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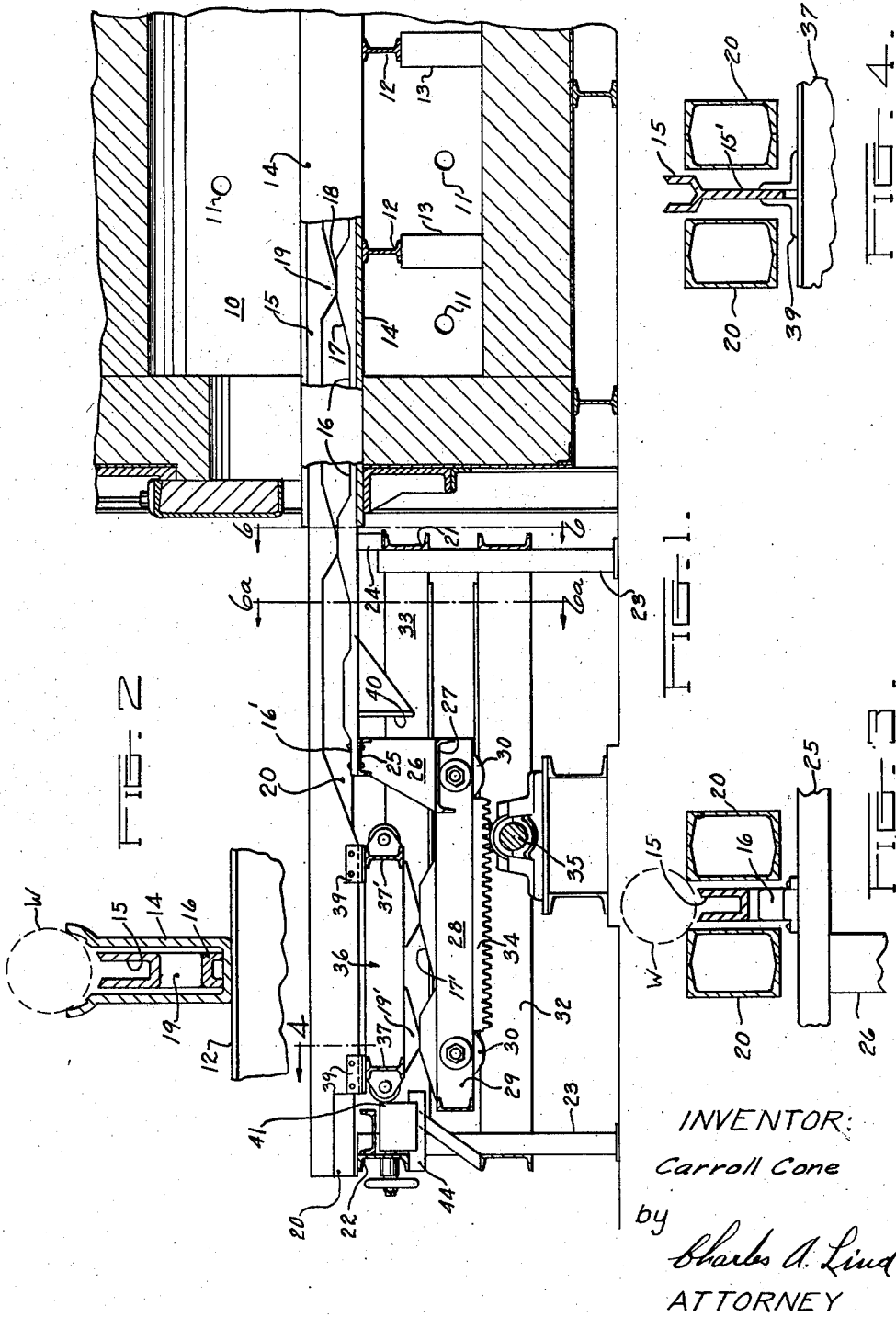
C. CONE

