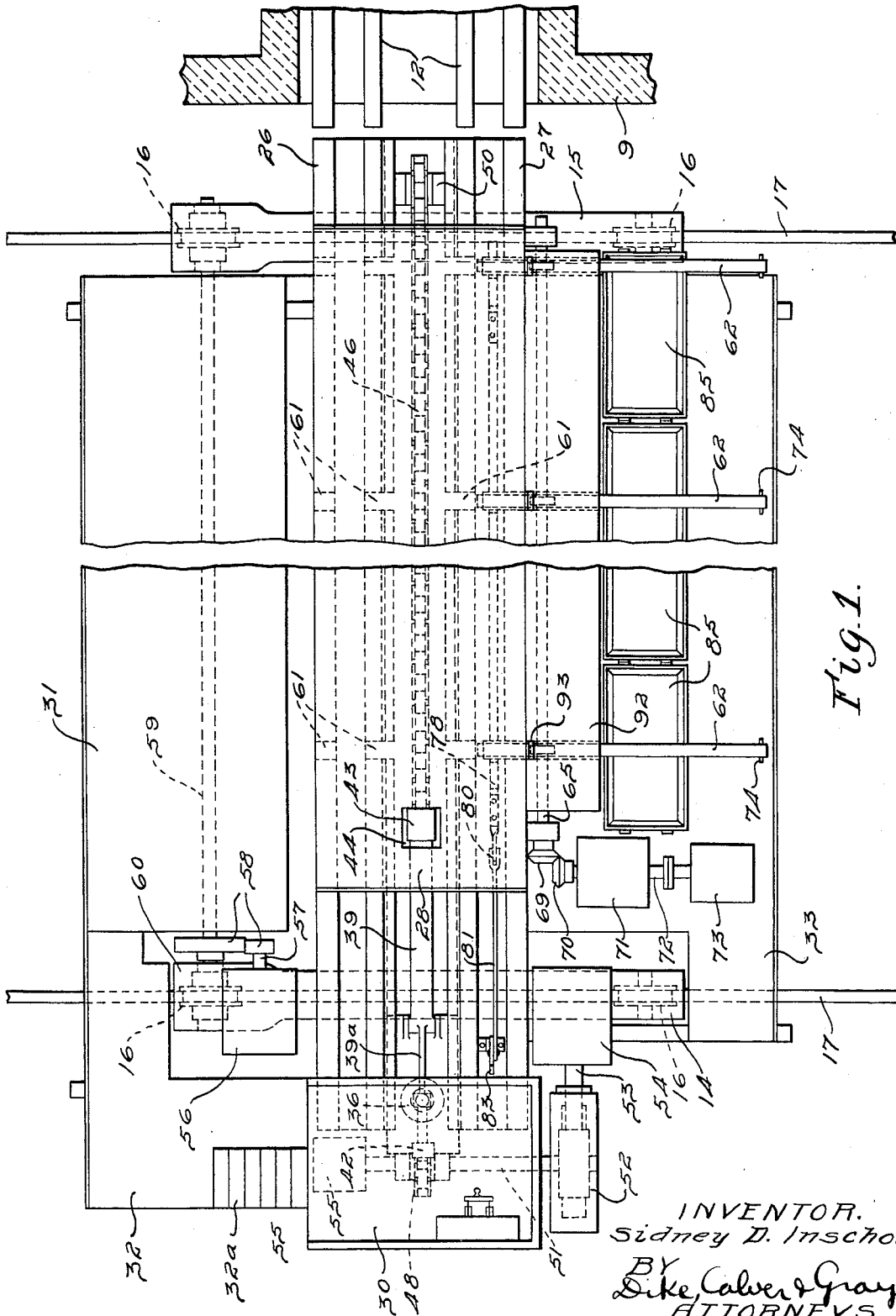
S. D. INSCHO

1,936,840

APPARATUS FOR CHARGING AND DISCHARGING FURNACES

Filed Oct. 22, 1931

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

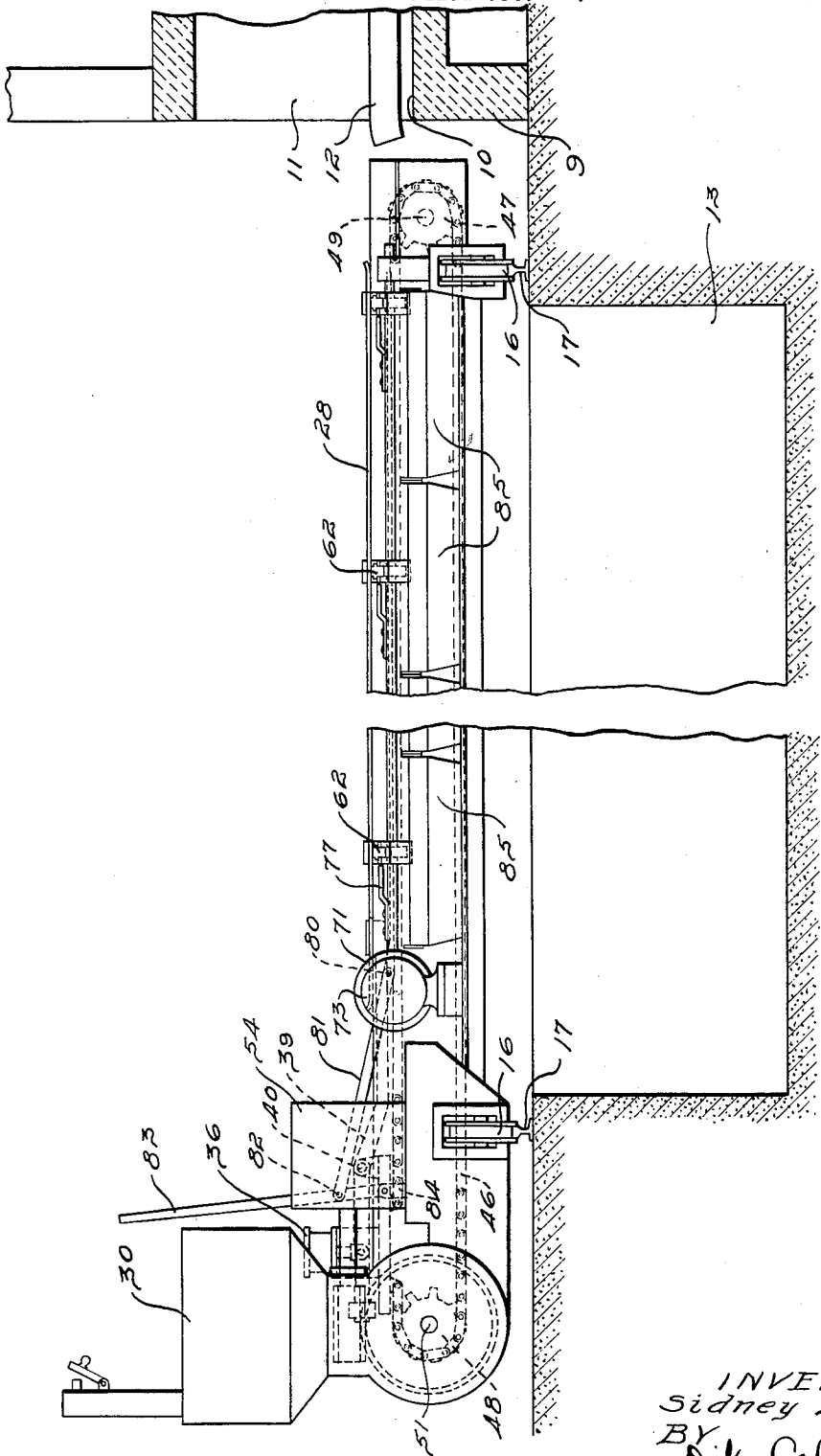


