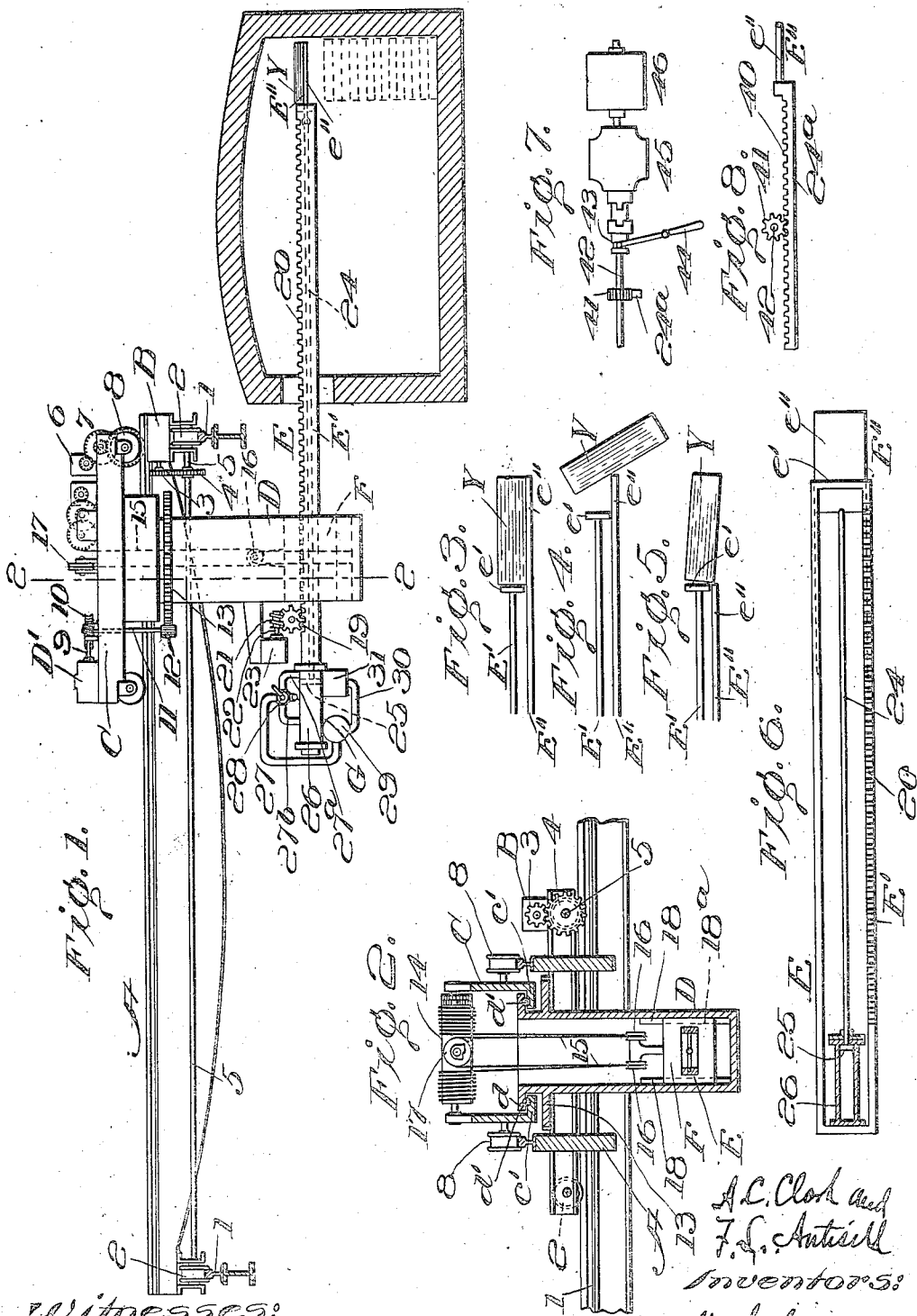


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FURNACE CHARGING APPARATUS.
APPLICATION FILED SEPT. 12, 1907.

