

March 18, 1924.

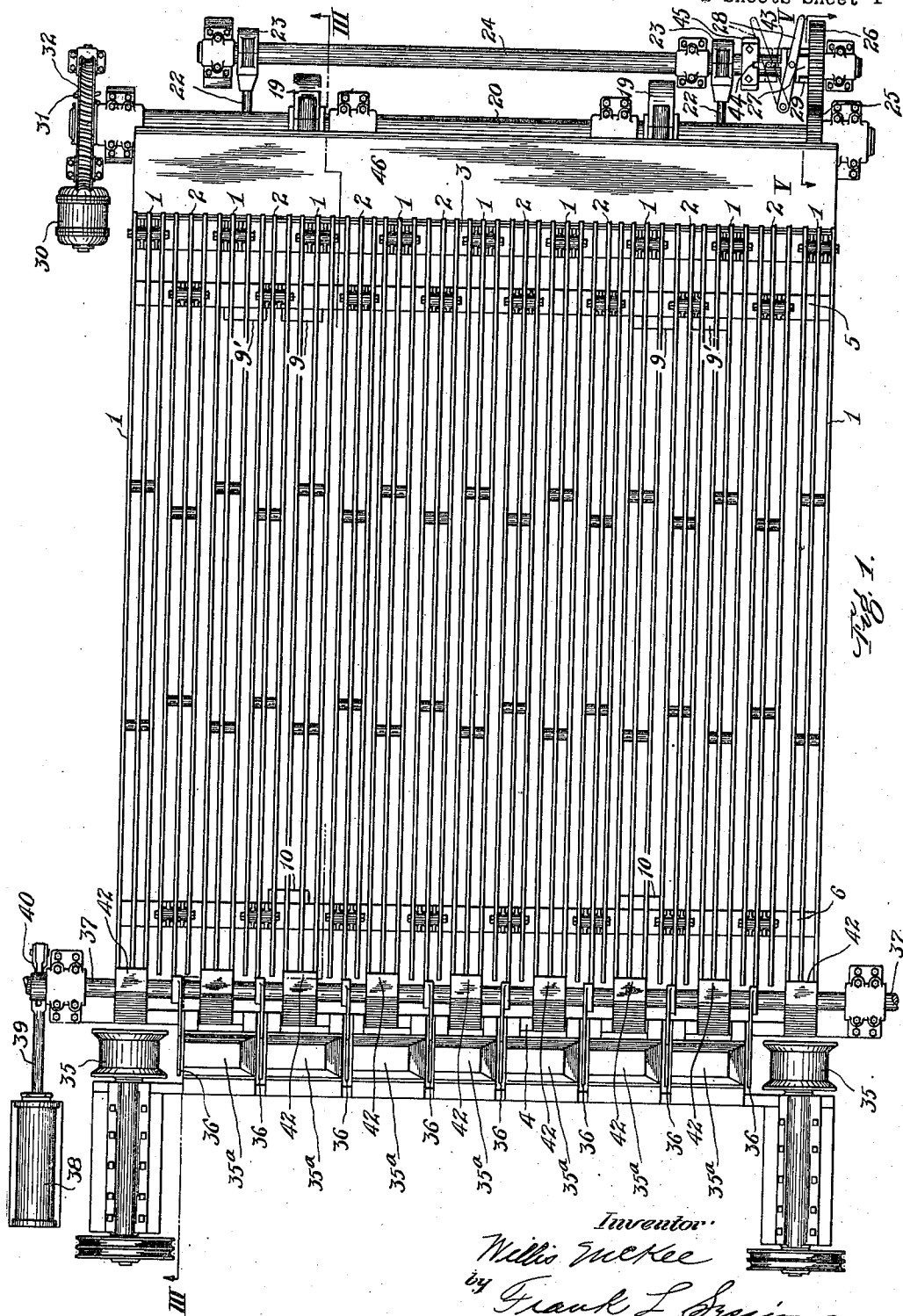
W. McKEE

1,486,984

HOTBED

Filed Sept. 27, 1920

2 Sheets-Sheet 1



Inventor:
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2 Sheets-Sheet 2

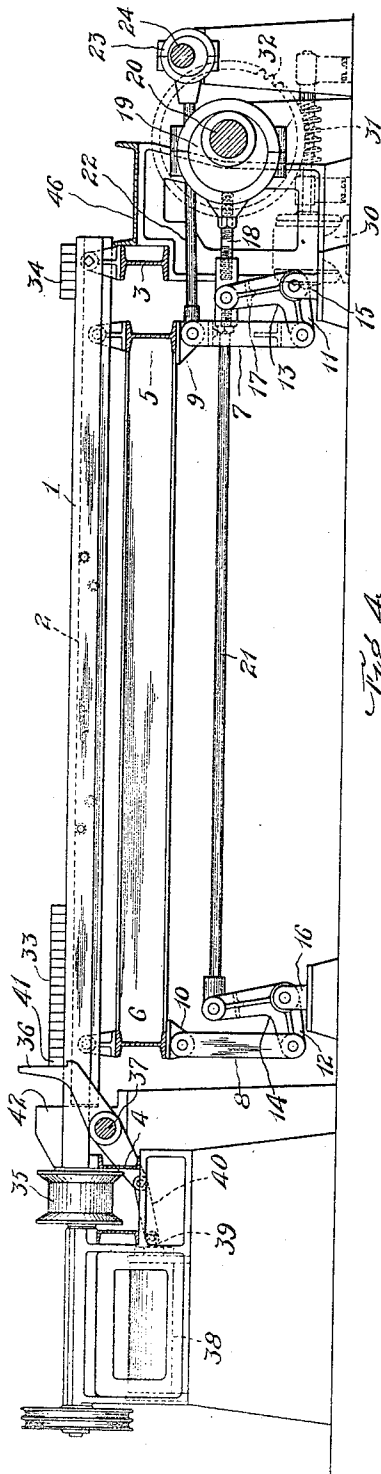


Fig. 4.

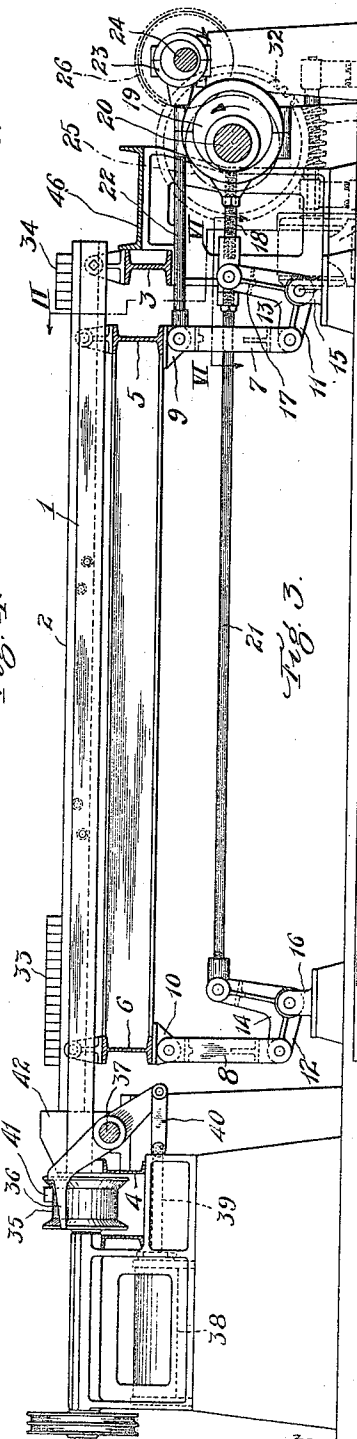


Fig. 3.