Fig. 2.

INVENTOR.
Sidney D. Inscho.
BY
Dike, Calvert & Gray
ATTORNEYS.

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4 Sheets-Sheet 3

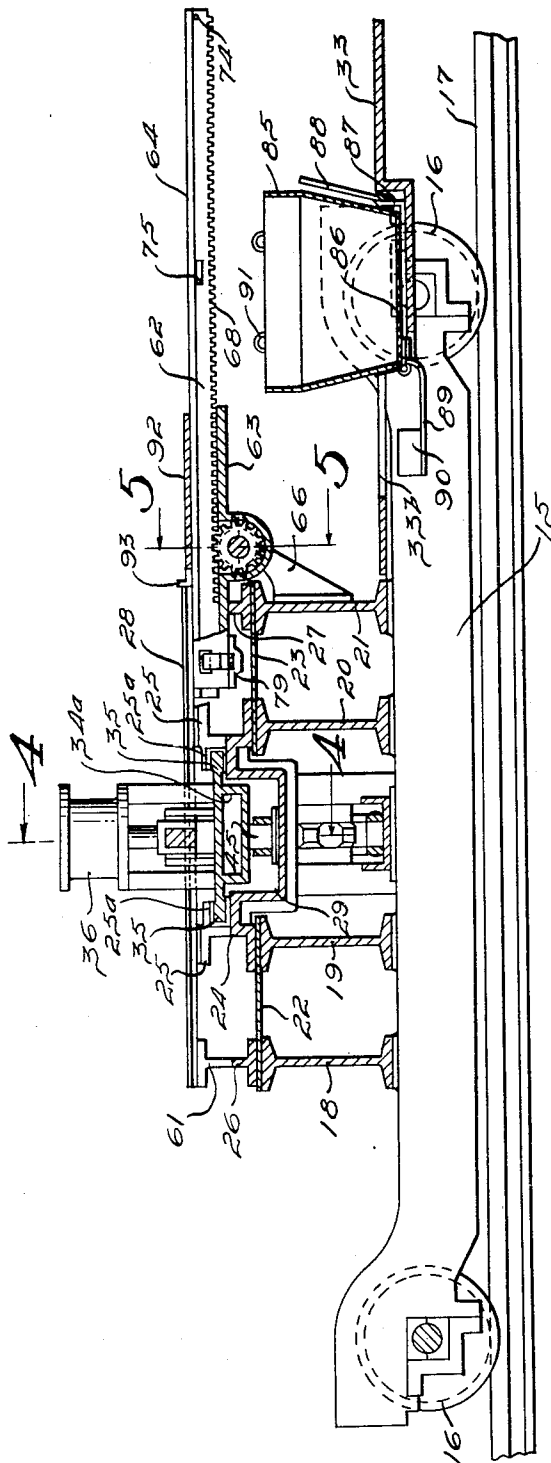


Fig. 3.

