May 23, 1933. E. A. SMITH ET AL 1,910,267

CHARGING MECHANISM

Filed March 24, 1932

Fig. 1.

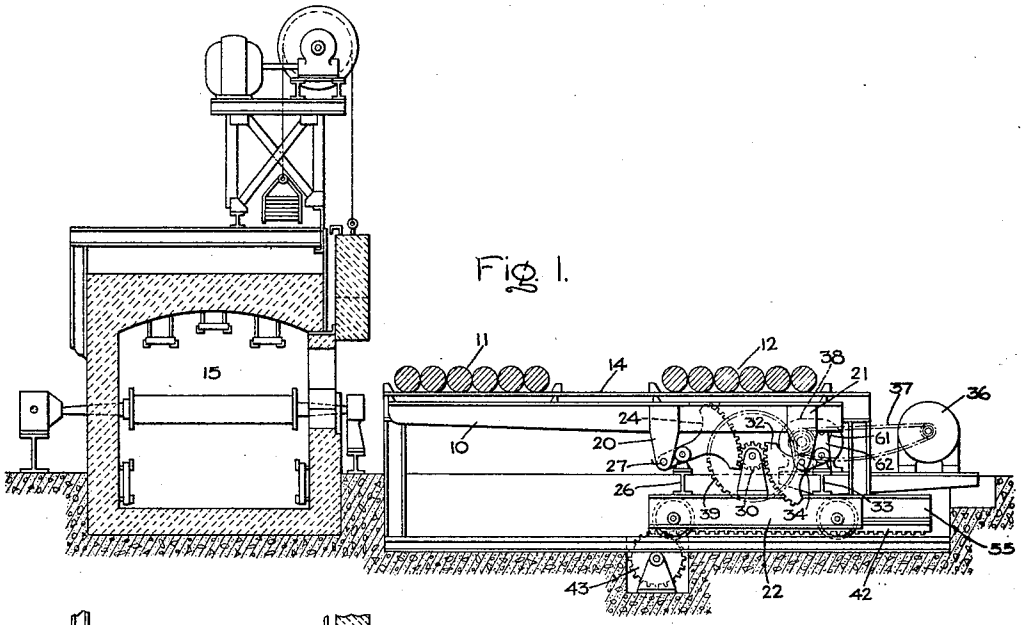


Fig. 2.

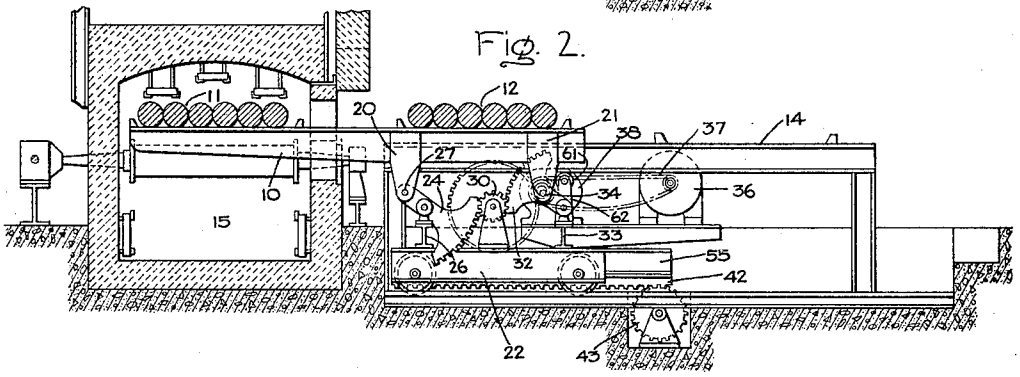
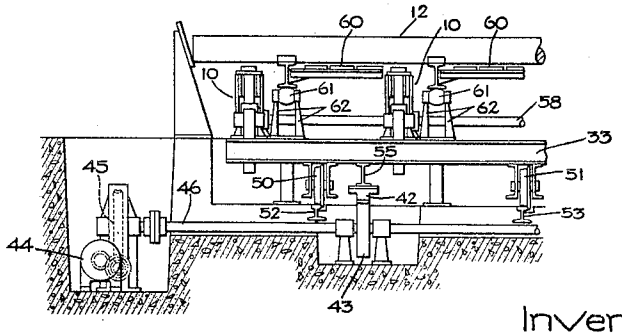


Fig. 3.