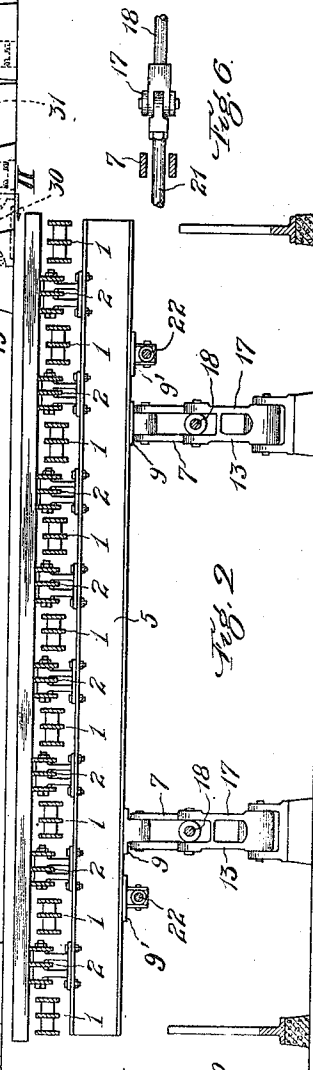


Fig. 2.

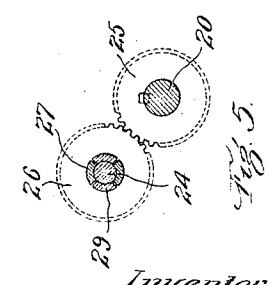


Fig. 5.

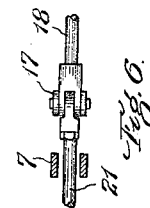


Fig. 6.

by
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Patented Mar. 18, 1924.

1,486,984

UNITED STATES PATENT OFFICE.

WILLIS MCKEE, OF CLEVELAND, OHIO.

HOTBED.

Application filed September 27, 1920. Serial No. 413,027.

To all whom it may concern:

Be it known that I, WILLIS MCKEE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Hotbeds, of which the following is a specification.

My invention relates to that class of apparatus upon which hot metal bars are placed as they come from the rolling mill and across which the bars are caused to slowly progress while they are cooling. In the construction of hot beds heretofore known to me various means have been provided for conveying the load or causing it to move from one side to the other of the hot bed. A well known type of hot bed is one in which the supporting members for the linear materials, generally consisting of hot rolled shapes which comprise the load, are spaced apart, metal bars running crosswise of the hot bed, some of which metal bars are given upward, forward and downward movements, in vertical planes which are parallel with the direction of progress of the supported load, at intervals so as to lift the super-imposed load of hot linear materials, carry it forward, horizontally, transversely of the bed, a short distance and deposit it again upon other, usually stationary, supporting bars. This type of hot bed is well illustrated in Patent No. 754,229, of which I am a joint inventor. Various means have been employed for depositing the hot bars constituting the work upon the hot bed and holding them in proper relation and alignment during their progress across the hot bed. It is well known that if a heated metal bar cools unevenly it will warp and twist. It is also well known that if a heated bar be sufficiently hot it will, when supported upon spaced apart supports, sag between such supports while cooling and after being cooled will be curved or cambered between the points where it was supported while cooling.

Control of the progress of the hot metal bars across the hot bed while cooling is of great importance. For well known reasons it may be necessary or desirable to retard the progress of the materials or to completely stop their movement across the bed. If the conveyor be stopped while the bars supported by it are hot the bars will sag down between the points of support as above described and be crooked after they are cooled.

For this reason it is best to support flat or rectangular bars upon their narrow sides with their wide sides vertical while traversing the hot bed in order that they may offer the greatest possible resistance to this tendency to sag between the points of support. It is known that even cooling throughout the entire length of the bars takes place best when they are stacked in contact with each other. There is also less scaling of the bars as the air is excluded from between them. For these reasons many mill operators prefer to retain hand operated beds notwithstanding the high operating cost as the bars can be edged together by hand to secure better results than can be had with the usual designs of mechanical beds which do not provide for this operation. This is especially true in mills producing alloy steels which are difficult to straighten after they cool.