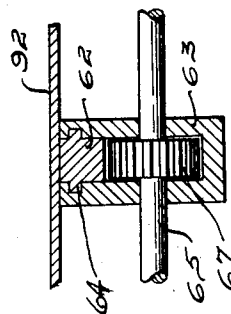


Fig. 5.

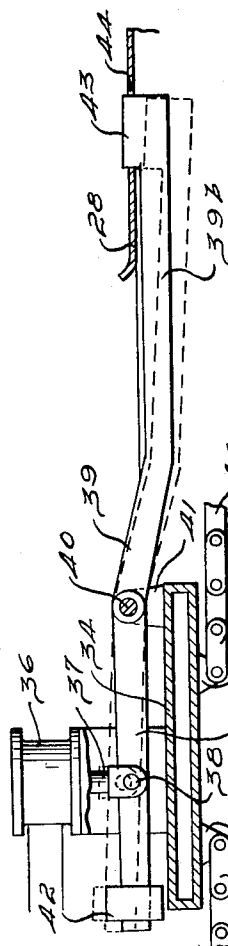


Fig. 4.

INVENTOR.
Sidney D. Inscho.
BY
Dike, Colver & Gray
ATTORNEYS.

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S. D. INSCHO

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4 Sheets-Sheet 4

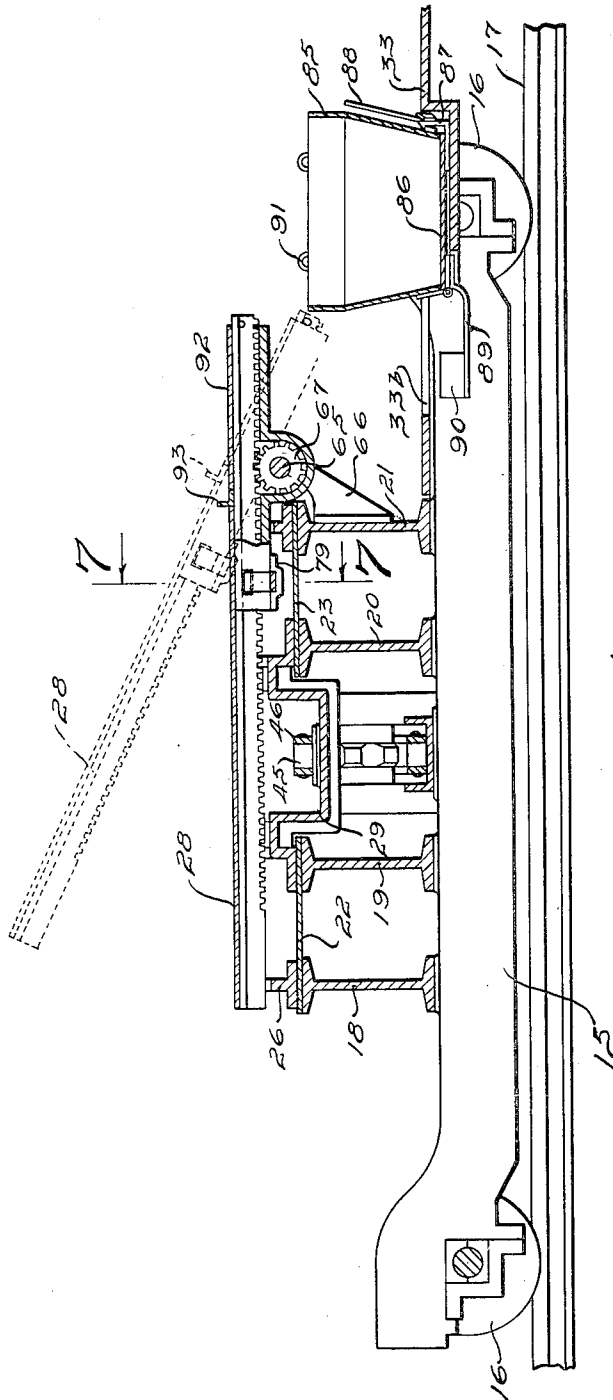


Fig. 6.

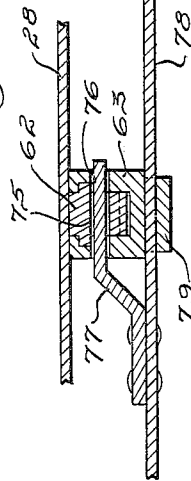


Fig. 7.

INVENTOR.
Sidney D. Inscho.
BY
Dike, Calver & Gray
ATTORNEYS.

UNITED STATES PATENT OFFICE

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APPARATUS FOR CHARGING AND
DISCHARGING FURNACES

Sidney D. Inscho, Shelby, Ohio, assignor to Ohio
Seamless Tube Company, Shelby, Ohio, a cor-
poration of Ohio

Application October 22, 1931. Serial No. 570,411

25 Claims. (Cl. 214—26)

This invention relates to an apparatus for charging and discharging furnaces, and particularly to improvements in machines of the type designed for the purpose of automatically delivering to a furnace a charge of metal parts or products to be annealed or heat treated and also for removing the charge from the furnace.