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UNITED STATES PATENT OFFICE

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CHARGING MECHANISM

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Our invention relates to charging mechanisms of the type employed for the introduction of charges of work within material modifying apparatus such as furnaces and the like, and has for an object the provision of a simple and powerful drive for the raising and lowering of the charging fork.

While it is not limited thereto, our invention is particularly applicable to furnaces of the automatic type wherein a charging fork is employed to introduce charges of work into a heating chamber.

In carrying out our invention in one form thereof, we provide a charging fork supported in cantilever fashion by a plurality of levers pivotally connected to the fork and to the carriage with a driving gear mechanically connecting the levers to each other so that the fork may be raised and lowered while maintaining its work supporting surfaces horizontal.

For a more complete understanding of our invention, reference should now be had to the drawing in which Fig. 1 is a sectional elevation of a charging mechanism embodying our invention as applied to a furnace; Fig. 2 is a sectional elevation similar to Fig. 1 but illustrating the manner in which a charge of work is introduced into the furnace, while Fig. 3 is a fractional end view showing the plurality of levers provided for the charging fork.

Referring to the drawing, we have shown our invention in one form as applied to a charging fork 10 arranged to transfer the charges of work 11 and 12 from a stationary rack 14 to a furnace 15. The charging fork 10 has a plurality of arms each of which is provided with a pair of downwardly extending projections 20 and 21, by means of which the fork 10 is supported from a carriage 22. A lever 24 is pivoted from an I beam 26 and there is provided a pivoted connection 27 between the downwardly extending projection 20 and the corresponding ends of the lever 24. To the opposite end of the lever there is integrally secured a quadrant of a gear the teeth of which are arranged in meshing relation with a driving gear 30. A second lever 32 is similarly provided with a quadrant of a gear, the teeth of which are arranged in meshing relation with the driving gear 30 and this lever is pivoted at its other end to an I beam 33 supported on the carriage 22. A downwardly extending projection 21 secured to the charging fork 10 is pivotally connected to this lever at 34. A driving gear 30 is driven by a motor 36 by means of a driving chain 37, a gear reduction box 38 and the gear 39.

It will be observed that if the motor 36 is energized in a direction to rotate the driving gear 30 in a counter-clockwise direction, the lever 24 will be rotated about its pivotal point or fulcrum thereby producing a substantially vertical thrust on the downwardly extending projection 20. At the same time, the rotation of the driving gear 30 in the counter-clockwise direction rotates the lever 32 about its pivotal point or fulcrum on the I beam 33 so that a substantially vertical thrust is exerted on the downwardly extending projection 21. The result is the vertical raising of the charging fork 10. We have shown in Fig. 2 the positions of the respective parts when the charging fork has been hoisted to its uppermost position.

In order to provide for the translational movement of the charging fork 10, the carriage 22 is provided with a rack gear 42 supported in meshing relation with a driving gear 43. The direction of rotation of the driving gear 43 is controlled by the energization of a driving motor 44 connected through a gear reduction mechanism 45 and the shaft 46 to the driving gear 43.

It is to be understood that the charging fork 10 may be provided with any desired number of work supporting arms depending upon the length of the charge to be supported. For example, in one installation where bars of steel were twenty-five feet long, to be heat treated, six work-supporting arms were provided with a corresponding number of pairs of hoisting levers.

The manner in which our invention is applied to a charging fork having a number of supporting arms will be clearly seen with reference to Fig. 3. The desired width of the carriage 22 will determine the length

of the I beam 33. A plurality of flanged wheels 50 and 51 riding upon the track rails 52 and 53 provide support for the carriage. A second rack gear (not shown) arranged in the same manner as the gear 42 may be provided on the opposite end of the carriage. These rack gears are supported from an I beam 55 carried by the carriage frame. Each arm of the fork may be raised and lowered by the levers described in connection with Figs. 1 and 2. A driving shaft 58 common to these levers is driven by the motor 36. Between the arms of the fork stationary supporting beams are provided. As shown a board walk 60 is secured to each of the stationary beams to facilitate inspection of the mechanism.