951,304.

Patented Mar. 8, 1910.

2 SHEETS—SHEET 1.

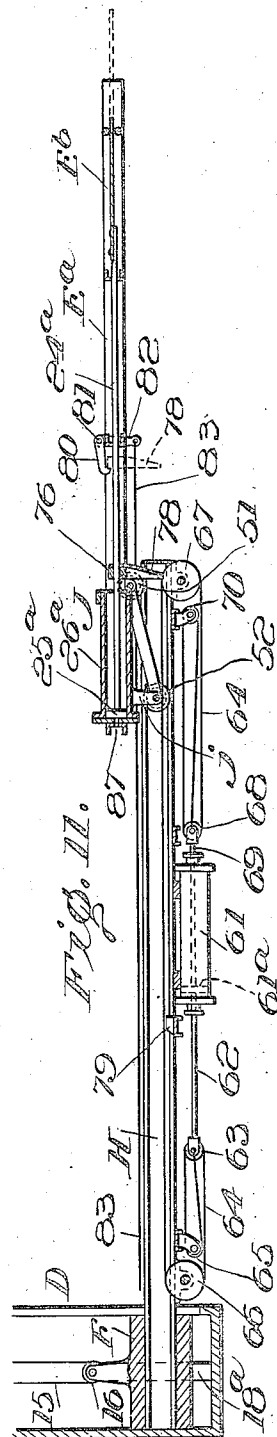
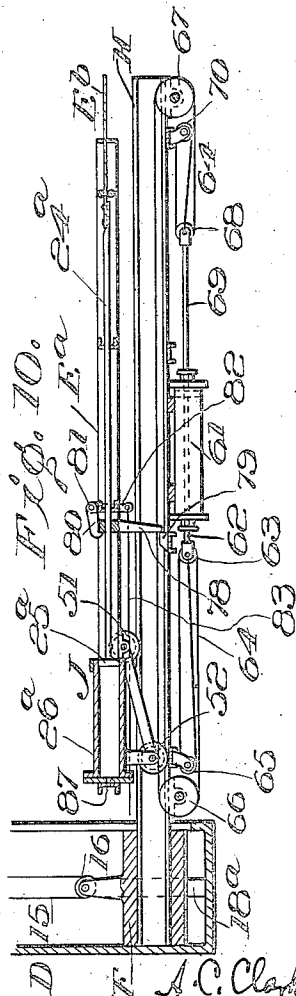


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951,304.

2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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FURNACE-CHARGING APPARATUS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, ADOLPH C. CLARK and FRANK L. ANTISELL, citizens of the United States, and residents, respectively, of Perth Amboy, county of Middlesex, State of New Jersey, and of the city, county, and State of New York, have invented certain new and useful Improvements in Furnace-Charging Apparatus, of which the following is a specification.

This invention consists in certain peculiarities in the construction and arrangement of parts and in certain novel combinations of elements substantially as hereinafter described and particularly pointed out in the subjoined claims.

The main purpose of the present invention is to provide an apparatus for charging furnaces, in which the charge will be uniformly and evenly stacked, so as to utilize the entire available space of the furnace intended for the charge. In pursuance of this object, we have provided such apparatus, with a peel having means whereby it is moved into the furnace and to a position immediately above the place where the charge is to be deposited, and the shelf of the peel is then quickly withdrawn from beneath the charge, which drops by gravity to the predetermined place. By thus depositing the charge in contradistinction to carrying it to a position slightly in advance or in rear of the place where it is to be deposited and then shoving the charge off the peel the canting movements of the charge, which causes the charge to be irregularly or unevenly stacked, are eliminated.