Among the objects of my invention are the provision of a hot bed in which the lifting and the feeding or progressing movements are separately controllable so that when desired the progressive movement of the materials crossing the table may be arrested and the lifting and lowering movements may be continued so that the hot bars while not progressing across the bed will nevertheless be alternately supported by the lifting and the stationary members of the hot bed; the provision of means for transferring the load from one set of members of the hot bed to the other and vice versa while the movement of the hot bed is arrested; the provision of means for reversing the direction of progress of the work across the hot bed; the provision of means for loading or charging the hot bed with metal bars in contact with each other; the provision of means for aligning the hot bars and for pushing them into contact with each other upon the hot bed; the provision of means for loading flat bars upon their narrow sides upon the hot bed; the provision of a hot bed of the "creeping" type in which the load may be caused to progress in either direction across the hot bed or to have its progressive movement across the hot bed completely stopped while the vertical movements are continued; and the provision of means for reversing the direction of progress of the load across the hot bed without stopping the vertical movement. These and other objects of my inven-

tion are accomplished by the use of the apparatus herein described and shown in the accompanying drawings in which—

Fig. 1 is a plan view of a hot bed embodying my invention;

Fig. 2 is a transverse section through the movable and stationary supporting bars, the section being taken on line II—II appearing in Fig. 4 which will presently be described;

Fig. 3 is a section on line III—III of Fig. 1;

Fig. 4 is a view similar to Fig. 3 but showing the members moved into a different position;

Fig. 5 is a fragmentary section on line V—V of Fig. 1; and

Fig. 6 is a fragmentary section on line VI—VI of Fig. 3.

Referring to the drawings, the cooling bed here shown is composed of alternate groups of stationary and movable bars, but, if desired, both sets of groups may be made movable by suitable known construction. In the form of my invention illustrated in the drawings, the stationary bars, 1, and the movable bars, 2, are each assembled in groups of three, the groups of stationary and movable supporting bars alternating in position along the hot bed. As will be seen in Fig. 1, the stationary members, 1, and the movable members, 2, extend transversely, or in the direction of progress of the load, of the bed. The stationary members, 1, are supported near their ends upon longitudinal supporting beams, 3 and 4. The movable members, 2, are supported between the beams, 3 and 4, by the movable longitudinal beams, 5 and 6.

The beams, 5 and 6, are, in turn, supported upon vertical connecting links, 7, 7', and 8, 8'. These connecting links are pivoted to suitable brackets, 9, 10, secured to the undersides of beams, 5 and 6. At their lower ends the connecting links, 7 and 8, are pivoted respectively to arms, 11 and 12, of bell crank levers, 13, and 14. Levers, 13 and 14, are fulcrumed in suitable chairs, 15 and 16, resting upon the foundation or other support of the hot bed. The long arms, 17, of levers, 13, are pivoted to connecting rods, 18, which are reciprocated back and forth by means of eccentrics or cranks, 19, upon drive shaft, 20. The long arms of levers, 14, are pivotally connected to rods, 21, the other ends of which are pivoted to the long arms of levers, 13, so that the levers, 13 and 14, are oscillated in unison by the connecting rods, 18. It will be seen that the oscillating movements of levers, 13 and 14, impart vertical movements to the movable supporting bars, 2, of the hot bed, movement being transmitted from the levers, 13, 14, to the bars, 2, through connecting links, 7, 8, and supporting beams 5, 6. It will also be seen that the vertical move-

ments of the movable members are such that their work-engaging surfaces travel substantially equal distances above and below the work-supporting surfaces of the stationary members.

To the supporting beams, 5, are fixed brackets, 9', to which there are pivotally connected connecting rods, 22, which are reciprocated back and forth by the rotation of eccentrics, 23, upon drive shaft, 24. This driving connection between shaft, 24, and the movable portion of the hot bed reciprocates the bars, 2, back and forth transversely of the hot bed. In order that the vertical and horizontal movements be imparted to the movable portion of the hot bed at the proper times, the eccentrics, 19 and 23, are set 90° apart. This results, when both of the shafts, 20 and 24, are revolving in causing the upper half of the vertical movements of the movable members to take place while they are moving in one direction, horizontally, and the lower half of their vertical movements to take place while they are moving in the opposite direction, horizontally.