2,057,367

WALKING BEAM FURNACE

Filed April 25, 1936

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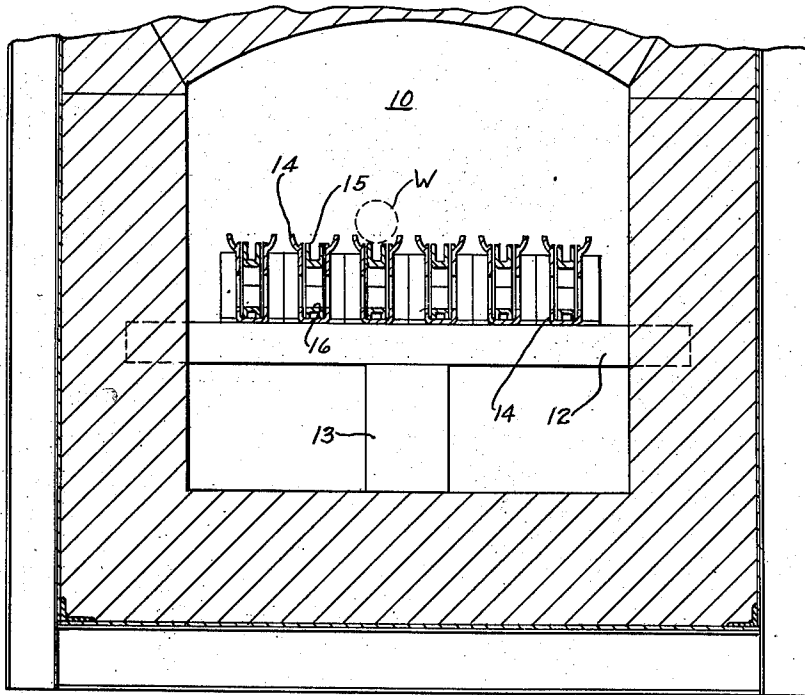


FIG. 5.

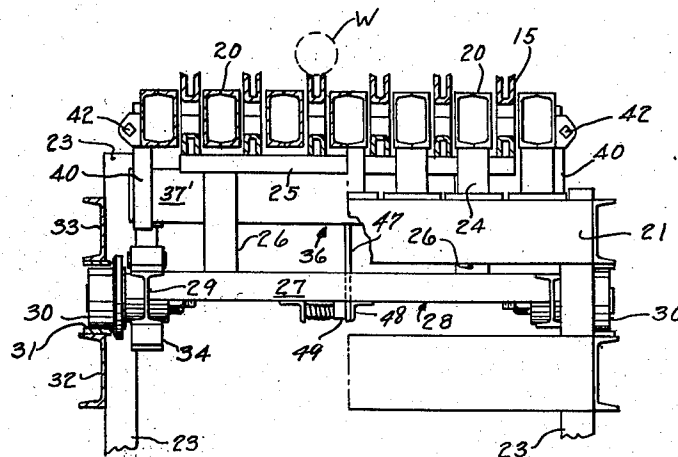


FIG. 6.

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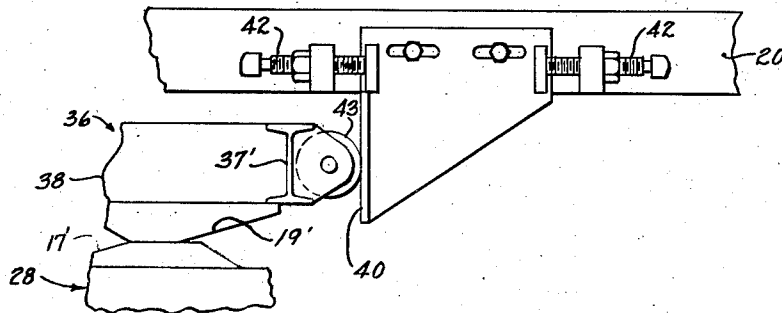


FIG. 7.

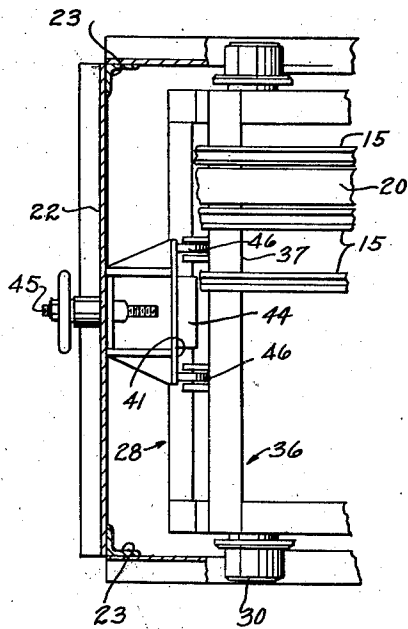


FIG. 8.