The various movements and adjustments are accomplished, in the type of the invention herein illustrated by providing the peel carrier with means which are movable to and from the furnace, are adjustable vertically and pivotally and are movable horizontally into and out of the furnace through the door of the latter; the peel being also movable relatively to its charge so as to quickly move it from under the charge and cause it to remove to a position for a fresh charge. The means herein illustrated by which these movements are accomplished are of simple and effective nature and in some respects constitute important features of the invention.

The importance of this invention will be appreciated when the charge consists of flat sheets as cathode sheets as made in electrolytic refineries which are to be piled one upon another and which must be stacked evenly in order to avoid waste of space in the furnace with a consequent loss of efficiency of the furnace. While our invention is more especially useful in connection with charges of such description, it will be apparent that its usefulness is not restricted thereto.

In the accompanying drawings, we have illustrated different means by which the invention may be advantageously carried into practice; but we wish it to be understood that many other forms than those herein set forth, and many apparently widely different variations of the invention may be made within the scope of the subjoined claims and without departing from the spirit of the invention, for which reason the forms of the invention herein described, or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

In the drawings, wherein like characters of reference designate like parts in the several views: Figure 1 is a side elevation of one form of the apparatus showing it in the operation of charging a furnace X, the latter being illustrated in section. Fig. 2 is a cross section on line 2-2 of Fig. 1. Fig. 3 is a diagrammatic view of the end of the peel, showing a charge Y supported thereby. Fig. 4 shows the action or movement of the charge when pushed off the peel. Fig. 5 shows the movement of the charge when the peel is quickly withdrawn from under the charge according to our invention. Fig. 6 is a plan view of the peel and its carrier provided with a means of one form which may be employed to reciprocate it in the carrier, said means being shown in section. Fig. 7, is a detail view of different means for reciprocating the peel to adapt it to receive the charge and to quickly withdraw it from underneath the same. Fig. 8 is a detail view of the end of the peel adapted to the operating means shown in Fig. 7. Fig. 9 is a plan view of an apparatus for charging furnaces having another means for reciprocating the peel, the parts being shown in the position which they assume when the

peel has been withdrawn from under the charge deposited and prior to the peel being moved with its carrier from the furnace, for the reception of another charge. Fig. 10 is a longitudinal section taken on lines 10—11 on Fig. 9, but showing the position of the parts when the peel is in its charge-receiving position. Fig. 11 is a longitudinal view of the same line illustrating the parts in the position of Fig. 9 and in dotted lines the peel projected to the position it occupies prior to its withdrawal from under the charge.

Referring first to the construction shown in the first sheet of the drawing, it will be noted that our apparatus as here embodied contemplates the use of an over-head crane which travels on rails 1, 1 from one charging door or furnace to another. The crane consists of a bridge A having trucks provided with wheels 2 by which it moves on the rails 1, and suitable actuating means, as a motor B connected by gears 3 and 4 with the axle 5 to move the crane on the rails. The crane is also provided with a trolley C carrying a motor 6 connected by gears 7 to wheels 8 of the trolley indicated. The parts thus far described may be of the usual or any suitable construction.

Suspended from the trolley C is a housing D mounted to turn relatively to the trolley and to support the peel E hereinafter described. As here shown, the housing D has a flange *d* at its upper end which is arranged contiguous to a flange *c'* at the lower end of the frame of the trolley, and anti-friction balls *d'* are arranged between these flanges. To rotate the housing there is provided a motor D', carried by the trolley, a worm shaft 9, gear 10, shaft 11, pinion 12 and gear 13. The peel E is also mounted to be moved up and down and to be moved into and out of the furnace. A convenient means for effecting the first of these movements comprises a drum 14 mounted in the frame of the trolley and connected with a cross-head F by a suitable flexible transmission element, as a rope or cable 15, having its ends wound upon the drum and its intermediate portions passing around pulleys 16 connected with the cross-head, and around an equalizing pulley 17 connected with the frame of the trolley. The cross-head is guided in its up-and-down movements within the housing by interengaging projections 18 and grooves 18^a. The peel is mounted in the cross-head F and is reciprocated transversely thereof. The peel is made in two relatively movable parts, to wit, a frame E' and an element E'' which in form is, or may be, similar to an ordinary hand peel, having at its outer end a blade or support *e''* upon which the charge is received. This element may be regarded as the peel proper, but we prefer to designate it a "shelf". The frame

and its shelf reciprocate together relative to the cross-head F and are also mounted so that the shelf may be moved independently of the frame so as to withdraw from under the charge.