The shafts, 20 and 24, are driven at the same speed and are preferably geared together at a one-to-one speed ratio by gears, 25, 26. Gear, 25, is mounted upon and has a permanent driving connection with shaft, 20. Gear, 26, is mounted for free rotation upon shaft, 24, and may be rotated by the shaft, 24, by means of a jaw clutch, 27, which is slidably mounted upon shaft, 24, but keyed or otherwise connected thereto, for rotation therewith. An operating lever, 28, may be provided for operating the clutch, 27, the jaws of which are adapted to engage corresponding jaws, 29, upon the hub of gear, 26. A detachable, reversible driving-connection is thus provided for the horizontal reciprocating means which makes it possible to reverse the direction of the horizontal reciprocations relative to the vertical reciprocations of the movable members, or to stop the horizontal reciprocations altogether.

I prefer to make the clutch, 27, with two jaws and to provide the same number of jaws, 29, upon the gear, 26. When so constructed the direction of progress of materials along the hot bed may be reversed by opening the clutch, turning gear, 26, one hundred and eighty degrees and again closing the clutch. By simply disengaging clutch, 27, the horizontal reciprocations cease altogether.

Any suitable means may be provided for driving the shaft, 20. In the drawings there is shown a motor, 30, in driving connection with the shaft, 20, the driving connection consisting of a worm, 31, and worm gear, 32. As shown in the drawings the shafts, 20 and 24, are geared together so that the combined vertical and longitudinal reciprocatory movements of the movable members,

2, of the hot bed result in these members describing a curved path something like an ellipse. As seen in Fig. 3 the members, 2, are at the highest point of their vertical movement and about to begin their descent. The members, 2, are also at the middle of their forward, transverse movement of the bed, eccentric, 23, being at the middle of its throw to the right as seen in the drawings. With the shafts, 20 and 24, rotating in the direction of the arrows shown in Fig. 3 further rotation of these shafts will cause the simultaneous lowering and forward movement of the members, 2, so that the load, 33-34, upon the table will be deposited upon the stationary bars, 1. Movable bars, 2, will continue to move to the right and down until the eccentrics, 19 and 23, have rotated into the position in which they are seen in Fig. 4 which is one hundred and eighty degrees from the position in which they are shown in Fig. 3. As seen in Fig. 4, the members, 2, are at the lowest point of their vertical movements and about to start their rising movement. They are at the middle of their backward, transverse movement. As they continue their movements from this point, they will move upward and to the left until the tops of members, 2, are even with the tops of stationary members, 1. At this point the members, 2, will start to move to the right. At the same time they will contact with the load, and, as they continue to rise they will lift it from the stationary members, 1, and carry it forward and upward until the members, 2, reach the highest point of their vertical movement as seen in Fig. 3, which is the starting point of the cycle of movements just described. From this point the members, 2, and the load will continue moving forward and downward until the load is again deposited upon the members, 1. In this manner the load is caused to move across the hot bed, step by step, the movable members, 2, picking up the load, moving it forward a short distance in, approximately, an elliptical path, depositing it upon the stationary members, 1, and then returning through the lower half of the cycle of their movement, out of contact with the work, to the starting point, and continually repeating the cycle movement.

It is obvious that if the transverse movements of the members, 2, be arrested, while their vertical movements are continued, the load will be alternately lifted vertically off from the stationary members, 1, and lowered vertically downward and re-deposited upon them. This up and down movement without progression of the load is accomplished in the following manner:

By disengaging clutch, 27, from the gear, 26, the rotation of shaft, 24, and consequently of eccentric, 23, will be arrested and,

if the rotation of shaft, 20, continues, the movable members, 2, and any load such as the bars, 33, 34, which is superimposed upon the hot bed will be moved vertically up and down, the load being alternately lifted off from and deposited upon the stationary members, 1. In this manner, the points of support of the load will be continually shifted from one set to the other of the supporting members so that as the bars composing the load cool they will not have time to sag between their supports while hot and consequently they will not be crooked after cooling.