In the patent to Inscho et al., No. 1,712,997, patented May 14, 1929, there is shown a machine of this type especially adapted for handling stacks or bundles of tubes, bars or other material capable of being readily delivered to and removed from the charging pan or receptacle in bundles by means of an overhead crane. Machines in accordance with said patent are particularly effective in plants or factories having overhead crane installations and where the character of material, such as tubes, bars, rods, etc. is such as to permit the material to be handled in unit stacks or bundles. Although the patented machine is susceptible of use in connection with the annealing or heat treatment of a variety of other metal products, there are certain disadvantages where the material consists of small parts or pieces not capable of being handled in bundles or stacks. One of the principal objections arises from the difficulty in unloading the small parts from the charging pan after annealing and when the parts are still hot. This results in considerable loss of time in the use of the equipment as well as increased labor expense. The present machine avoids these disadvantages and provides an apparatus adapted to automatically handle all types of material, such as forgings, tubing, castings of all kinds including shafts, gears, etc., and in which considerable savings in labor and operating costs are possible.

An object of the invention is to provide a machine of the foregoing type having a charging pan or load carrier adapted to be delivered into the furnace and also retracted therefrom as by means of push and pull mechanism, and wherein means is provided which may be moved into position with respect to the carrier, when retracted, to discharge the load therefrom. More specifically, said means, as shown in the present case by way of example, may comprise an apparatus operative to shift, and preferably tilt, the load carrier into position to dump the load at one side of the machine.

A further object of the invention is to provide a machine for charging and discharging furnaces in which the machine is provided with a load carrier, such as a pan or tray designed to carry a load of parts or pieces and to be supported

within the fire chamber of the furnace; wherein a push and pull mechanism is provided for moving the carrier into the furnace and also for retracting it from the furnace; and in which the carrier is supported so that it may be tilted to dump its load when in retracted position.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts, in the several views.

Fig. 1 is a plan view, partly broken away, illustrating an apparatus embodying the invention and in which the charging mechanism is shown in retracted position.

Fig. 2 is a side elevation, partly broken away, of the construction shown in Fig. 1.

Fig. 3 is a transverse sectional elevation particularly illustrating the reciprocating head or carriage and showing the tilting mechanism in retracted position.

Fig. 4 is a fragmentary section taken substantially on line 4—4 of Fig. 3 in the direction of the arrows.

Fig. 5 is a detail section taken substantially on line 5—5 of Fig. 3 in the direction of the arrows.

Fig. 6 is a transverse sectional elevation particularly illustrating the tilting mechanism in operative position.

Fig. 7 is a detail section taken substantially on line 7—7 of Fig. 6.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention beyond the terms of the several claims hereto appended as considered in view of the prior art and the requirements thereof.

In the drawings there is illustrated a present preferred form of the invention as applicable to a mill or plant having a series or battery of furnaces arranged in line. With such an arrangement the entire charging machine may be mounted on spaced trucks which travel on rails in a direction parallel to the front of the battery of furnaces. The furnaces may thus be charged and discharged successively by moving the truck

into operating positions in front of the furnace doors.

In general the machine preferably comprises, as herein shown by way of example, a supporting frame upon which is mounted a carriage or charging head reciprocable toward and from the furnace opening. This carriage mechanism includes a push and pull device which pushes or projects a load carrier, such as a pan or receptacle carrying the charge of metal pieces, into the chamber above the furnace hearth and also retracts the load carrier after the material has been annealed or heat treated. Mechanism is provided for discharging the load when the carrier is in retracted position, and in the present embodiment this preferably includes slide bars capable of being thrust into position beneath the carrier and tilted so as to tilt the carrier and dump the load. Normally the slide bars are retracted so as to be disposed during the charging and discharging operations out of the path of travel of the reciprocating head.

In accordance with the system in which the herein illustrated machine may be used, a battery of furnaces is provided, one furnace of a battery being shown at 9 having a hearth 10, and a fire chamber 11 which is closed at the front by a door (not shown) in the conventional manner. Supported on the hearth are a series of guide rails 12 for the charging pan or load carrier.

The floor along the front of the row of furnaces may be provided with a longitudinal pit 13 which serves as a storage space either for containers holding parts to be annealed, or parts after annealing, or both. It will be noted that this pit is out of the path of air drafts in the furnace room and hence an even and uniform cooling of the annealed parts is permitted.

The operating mechanism and other parts of the apparatus are preferably supported by means of a pair of spaced trucks 14 and 15 of suitable construction, each having a pair of flanged wheels 16 adapted to travel on the rails 17 which in the present instance are disposed at opposite sides of the pit 13 and extend in parallel relation to the front of the battery of furnaces 9. Connecting the spaced trucks 14 and 15 are a series of longitudinal I-beams or girders 18, 19, 20 and 21. The adjacent pairs 18-19 and 20-21 of these beams are connected by means of plates 22 and 23 respectively. Supported on the frame members 19 and 20 is a structural frame member 24 of special design having longitudinal rail portions 25 and spaced longitudinal channel portions 25a which provide a guide way for the reciprocating carriage. Additional rails 26 and 27 are mounted above the I-beams 18 and 21, and it will be seen that the rails 25, 26 and 27 provide a supporting medium for a reciprocable charging pan, receptacle or plate 28. This plate serves as the load carrier and is adapted to be shifted into and out of the furnace chamber 11 on the rails 25-27 and the rails 12 of the furnace hearth, there being suitable wear plates interposed between the pan 28 and rails of the charger.