To prevent rearward movement of the charge with the shelf when the shelf is quickly withdrawn, the frame E' has an abutment bar or stop *e'* at its forward end against which the charge strikes and rearward of which it cannot pass. The means for reciprocating the frame E' as shown in Fig. 1, consists of a pinion 19 which engages a rack 20 on the frame. This pinion is in mesh with a worm 21 mounted on a shaft 22 driven by a suitable motor 23.

In the forms shown in Figs. 1 and 6 the means for giving the shelf a quick withdrawal movement are as follows: 24 is a rod extending from a piston 25 on the cylinder 26 of an air or other suitable engine, G. This engine is shown as connected by a suitable system of pipes, designated generally by the character 27, provided with a four-way valve 28, with a receiver or storage tank 29 which is connected, by pipe 30, with a suitable motor and air compressor, 31. One member 27^a of the system of pipes 27 communicates with the interior of the cylinder 26 through a port close to the forward cylinder head, while another member 27^b of said system has communication with the cylinder's interior through a port at such distance from the other head of the cylinder as to cause the return movement of the shelf and its connected parts to be arrested automatically by the air compressed between the last named port and said head of the cylinder. When the valve 28 is turned to permit air to flow through pipe 27^a the piston 25 is quickly forced to the other end of the cylinder and the support *e''* is quickly withdrawn from under the charge.

As already stated, other means for reciprocating the shelf may be employed. One such is shown in Figs. 7 and 8 in which the rod 24^a of the shelf E is provided with a rack 40 which is in engagement with a pinion 41 keyed on a shaft 42 provided with a clutch 43 having an operating lever 44. A magnetic induction type of clutch, of the class in which one side, as the fields, is connected to either the driving or driven end of the clutch, while the armature is attached to the other part of the transmission, is shown at 45, and a reverse motor 46 is connected in a suitable manner to the magnetic clutch 45. By reversing the motor, the shelf E'' can be controlled so as to be projected or retracted from or into, or toward, the frame of the peel; it being apparent that by disengaging the clutch 43, by means of the handle or lever 44, the shelf, assuming that it is projected and the motor is rotating in its proper direction, will be drawn back by

the movement communicated thereto by the described gearing. This reverse movement may be very rapid and cause the shelf to be quickly withdrawn from under the charge and the charge to drop vertically by gravity.

On Sheet 2 of the drawing we have shown mechanism for operating the peel also having many features of novelty and advantage. In this form of the invention, a track H made of channel bars is secured to the cross-head F and projects toward the mouth of the furnace.

J is a carriage mounted on the track, the forward wheels 51 of which run on the upper flange of the channel bar and the lower wheel 52 on the lower flange so as to guide the carriage and prevent it from jumping off the track. This carriage carries the peel, the frame of which is here designated by the character E^a while the shelf is designated E^b.