For loading or charging the hot bed I prefer to employ the mechanism shown at the left in Figs. 1, 3 and 4. The hot bars as they come from the mill are run out upon rollers, 35, and intermediate supports, 35^a, while the throw-out levers, 36, are in the position shown in Figs. 1 and 3. Throw-out levers, 36, are preferably mounted upon a shaft, 37, and secured thereto for rotation therewith. Oscillating movements may be imparted to them by any suitable means such as the fluid pressure cylinder, 38, the piston of which is connected to the shaft, 37, to rock it back and forth in its bearings, by means of the piston rod, 39, and connecting rod, 40. Throw-out levers, 36, are caused to oscillate between the position in which they are shown in Fig. 3 to that in which they are shown in Fig. 4, by fluid pressure in cylinder, 38, which may be controlled by any suitable means. The timing of the movement of levers, 36, should be such that they will deposit the hot bar, 41, as shown in Fig. 3, which has just come from the mill, upon the hot bed just back of the bars, 33, as shown in Fig. 4, where it will be picked up and progressed by the movable members, 2, with the rest of the load upon the next movement thereof.

It sometimes happens that the load will have been moved one or more steps to the right before the arrival of a fresh bar from the mill and a space will be left between the load already on the hot bed and the newly arrived bar when it is deposited by the throw-out levers, and it may further happen that the newly arrived bar will not be placed upon the hot bed parallel with the other bars already upon it. A feature of my invention provides means for closing the gaps between bars which may thus occur and also for straightening up the bars which may be deposited upon the hot bed in slanting positions. This feature comprises the reversing clutch, 27, and the stops, 42. The latter are shown in the drawings, adjacent to the receiving side of the hot bed just to the left of the position where the hot bars are deposited by the throw-out levers, with their faces in alignment with the hot bed. To close the gaps between the bars

constituting the load upon the hot bed or to straighten up one or more slanting bars, it is only necessary to reverse clutch, 27, so that the load will be caused to progress backwards or to the left as seen in Figs. 1, 3, and 4, until it is arrested by the stops, 42, which will cause the load to slide upon the hot bed until the bars constituting the load lie parallel with the stops, 42, and in close contact with each other.

Another advantage of my invention arising from the use of clutch, 27, is that by alternately releasing and engaging the clutch the load may be given any desired number of vertical movements between progressing movements. The time required for the load to cross the hot bed may thus be accurately controlled to suit the requirements of any materials that may be placed upon it.

To hold the movable members, 2, from moving transversely of the hot bed while clutch, 27, is disengaged from gear, 26, the shaft, 24, may be provided with a suitable locking or braking means to hold it against rotation. For this purpose I prefer to provide a projection, 43, upon clutch, 27, which projection is adapted to enter a slot or jaw, 44, in a stationary member, 45, when the clutch, 27, is disengaged and thus prevent shaft, 24, from turning.

When the load upon the hot bed has arrived at the right hand or delivery side, as shown at 34, in Figs. 3 and 4, the cooled bars may be allowed to drop into the trough or delivery table, 46, or they may be removed from the hot bed in any other suitable manner.

For the purpose of adjusting the position of the members, 2, relative to members, 1, each of the rods, 18, 18 and 21, 21, preferably has one of its ends threaded with a right hand thread and the other end threaded with a left hand thread, the pivoted connecting members at the ends of the rods being correspondingly threaded internally to receive them. The length between centers of each connecting rod can thereby be varied by turning the rod and can be secured in its adjusted length by tightening the jam nut provided for the purpose upon each rod against the adjacent pivoted end member.

The position of the top or lifting surfaces of the movable members, 2, may thus be adjusted so as to coincide with the plane of the top surfaces of members, 1, at the middle point of the vertical movements of the movable members; or, the position of the top or lifting surfaces of the movable members, 2, may by the same means be adjusted so as to be either above or below the plane of the top surfaces of members, 1, at the middle point of the vertical movements of the movable members. If members, 2, be adjusted to be above or below the plane of the top surfaces of members, 1, when members, 2,

are at the middle point of their vertical movements, the materials upon the hot bed will not be moved as far, per step or cycle of movement, as when members, 2, are adjusted to have their top surfaces in the plane of the top surfaces of members, 1, at the middle point of the vertical movements of the movable members.