The longitudinal frame member 24 is also provided centrally thereof with a depressed channel or trough 29 into which a portion of the carriage extends and which also receives and guides the upper run of the sprocket chain, hereinafter described.

Supported on the frame at one side of the machine is a cage or pulpit 30 for the operator of the machine. Also supported on the frame of the

apparatus are platforms 31, 32 and 33, the pulpit being reached from the platform 32 by means of suitable steps 32a. It will be understood that the operation of all mechanisms of the apparatus is preferably controlled by the operator from the pulpit 30 and for this purpose the switches and other control devices are mounted in the pulpit within easy reach of the operator. The electric controls are of conventional type and are, therefore, not illustrated in the present case, and for like reason the wiring diagram by which the electric current is conducted from a source of current supply to the controls and operating parts is not illustrated herein.

Referring particularly to Figs. 3 and 4, a reciprocating carriage or head 34 is provided for the purpose of shifting the charging pan or load carrier 28 into and out of the furnace. As shown in Fig. 3 the carriage or head is provided with a central portion 34a which projects into the trough or guide way 29 and is also provided at opposite sides with projecting guide members 35 which travel in the guide ways 25a, suitable wearing plates being interposed between the surfaces of the guide members 35 and the guide ways. A solenoid 36 is mounted on the carriage 34 and is provided with an armature 37 pivoted at 38 to one arm 39a of a lever 39. This lever is pivoted at 40 to a bracket 41, carried by the carriage frame 34. The free end of the arm 39a of the lever is preferably weighted at 42 for the purpose of normally maintaining the opposite end 39b of the lever in raised position as illustrated in full lines in Fig. 4. The free end of the arm 39b is provided with a lug 43 adapted to freely extend into an aperture 44 in the charging plate 28. With the lever arm 39b in the position shown in full lines in Fig. 4 it will be seen that rearward movement of the carriage 34 away from the furnace will be transmitted to the charging plate or pan 28 thus moving the pan rearwardly on the guide rails out of and away from the furnace. The reverse movement of the carriage 34 will cause the lever 39 through the lug 43 to push the pan forwardly toward and into the furnace.

From the foregoing it will be seen that the carriage mechanism includes in the present instance a single push and pull bar 39 adapted to be connected or disconnected from the pan 28 and, upon reciprocating the carriage, to draw the pan with its load of material out of the furnace or push it into the furnace. It will be understood that the solenoid 36 is operated by electric current conducted thereto in conventional manner, and that the operation of this solenoid is controlled from the pulpit 30 in conventional manner as by means of push buttons which are actuated to make or break the circuit. It will also be understood that when the solenoid is magnetized the armature 37 is drawn upwardly thereby tilting the lever 39 and depressing the lug or hook end 43 thereof to disconnect the lever from the charging pan or carrier 28.

Depending from the bottom of the carriage frame 34 are a pair of spaced lugs or blocks 45 to which are attached the ends 46a of a continuous sprocket chain 46. The upper run of this chain is supported and guided on the floor of the channelway 29, see Figs. 3 and 6. This chain at the forward end of the machine travels over a sprocket wheel 47 and at its rear end over a similar sprocket wheel 48. The sprocket wheel 47 is secured to a shaft 49 (Figs. 1 and 2) preferably mounted in adjustable bearings 50 for the purpose of permitting adjustment of the chain to

obtain the proper tension thereof. Referring to Fig. 1, the sprocket wheel 48 is carried by a cross shaft 51 supported in suitable bearings and driven through the medium of reduction gearing, indicated at 52, from the drive shaft 53 of a reversible electric motor 54. It will be understood that the motor 54 is driven by electric power conducted from the source of supply in conventional manner and is controlled by the operator from the pulpit 30. Thus by operating the drive shaft 53 of the motor in one direction the chain 46 will be caused to travel in one direction and by reversing the motor the chain will be caused to travel in the opposite direction, and travel of the chain in either direction is imparted directly to the carriage 34. It will also be understood that a suitable limit switch at 55 is provided to define the opposite limits of travel of the carriage independently of the operator.

The charger apparatus is caused to travel laterally over the rails 17 from furnace to furnace by means of driving mechanism connected to a wheel 16 of each of the trucks. For this purpose there is provided a reversible electric motor 56, the driving shaft 57 of which is connected by means of gears 58 with a longitudinal shaft 59 through the medium of suitable reduction gearing 60. The shaft 59 is connected to the driving wheels of the trucks. Thus the charger may be caused to travel in either direction parallel to the front of the furnaces by operating the motor 56 in either direction. It will be understood that electric power is conducted from a suitable source of supply to the motor 56 and that control of motor is effected in conventional manner from the pulpit 30.

Referring to Figs. 1, 3 and 6, it will be noted that the guide rails 25, 26 and 27 are provided with aligned transverse slots 61 wide enough to provide guide ways for a plurality of slide bars 62. Three of these bars (see Fig. 1) are illustrated by way of example in the present case. Although the guide rails are shown slotted at 61 to receive the slide bars 62 and permit the latter to be freely shifted into and out of position beneath the carrier or pan 28, it will be understood that separate sets of guide rails may be provided which may be spaced apart at their adjacent ends to provide similar spaces 61 to receive the slide bars.