A desirable means for reciprocating the carriage is as follows: 61 is a double-acting automatic hydraulic or steam "engine", secured to the bottom of the track. To one of the piston rods, 62, of this engine is connected a pulley 63. Secured to the strap of this pulley is one end of a fall 64 which may consist of a rope, wire cable or any other suitable material. This fall passes over the guide pulley 65 secured to the underside of the track, around the pulley 62, then back and around a pulley 66 and then to the carriage to which it is secured in any suitable manner. As here shown, it is attached to the arm j of the truck of the carriage J. From this arm the fall extends forward and around a pulley 67 secured to the underside of the track H, then around a pulley 68 secured to the forward piston rod 69, then around a pulley 70 secured to the underside of the track and back to the strap of the pulley 68, where it is secured. From this construction it is apparent that upon the piston 61^a being reciprocated in the cylinder 61, a rapid movement will be transmitted to the carriage J through the cable 64. The frame E^a of the peel is connected to and moves with the carriage, and is so arranged that as the carriage moves toward the end of the track J the frame and support are moved into the furnace. In this construction we have provided the following means for quickly withdrawing the shelf into the frame from beneath the charge in the operation of depositing the latter at the predetermined place in the furnace. The rod 24^b of the shelf or support E^b is provided with a crosshead 76 to the ends of which the forward ends of the springs 77 are secured, the other ends of the springs are attached to a suitable part of the frame E^a. To the said crosshead or rod 24^a, or any other suitable part of the structure, is se-

cured an arm 78 which is adapted to be engaged by a stop 79, here shown as secured to the track H.

In the rearward movement of the carriage J, the arm 78 is brought into engagement with the stop 79, thus holding the rod 24^b of the shelf or support E^b against further movement of the carriage. The movement of the latter being continued, draws the frame E^a rearward of the support with the effect that the latter is projected to receive a charge. The rearward movement referred to also places the springs 77 under tension and they are held in this condition by means of a catch 80 arranged in position to engage the upper end of the arm 78 when the frame E^a reaches the extreme of its rearward movement. This catch is here shown as an ordinary pawl fixed on a shaft 81 which extends transversely of the frame E^a and is journaled in bearings provided in the sides of the latter. This shaft has a downward projecting arm 82 to which a lanyard 83 which extends to a place convenient to the operator is placed.

The position of the parts when the peel is retracting is shown in Fig. 10. Assuming now that the support E^b has received a charge, and that the apparatus is in position to enter the door of the furnace; the engine 61 is operated to move the peel forward into the furnace when the peel may be turned so that the shelf or support will be directly over the place where the charge is to be deposited. When this position is reached, lanyard 83 is pulled by the operator the pawl 80 is thereby freed from the arm 78 and the rod 24^b being released the springs 77 quickly draw the shelf rearward from under the charge, the position shown in dotted lines in Fig. 11 to the position shown in Fig. 10 and in full lines in Fig. 11, when the charge drops to the predetermined place without any horizontal or canting movements. The charges are thus uniformly stacked and the entire available space of the furnace is utilized as already stated. At its rear end the rod 24^b of the shelf is provided with a head 25^a which works in a cylinder 26^a having an open forward end. The rear end of the cylinder is provided with an air-emission aperture 87. This cylinder constitutes a dash pot by the use of which the rearward movement of the shelf is accomplished without noise or shock.

When the shelf or support has been retracted by the spring as described, the peel is withdrawn from the furnace for a fresh charge, by operation of the engine 61, during which movement its parts assume the position shown in Fig. 10 as already explained.

From the foregoing, the operation and advantages of the system will readily appear, and it will be noted that, as already stated,

the invention is not restricted to the details shown.

We desire it to be also understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention, which, as a matter of language, might be said to fall therebetween.

Having thus described the invention what we believe to be new and desire to secure by Letters Patent, is:

1. A furnace charging machine comprising a peel, supporting means, means for moving said peel horizontally, vertically and pivotally, and means for reciprocating the peel with relation to the support.

2. A furnace charging machine comprising a peel, supporting means, means for moving the peel horizontally, vertically and pivotally, a frame mounted to reciprocate relatively to the supporting means, and a charge support carried by the frame, said charge support and frame having relative movement as and for the purpose set forth.

3. A furnace charging machine comprising a crane, a carrier pivotally connected therewith, an adjustable peel-supporting means carried by the carrier, and a peel supported by said means and reciprocating means for the peel in relation to the supporting means.