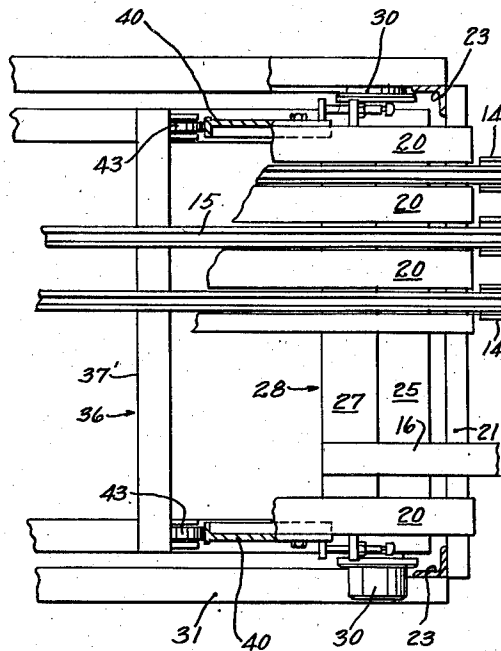


FIG. 9.

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2,057,367

WALKING BEAM FURNACE

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Application April 25, 1936, Serial No. 76,473

4 Claims. (Cl. 198—219)

The present invention relates to heat treating furnaces of the type requiring a conveyor for moving the work to be heat treated through the furnace chamber; and the object of the invention is to provide an improved walking beam conveyor for furnaces of the type mentioned. One of the more particular objects of the invention is to provide a walking beam conveyor which shall be particularly well adapted for moving cylindrical bodies through a furnace chamber but which nevertheless shall be well adapted for moving other types of work through the chamber. Another object is to provide a walking beam conveyor which shall embody relatively few moving parts. Other objects will more fully appear hereinafter.

In the drawings wherein the preferred form of the invention is shown,—

Fig. 1 shows how the present invention is associated with a heat-treating furnace, a portion only of the latter being shown, the view as a whole being a side elevation with parts in section;

Figs. 2, 3 and 4 are fragmentary detail views illustrative of certain features of the invention, Fig. 4 being taken along the vertical line 4 at the left hand part of Fig. 1;

Fig. 5 is a vertical cross sectional view through the furnace structure shown in Fig. 1;

Fig. 6 is taken partly on line 6—6 and partly on line 6a—6a of Fig. 1, and

Figs. 7, 8 and 9 are fragmentary detail views of certain features embodied in the mechanism shown in Fig. 1.

The furnace chamber is indicated at 10 and is a tunnel of appropriate cross sectional area and length consistent with the work to be heat treated. Any suitable means, such as burners 11, may be employed for heating the chamber.

Extending across the furnace chamber intermediate the roof and floor thereof at spaced intervals and in a common level are a number of metal cross beams 12, the ends of which are supported in the side walls of the chamber. They may also be supported between their ends on pedestals 13 extending upwardly from the chamber floor. These beams 12 together constitute a support for certain parts of the conveying mechanism, namely, for a plurality of stationary channel beams 14 arranged in laterally spaced relation (see Fig. 5).

At certain times during the operation of the conveying mechanism the channel beams 14 serve as temporary supports for the work which is to be heat treated. The work is shown as cy-

lindrical bodies W which may be assumed to be ordnance shells. Work of this type will be supported in an axially alined row on each beam 14, the work being seated, as in a saddle, on and between the upper marginal edges of the beam as will be readily understood by reference to Fig. 2. When the work is not supported on the stationary beams 14, it is supported free and clear of the same by rails 15 adapted to be moved both horizontally and vertically within the channels of the respective beams, the top side of the rail being of such form as to form a seat or saddle for the work.

In cases where the work is not cylindrical (sheets and bars, for example) or is not otherwise well adapted for seating in a row on each beam 14, it may be disposed crosswise of the chamber for support on a plurality of said beams and rails.

Each rail 15 overlies and is slidably supported on a rail or beam 16 which is slidably supported within the channel of the individual beams 14 on the bottom wall thereof. The underside of the lower rail 16 is flat lengthwise whereas its upper side is provided with a series of inclined planes each of which terminates in a flat top (see Fig. 1). The underside of the upper rail 15 has a series of bevelled heels 19 for riding up and down the inclined planes 17 and for seating on said tops 18. Relative longitudinal movement between the two rails 15 and 16 will, therefore, cause the upper rail to move vertically with respect to its stationary beam 14. As will be readily appreciated, the degree of relative vertical movement between the upper rail 15 and the stationary beam 14 will be such that when the rail 15 is at its uppermost limit of movement, the work W will be lifted free and clear of the stationary beam 14 whereas when the rail 15 is at its lowermost limit of movement, the work will rest on the stationary beam as previously explained.