Each slide bar 62 is slidably mounted in a rocking guide member or yoke 63, the parts being interlocked by means of keys 64 on the guide bar extending into keyways in the yoke 63. Each guide member or yoke 63 is freely mounted on a longitudinal shaft 65 supported in brackets 66 carried by the I-beam 21. The members 63 are recessed to receive pinions 67 pinned or otherwise secured to the shaft 65, and each pinion meshes with rack teeth 68 preferably formed on the lower edge of each slide bar 62. For the purpose of driving the pinions 67 and thereby reciprocating the rack bars 62, the shaft 65 at its rear end carries a bevel gear 69 meshing with bevel gear 70 driven through reduction gearing 71 from the armature shaft 72 of a reversible electric motor 73. This motor is wired in conventional manner from the source of electric current and is also controlled by the operator from the pulpit 30 in conventional manner. Thus, by driving the motor in one direction the pinions 67 will be rotated so as to shift the rack bars 62 from the position shown in Fig. 3 to the position shown in full lines in Fig. 6, beneath the charging receptacle or pan 28; and by reversing the opera-

tion of the motor 73 the rack bars 62 will be returned to their positions shown in Figs. 1 and 3 out of the path of travel of the reciprocating carriage 34 and associated parts.

Each bar 62 at its outer end is preferably provided with a transverse pin 74 which functions as a stop to limit the extreme inward movement of the bar by engagement with the end of the yoke or guide 63. The movement of the bars into position beneath the charging pan and also into retracted position is also controlled by means of suitable limit switches of conventional type (not shown) which arrest the movement of the bars when they reach their extreme positions, thereby preventing any possibility of damage to the parts.

The rack and pinion mechanism may also be utilized for the purpose of swinging or rocking the guides 63, tilting the bars 62, and thereby lifting and tilting the charging pan 28, as shown in dotted lines in Fig. 6. To accomplish this the bars 62 are locked beneath the charging pan. Each bar is provided with an aperture 75 adapted to align with a corresponding aperture 76 in the member 63 when the bar is in its operative position shown in Fig. 6. The parts 62 and 63 may then be locked together by means of latches 77 (see Fig. 7) riveted to a shiftable latch bar 78 guided along the under side of the members 63 by guide clips 79. The latch bar 78 (see Figs. 1 and 2) is flexibly connected at 80 at its rear end to a link 81 pivoted at 82 to an operating lever 83 which in turn is pivoted at its lower end to a bracket 84. The lever 83 is located in convenient position for manipulation by the operator in the pulpit 30, and by swinging this lever forwardly the latches 77 may be shifted into locking position in the aligned apertures of members 62 and 63. When these parts have been locked together by the latches 77, the motor 73 may be reversed so as to drive the pinions in a direction which normally would retract the slide bars 62, but since these bars are locked against such movement the pinions will act in conjunction with the racks 68 to swing the bars into the dotted line positions shown in Fig. 6 thereby elevating and tilting the charging pan 28.

The load will then slide from the pan over a fixed plate 92 forming a continuation thereof, into a series of containers or buckets 85, there being stops 93 on the members 63 to prevent the pan or plate 28 from sliding off the bars 62 and becoming displaced.

It will be seen from the foregoing that the tilting bars, which are adapted to be projected into position to effect the discharge of the load from the load carrier, are supported at a lateral side of the push and pull mechanism and independently thereof so as to be unaffected by the movement of the carrier. Hence, the discharging means for the carrier is supported against longitudinal movement with the load carrier. Moreover, when the longitudinally shiftable push and pull mechanism is shifted to position the carrier within the furnace it will be seen that a portion of this mechanism provides a stop preventing the lifting and tilting bars from being moved laterally into normal discharging position. As a consequence, the lifting and tilting mechanism for effecting discharge of the carrier is rendered inoperative when the push and pull mechanism is in the lateral path of the tilting bars.

A number of containers 85 are preferably aligned side by side so as to receive all of the material discharged from the charging pan 28, 150

and these containers may be mounted in recesses 33a in the platform 33. Each bucket 85 has a swinging trap 86 releasably locked by means of a latch 87 operated by a trip lever 88. Connected to the trap door 86 is an arm 89 carrying a weight 90 which, when the load has been dumped from the bucket, will operate to swing the trap door into closed and latched position. The platform 33 has openings 33b to provide clearance for the parts 89 and 90 so that an overhead crane may be readily connected to the eyes 91 to lift the buckets or containers from the platform, and deposit them in the pit 13 for storage or carry them to any suitable destination where the buckets can be dumped by operating the trip levers 88, the crane then returning the buckets to the machine for further operations.

It will thus be seen that the present machine may be readily used in connection with a variety of material to be annealed or heat treated, including tubes, bars, rods, and castings of all sizes. In the case of small castings these may be discharged from the crane onto the charging pan or receptacle and suitably spread over the top by the workman. The machine is then operated to deliver the charge to the furnace, the door of which need be opened only a fraction of a minute during either the charging or discharging operation, thus minimizing the heat loss. The load, after annealing, can be promptly discharged from the charging pan without any substantial loss of time, thus releasing the apparatus for immediate use in charging or discharging another furnace. It will be understood that in using the charger where the mill is equipped with a battery of furnaces, all furnaces should be alined and the hearths thereof at the same elevation so that the charging pan or carrier will travel readily from the machine into the furnace.