If the charges of work to be handled are quite heavy, rollers 61 may be supported directly beneath each stationary rack by means of brackets 62 supported from the carriage. The provision of these brackets prevents a heavy load at the outer end of the fork from tipping the fork downward.

In the operation of our invention it will be assumed that the charges of work 11 and 12 have been placed upon the stationary rack 14 by any suitable means such as a crane (not shown). The fork driving motor 36 is thereupon energized in a direction to rotate the driving gear 30 in a counter-clockwise direction thereby elevating the charging fork 10. As the charging fork 10 moves in an upward direction the charges 11 and 12 are picked up from the stationary rack 14 in readiness for the transfer to their next position. The carriage motor 44 is now energized in a direction to cause the driving gear 43 to rotate in a counter-clockwise direction thereby moving the carriage 22 and the charging fork 10 towards the furnace 15. After the completion of both movements the charge 11 and the charge 12 will occupy the positions shown in Fig. 2.

At this point in the operation of our invention, a third charge of material may be placed on the stationary rack 14 in the position formerly occupied by the charge 12.

The driving motor 36 is now energized in a direction to lower the charging fork to its lowermost position after which the carriage motor 44 is energized in a direction to cause the carriage and the charging fork to return to the position shown in Fig. 1 in readiness for the next cycle of operation. The provision of the stationary rack and the progressive movement of the charges along the rack towards the furnace decreases the loading time required between successive charging operations. If the progressive movement had not been provided for, it would be necessary to return the charging mechanism to its original position as shown in Fig. 1 before an additional charge could be placed on the charging fork. Moreover, the stationary rack and the charging fork may be located in juxtaposition with the furnace 15 while ample space is had for the lowering of a charge of work to the charging fork thereby diminishing the likelihood of damage to the furnace by the careless lowering of a charge to the fork.

While we have shown a particular embodiment of our invention, it will be understood of course that we do not wish to be limited thereto since many modifications may be made and we therefore contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of our invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. A charging mechanism for furnaces and the like comprising a stationary charge-supporting rack, a charge-supporting fork arranged for movement above and below said rack, a plurality of pivoted levers for supporting said fork at one end thereof, one end of each of said levers being connected to said fork, the other end of said levers being provided with gear teeth, and a single driving gear arranged to mesh with the said gear teeth on said levers so that said driving gear may be rotated to raise and lower said fork.

2. A charging mechanism for furnaces and the like including, a charge supporting rack, a plurality of charge-supporting arms arranged for movement above and below said rack, a plurality of pivoted levers arranged in cooperative relation for supporting said arms in cantilever fashion, one end of each of said levers being connected to said arms, the other end of each of said levers being mechanically interlocked with another lever to insure a substantial vertical movement of said supporting arms.

3. A charging mechanism for furnaces and the like comprising a supporting carriage, a plurality of charge-supporting arms, a pair of downwardly extending projections at one end of said arms and spaced from each other, pivoted levers connected to said carriage and to said extensions, and a geared driving connection between said levers whereby the said levers when rotated about said supports on said carriage by the said driving connections raise and lower said arms.

4. A charging mechanism for furnaces and the like comprising a charge-supporting rack in juxtaposition to said furnace, a charging fork movable above and below said rack, a supporting carriage for said fork arranged for translational movement, a plurality of pairs of levers each pair of which is pivotally connected to said fork and to said carriage, and a driving connection for jointly operating said levers to raise or lower said fork, a rack gear supported at the base of said carriage, and a driving gear meshing with

said rack gear so as to impart translational movement to said fork.

5. In combination with a furnace of a charging mechanism therefor comprising a plurality of arms provided with work-supporting surfaces, a pair of downwardly extending projections on each of said arms, a pair of levers for each of said arms each of said pair of levers having a quadrant of a gear integrally secured at one end thereof, means for pivotally connecting said levers to said projections and to said carriage so that the gear teeth of said gears are directed toward each other, a driving gear mounted in meshing relation with each of a pair of said levers, and a single driving shaft for said driving gears forming a mechanical interlock between said pairs of levers so as to insure the raising and lowering of said arms in a horizontal plane.

In witness whereof, we have hereunto set our hands.

ERNEST A. SMITH.
WILLIAM H. DEERY.