The upper rails 15 are of sufficient length to extend a considerable distance beyond the work entering end of the chamber 10 to form part of a work loading station. The stationary beams 14, insofar as they are of the form shown in Fig. 2, terminate a short distance outside of the chamber; but other beams 20 are provided in place thereof for cooperating with the extended portions of the rails 15 to form the work loading station.

The beams 20 are supported in spaced relation by a stationary frame work and more particularly on two spaced cross beams 21 and 22 secured

to upright frame posts 23. Fixedly supported on the cross beam 21 are pedestals 24 individual to the longitudinal beams 20 and to which the latter are fixedly secured. The other cross beam 22 is at a higher level than the beam 21 and the outer ends of the beams 20 are fixedly supported directly thereon (see Fig. 1). Said beams 20 are conveniently made channel irons welded together in the form of a hollow body. The manner in which the beams 20 cooperate to support the work W when the rails 15 are at their lowermost level is clearly shown in Fig. 3.

The lower rails 16 terminate at point 16' and at this point they are fixedly secured to a cross bar 25 which is fixedly supported on pedestals 26 which in turn are fixedly supported on a cross beam 27 forming part of a carriage 28. The carriage 28 is a rectangular steel frame of which 29 indicates the sides. This carriage is provided with four wheels 30, two on each side. Each set of side wheels run on a track 31 fixedly secured on top of a longitudinal side beam 32 supported by the corner posts 23 of the stationary frame. Another side beam 33 at a higher level cooperates with the underlying beam 32 to form a guide way for the side wheels.

The carriage 28 is horizontally reciprocated by any preferred means. For illustrative purposes, a rack and pinion drive is shown, the rack being indicated at 34 and the driving shaft for the pinion at 35, the rack being secured to the underside of the carriage as to the side beam 29. Two racks with corresponding pinions, one at each side of the carriage, will ordinarily be employed when a rack and pinion drive is used.

Supported on the carriage 28 is a rectangular carriage 36 of which its front and rear cross beams are indicated at 37 and 37', respectively, and its longitudinal side beams at 38. The upper rails 15 are anchored to the cross beams 37 and 37' in any suitable manner as by angle plates 39 (see Figs. 1 and 4), the lower portion of the rail for this purpose having a web 15'. The underside of the carriage 36 is provided with downwardly extending heels 19' for riding up and down on inclined planes 17' on the top side of the lower carriage 28. These heels and inclined planes correspond in function to the heels 19 and inclined planes 17 on the rails 15 and 16, respectively.

It will now be seen that the upper rails 15 and their carriage 36 are frictionally supported on the lower rails 16 and lower carriage 28, respectively; and that in the absence of means for positively preventing the upper rails from being carried along by the lower rails, the upper and lower rails will be reciprocated as a unit by the reciprocating means (the rack and pinion drive) coupled to the lower carriage 28.

In Fig. 1, both carriages are at their limit of movement toward the left. In this position the upper rails 15 are at their uppermost level with respect to the stationary work supports 20 and 14 and consequently the work W will be free and clear of said supports and be supported on the upper rails 15. Therefore, as the two carriages 28 and 36 move as a unit toward the right, as viewed in Fig. 1, the work will be advanced in the chamber 10 a distance equal to the length of the stroke of the upper rails 15. After the upper rails 15 reach their limit of movement toward the right, it is necessary that they be lowered in order to redeposit the work on the stationary work supports before said rails 15 begin their return movement toward the left; and

this lowering of the rails 15 is accomplished in the manner now to be described.

Before the lower carriage 28 reaches the end of its stroke toward the right, the advancing end of the upper carriage 36 meets a stationary abutment 40 which, however, does not interfere with the continued movement of the lower carriage. Likewise, before the lower carriage 28 reaches the end of its stroke toward the left, the then advancing end of the upper carriage 36 meets a stationary abutment 41 which, however, does not interfere with the continued movement of the lower carriage. The result is that as the lower carriage continues to move towards the right after the upper carriage meets the abutment 40, the upper carriage descends to its lowermost level due to the inclined planes between the two carriages. This relative longitudinal movement of the two carriages will, of course, also cause the upper rails 15 to descend to their lowermost level as will be readily appreciated. As a result of this descent of the upper rails 15 the work thereon will obviously be redeposited on the stationary work supports.