It will also be seen that the present machine may be used in connection with furnaces already installed as regular equipment in plants or mills and without necessitating any substantial alterations in the equipment. The furnaces need only be arranged in parallel relation with the hearths at the same elevation. Moreover, the guide rails may be readily embedded in the hearth of the furnace in order to facilitate sliding of the pan in and out of the furnace. The apparatus does not require an opening and door at each end of the furnace, thus holding the heat in the furnace to a greater degree than in the case of furnaces which are charged and discharged through doors at opposite ends. It will also be seen that the containers can be utilized to load and bring material to the machine to be dumped on the charging pan. Hence, these containers are useful for carrying material to and from the machine.

What is claimed is:—

1. In a charging and discharging machine for furnaces the combination of a truck-supported frame movable into predetermined position in front of a furnace, a load receptacle mounted on said frame, push and pull mechanism for shifting said receptacle into a furnace and for retracting the receptacle with its load from the furnace, and means for tilting said carrier when in retracted position to discharge the load therefrom, said means including a rocking member and a horizontally sliding bar carried thereby.

2. In a charging and discharging machine for furnaces, the combination of a supporting frame, a load carrier mounted on said frame, push and pull means adapted to be connected to and disconnected from said carrier for shifting the same

with its load into the furnace and also for retracting the carrier with its load from the furnace, and means shiftable into and out of position beneath the carrier when retracted for lifting the same to discharge the load.

3. In a charging and discharging machine for furnaces, the combination of a supporting frame, a load carrier mounted on said frame, push and pull means adapted to be connected to and disconnected from said carrier for shifting the same with its load into the furnace and also for retracting the carrier with its load from the furnace, members shiftable into and out of position beneath the carrier, and means for swinging said members to move the carrier into position to discharge its load.

4. In a machine for charging and discharging furnaces the combination of a load carrier, a reciprocating carriage having push and pull means operative to shift the carrier into a furnace and also to retract the carrier with its load, devices shiftable into and out of the path of the carriage beneath said carrier, and means for operating said devices to tilt the carrier.

5. In a machine for charging and discharging furnaces the combination of a load carrier, a reciprocating carriage having push and pull means operative to shift the carrier into a furnace and also to retract the carrier with its load, slide members, and means for supporting said members for shiftable movement into position beneath the carrier and also for swinging movement to tilt the carrier.

6. In a machine for charging and discharging furnaces the combination of a load carrier, a reciprocating carriage having push and pull means operative to shift the carrier into a furnace and also to retract the carrier with its load, slide members, power operated means for shifting said slide members beneath the carrier and for swinging the same to tilt the carrier.

7. In a charging and discharging apparatus for furnaces, the combination of a frame adapted to be successively moved into position in front of a series of furnaces, a load carrier mounted on said frame, a carriage having a push and pull bar for shifting said carrier into a furnace and for retracting it from the furnace, means for connecting and disconnecting said bar from the carrier, means for reciprocating said carriage toward and from the furnace, and load discharging means for the carrier including bars slidable transversely of the path of reciprocation of the carriage when in retracted position.

8. In a charging and discharging apparatus for furnaces, the combination of a frame adapted to be successively moved into position in front of a series of furnaces, a load carrier mounted on said frame, a carriage having a single push and pull bar for shifting said carrier into a furnace and for retracting it from the furnace, means for connecting and disconnecting said bar from the carrier, means for reciprocating said carriage toward and from the furnace, and means for discharging the load from said carrier when in retracted position, said last means including mechanism shiftable into the path of the carriage for tilting said carrier.

9. In a charging and discharging apparatus for furnaces, the combination of a frame adapted to be successively moved into position in front of a series of furnaces, a load carrier mounted on said frame, a carriage having push and pull means for propelling said carrier into a furnace

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and for retracting it from the furnace, means for connecting and disconnecting said means from the carrier, means for reciprocating said carriage toward and from the furnace, a slide member, a rack carried thereby, a pinion cooperating with said rack to shift the slide member beneath the carrier, and means for operating said pinion to tilt the slide member.

10. In a charging and discharging apparatus for furnaces, the combination of a load carrier, longitudinally shiftable means for moving said carrier relatively to the furnace to charge the same, means for retracting said carrier to discharge the load from the furnace, means operative when the carrier is in retracted position for bodily lifting and tilting said carrier to discharge the load from the carrier, and means for rendering said last means inoperative when said first named means is shifted to move the carrier into its charging position.

11. In a machine for charging and discharging a furnace, the combination of a reciprocable load carrier, means for supporting said carrier in three positions comprising a loading position, a load charging position within the furnace and a load discharging position outside the furnace, longitudinally shiftable mechanism for reciprocating the carrier between its loading and charging positions, mechanism for moving the carrier into its load discharging position, and means for rendering said last named mechanism inoperative when said first named mechanism is shifted to move the carrier into its charging position.

12. In a machine of the class described, the combination of a load carrier, reciprocating mechanism for shifting said carrier into the furnace and for retracting the carrier with its load from the furnace, a member having a rack, a pinion co-acting with said rack to shift said member beneath the carrier, means for locking said member, and means for operating said pinion to tilt said member.

13. In a machine of the class described, the combination of a load carrier, reciprocating mechanism for shifting said carrier into the furnace and for retracting the carrier with its load from the furnace, a carrier tilting member, rack and pinion means for shifting said member into and out of position beneath the carrier, means for locking the member in position beneath the carrier, and means for operating said pinion to cause said member to tilt the carrier.