4. A furnace charging machine comprising a crane, a housing pivotally connected therewith, a cross-head adjustably mounted in the housing and a peel carried by the cross-head and means for reciprocating the peel relatively thereto.

5. A furnace charging machine comprising a crane, a housing pivotally connected therewith, means for turning the housing pivotally, a cross-head mounted in the housing, means for raising and lowering the cross-head, a peel carried by the cross-head and means for reciprocating the peel relatively to the cross-head.

6. A furnace charging machine, comprising a crane, a carrier pivotally connected therewith, an adjustable peel supporting means carried by the carrier, and a peel comprising a frame and a charge support, said frame reciprocatorily mounted in the peel supported means and said charge-support movably mounted in the frame and provided with means for withdrawing it from beneath the charge.

7. A furnace charging machine comprising a crane, a carrier pivotally connected therewith, a cross-head mounted in the carrier, means for raising and lowering the cross-head, a peel comprising a frame, means for reciprocating the frame in the cross-head, and a charge-support movably mounted in the frame, and means for moving the charge support in the frame and from beneath the charge.

8. A furnace charging machine, comprising a peel having a reciprocatory carrier and a charge support carried thereby and movable relatively thereto, means for moving the charge support relatively to the carrier and means whereby its movement with the carrier is arrested within the limits of movement of the latter.

9. A furnace charging apparatus, comprising a reciprocatory carrier a charge support carried thereby and movable relatively thereto, means for moving the charge support relatively to the carrier to withdraw it from the charge, and means for arresting the movement of the charge support in advance of the cessation of movement of the carrier in the return of the parts to the charge receiving place.

10. A furnace charging apparatus comprising a reciprocatory carriage, a carriage support carried thereby and movable relatively thereto, a mechanism for producing said relative movement, and means for restraining the action of the mechanism until the parts have reached a predetermined place.

11. A furnace charging apparatus, comprising a crane, a carriage, a track, a support for the carriage and track having a pivotal connection with the crane, means for reciprocating the carrier on the track, and a charge support carried by the carriage.

12. A furnace charging apparatus comprising a crane, a carrier suspended therefrom, a cross-head carried by the carrier, means for moving the cross-head in the carrier, a track carried by the cross-head, a carriage mounted to run on the track, and a charge-support carried by the carriage.

13. A furnace charging apparatus, comprising a crane, a carrier pivotally suspended therefrom, a cross-head carried by the carrier, means for moving the cross-head in the carrier, a track carried by the cross-head, a carriage mounted to run on the track, and a charge support carried by the carriage.

14. A furnace charging apparatus comprising a charge support and means for moving the charge support from beneath the charge, said means adapted to effect a quick movement of the support and to cushion it at the end of the stroke.

15. A furnace charging apparatus, comprising a charge-support and means for moving the charge support from beneath the charge, said means adapted to effect a quick initial return movement of the support, said support having a head and a fluid containing chamber in which said head operates and in which fluid is adapted to be compressed in such return movement so as thereto gradually retard such movement of the support.

16. A furnace charging apparatus having a peel comprising a frame provided with a

rack, a motor, gearing connecting the motor with the rack whereby the peel is reciprocated, and a charge support reciprocatorily mounted in said frame.

- 5 17. A furnace charging apparatus having a peel comprising a frame provided with a rack, a motor, gearing connecting the motor with the rack whereby the peel is reciprocated and a charge-support reciprocatorily
10 mounted in said frame, said charge-support having a rack, a pinion engaging the rack, and means comprising a magnetic induction

clutch for controlling operation of the charge-support relatively to the frame.

In witness whereof we have hereunto set 15
our hands at Perth Amboy, county of Middlesex, and State of New Jersey this 30th day of August, 1907.

ADOLPH C. CLARK.
FRANK L. ANTISELL.

In presence of—

WM. P. BRADLEY,
A. O. RULLMANN.