The lower carriage 28 having reached its limit of movement toward the right now begins its return movement toward the left and in so doing carries the upper carriage 36 along with it, the rails 15, of course, remaining at their lowermost level. However, since the now advancing end of the upper carriage 36 meets the stationary abutment 41 before the lower carriage 28 reaches the end of its stroke, it will be readily appreciated that continued movement of the lower carriage to the end of its stroke will cause the upper carriage 36 (and the rails 15) to move upwardly to the position shown in Fig. 1 thereby again lifting the work W from the stationary supports preparatory to once again advancing the work toward the right.

A single abutment 40 might be used. However, two identical members are preferably used to form the abutment. As clearly shown in Fig. 7, the abutment consists of a member which is secured to and which depends from that stationary work supporting beam 20 which is the outside one of the series. The abutment is preferably so connected to the beam as to permit it to be longitudinally adjusted with respect to the beam as by adjusting screws 42 carried by the beam. Since the carriage 36 has vertical movement with respect to the abutments 40, the carriage is preferably provided with idler rollers 43 in advance of its cross beam 37' whereby to reduce frictional contact between the carriage and said abutments. The abutment 41 is conveniently located between the sides of the stationary loading station frame and is shown as mounted on a shelf 44 forming part of said frame. Like the two other abutments 40 it is preferably mounted for longitudinal adjustment as by a screw 45. Idler rollers are carried by the cross beam 37 of the carriage 36 for reducing frictional contact between the carriage and the abutment 41.

When the rails 15 are at their uppermost limit of movement their heels 19 rest on the flat tops 18 of the inclined planes 17 of the lower rails 16 and, of course, tend to remain in that position until force is applied to push them down the inclined planes. The slope of the inclined planes 17 is such that the gravity alone will not cause the upper rails to ride down the slope and consequently the descent of the upper rails is gradual rather than sudden. However, means may be

provided for increasing the frictional resistance between the upper and lower carriage. Thus, as shown in Fig. 6, there may be secured to the underside of the upper carriage 36 a longitudinally-extending depending plate 47, the lower end of which is frictionally held between clamping elements 48 and 49 carried by the lower carriage 28.

From the foregoing description, it will be seen that the present invention provides a conveying mechanism that is particularly well adapted for its intended purpose.

What I claim is:

1. The combination with a structure forming a heating chamber, of means for transporting work through said chamber comprising a stationary work support in said chamber; a work moving member arranged in the chamber in parallelism with said support, said member comprising a lower rail and an upper rail slidably seated on the lower rail, means connected to the lower rail for longitudinally reciprocating said member, means cooperating with the upper rail before the lower rail reaches the end of its stroke for preventing the upper rail from being moved by the lower rail to the limit of the stroke of the lower rail, and inclined planes between the two rails for causing the lower rail as it continues to move to the end of its stroke to move the upper rail vertically with respect to the said stationary work support.

2. The combination with a structure forming a heating chamber, of means for transporting work through said chamber comprising a stationary work support in said chamber, a work moving member arranged in the chamber in parallelism with said support, said member comprising a lower rail and an upper rail slidably

seated on the lower rail, means wholly outside of the chamber and connected to the lower rail for longitudinally reciprocating said member, means cooperating with the upper rail before the lower rail reaches the end of its stroke for preventing the upper rail from being moved by the lower rail to the limit of the stroke of the lower rail, and inclined planes between the two rails for causing the lower rail as it continues to move to the end of its stroke to move the upper rail vertically with respect to the said stationary work support.

3. The combination with a structure forming a heating chamber, of means for transporting work through said chamber comprising a stationary work support in said chamber, a work moving member arranged in the chamber in parallelism with said support, said member comprising a lower rail and an upper rail slidably seated on the lower rail, means wholly outside of the chamber and connected to the lower rail for longitudinally reciprocating said member, stationary means outside of the chamber cooperating with the upper rail before the lower rail reaches the end of its stroke for preventing the upper rail from being moved by the lower rail to the limit of the stroke of the lower rail, and means forming parts of the seats between the two rails for causing the lower rail as it continues to move to the end of its stroke to move the upper rail vertically with respect to the said stationary work support.

4. In the combination specified in claim 1, said stationary work support comprising laterally spaced side walls between which the said rails are laterally confined.

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