14. In a machine of the class described, the combination of a load carrier, reciprocating mechanism for shifting said carrier into the furnace and for retracting the carrier with its load from the furnace, carrier tilting bars, rack and pinion mechanism for shifting said bars into and out of tilting position with respect to said carrier, and means whereby said bars may be swung to tilt said carrier.

15. In an apparatus for charging and discharging furnaces, in combination, a wheeled truck, power mechanism for moving said truck in a predetermined path relative to a battery of furnaces, a carriage mounted on the truck and reciprocable toward and from a furnace, a load carrier, means for connecting and disconnecting the carriage and carrier, means for supporting said carrier to permit travel of the carrier with its load from the truck into and out of the furnace, bars adapted to be shifted beneath the carrier when retracted, guide members supporting said bars for shiftable movement, and means for swinging said guide members to tilt the bars and

elevate said carrier into position to discharge its load.

16. In an apparatus for charging and discharging furnaces, in combination, a wheeled truck, power mechanism for moving said truck in a predetermined path relative to a battery of furnaces, a carriage mounted on the truck and reciprocable toward and from a furnace, a load carrier, means for connecting and disconnecting the carriage and carrier, means for supporting said carrier to permit travel of the carrier with its load from the truck into and out of the furnace, bars adapted to be shifted beneath the carrier when retracted, guide members supporting said bars for shiftable movement, means for swinging said guide members to tilt the bars and elevate said carrier into position to discharge its load, and removable containers supported on said truck in positions to receive the load discharged from the carrier.

17. In a charging and discharging apparatus for furnaces, the combination of a frame adapted to be successively moved into position in front of a series of furnaces, a load carrier mounted on said frame, a carriage having push and pull means for propelling said carrier into a furnace and for retracting it from the furnace, means for connecting and disconnecting said means from the carrier, means for reciprocating said carriage toward and from the furnace, a slide member, means for supporting said slide member out of the path of movement of the carriage, and mechanism for shifting the slide member beneath the carrier and for tilting the slide member to tilt the carrier.

18. In a charging and discharging apparatus for furnaces, the combination of a frame adapted to be successively moved into position in front of a series of furnaces, a load carrier mounted on said frame, a carriage having push and pull means for propelling said carrier into a furnace and for retracting it from the furnace, means for connecting and disconnecting said means from the carrier, means for reciprocating said carriage toward and from the furnace, slide members, and means for shifting said members transversely of the direction of reciprocation of the carrier and beneath the same and for tilting said members to tilt the carrier.

19. In a charging and discharging apparatus for furnaces, the combination of a load carrier, reciprocating mechanism for shifting said carrier into and out of a furnace, power operated means for reciprocating said mechanism, means shiftable transversely of the path of reciprocation of the carrier into position to tilt said carrier, and mechanism for operating said last means to tilt the carrier laterally of its path of reciprocation.

20. In a charging and discharging apparatus for furnaces, the combination of a load carrier, reciprocating mechanism for shifting said carrier into and out of a furnace, power operated means for reciprocating said mechanism, means shiftable transversely of the path of reciprocation of the carrier into position to tilt said carrier, mechanism for operating said last means to tilt the carrier laterally of its path of reciprocation, and receptacle means at one side of the carrier for receiving the load discharged from the carrier when tilted.

21. In a charging and discharging machine for furnaces, the combination of a load carrier, push and pull mechanism for shifting said carrier into a furnace and for retracting the car-

rier with its load from the furnace, means for disconnecting the carrier from said push and pull mechanism when the carrier is in retracted position, and means for tilting the carrier to discharge the load therefrom at a lateral side of its path of reciprocation.

22. In a charging and discharging apparatus for furnaces, the combination of a load carrier, mechanism for reciprocating said carrier to move the same longitudinally into and out of a furnace, power operated means for reciprocating said mechanism, load discharging means for the carrier shiftable transversely when the carrier is retracted into the normal path of travel of the carrier, and means for supporting said discharging means independently of the movement of the carrier.

23. In a charging and discharging apparatus for furnaces, the combination of a load carrier, mechanism for reciprocating said carrier to move the same longitudinally into and out of a furnace, power operated means for reciprocating said mechanism, load discharging means for the carrier shiftable, when the carrier is retracted, into and out of the normal path of reciprocation of the carrier, and means for supporting said discharging means against longitudinal movement with the carrier.

24. In a charging and discharging apparatus for furnaces, the combination of a load carrier, push and pull mechanism adapted to be connected and disconnected to said carrier for longitudinally reciprocating the same into and out of a furnace, load discharging means for the carrier shiftable transversely thereof into the normal path of travel of said mechanism, and means for supporting said discharging means at a lateral side of said carrier in fixed longitudinal position with respect to said carrier.

25. In a charging and discharging apparatus for furnaces, the combination of a load carrier, push and pull mechanism adapted to be connected and disconnected to said carrier for longitudinally reciprocating the same into and out of charging position in a furnace, load discharging means for the carrier shiftable transversely thereof into the normal path of travel of said mechanism, and means for supporting said discharging means at a lateral side of said carrier in fixed longitudinal position with respect to said carrier, said push and pull mechanism having means for limiting the transverse movement of the discharging means when the load carrier is in charging position.

SIDNEY D. INSCHO.

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