An important method of operating the hot bed is provided by the adjusting means described in the preceding paragraph, namely, to move the materials faster at one side of the hot bed than at the other. This may be accomplished by adjusting the position of the movable members at one side of the bed, for instance, the delivery or right hand side as seen in Figs. 3 and 4, to have their top surfaces in the plane of the top surfaces of the members, 1, at the middle point of the vertical movements of members, 2, thereby giving maximum movement to the materials at this side of the bed, and by adjusting the position of the movable members at the other side of the bed to have their top surfaces above or below the plane of the top surfaces of members, 1, at the middle point of the vertical movements of members, 2, thereby giving a smaller movement to the materials near the receiving side of the bed than is imparted to the materials near the other side of the bed. Thus materials which are made to lie in contact with each other at the receiving side of the bed may be made to gradually separate as they approach the delivery side of the bed or vice versa.

The capacity of my improved hot bed is double that of a hand operated bed and much greater than that of other power operated beds of equal size with which I am familiar. This increased capacity is due, largely, to the provisions I have made for aligning the work bars and pushing them into contact with each other thus leaving no unoccupied spaces between the bars upon the bed.

While the term "horizontal" is used in these specifications with reference to the progressing movements of the movable members and the work carried by them, it will be understood that my hot bed may be sloped or inclined if desired, in the well known manner, to prevent the hot bars from turning down as they are deposited upon the bed. It will also be understood that while I provide means for imparting "horizontal" movements (meaning movements in a plane substantially parallel with the plane of the top of the hot bed whether it be perfectly horizontal or sloping) to the movable members, such "horizontal" movements always take place simultaneously with vertical movements thus resulting in the movable members and the work describing approximately elliptical paths as herein stated. When the vertical movements are continued after the horizontal movements have been

arrested, the movable members and the work move in substantially straight, vertical paths.

Various modifications may be made without departing from the scope of my invention, the structure herein described and shown in the accompanying drawings being only one embodiment thereof.

I claim:

1. A hot bed comprising alternate stationary and movable members adapted to support work, means for imparting vertical reciprocating movement to said movable members, means for imparting horizontal reciprocating movement to said movable members, detachable driving means connecting said vertical and said horizontal reciprocating means whereby when said vertical reciprocating means is operated said vertical and horizontal movements are caused to take place simultaneously, and driving means connected to said vertical reciprocating means for operating it.
2. A hot bed comprising alternate stationary and movable members adapted to support work, means for imparting vertical reciprocating movement to said movable members, means for imparting horizontal reciprocating movement to said movable members, said vertical movement being such that the work-engaging surfaces of said movable members travel substantially equal distances above and below the work-supporting surfaces of said stationary members, and means connecting said vertical, and said horizontal reciprocating means whereby said vertical and said horizontal movements are combined, the vertical movement of said movable members when their work-engaging surfaces are above the work-supporting surfaces of said stationary members taking place simultaneously with their horizontal movement in one direction and the vertical movement of said movable members when their work-engaging surfaces are below the work-supporting surfaces of said stationary members taking place simultaneously with their horizontal movement in the opposite direction, said connecting means including detachable members whereby said vertical and said horizontal reciprocating means may be disconnected.
3. A hot bed comprising alternate stationary and movable members adapted to support work, means for imparting vertical reciprocating movement to said movable members, means for imparting horizontal reciprocating movement to said movable members, said vertical movement being such that the work-engaging surfaces of said movable members travel substantially equal distances above and below the work-supporting surfaces of said stationary members, and means connecting said vertical and said horizontal reciprocating means whereby said vertical

and horizontal movements are combined, the vertical movement of said movable members, when their work-engaging surfaces are above the work-supporting surfaces of said stationary members taking place simultaneously with their horizontal movement in one direction and the vertical movement of said movable members when their work-engaging surfaces are below the work-supporting surfaces of said stationary members taking place simultaneously with their horizontal movement in the opposite direction, said connecting means including means for reversing the direction of said horizontal movement relative to said vertical movement.

4. A hot bed comprising alternate stationary and movable members adapted to support work, said movable members being adapted to move each in a vertical plane between the adjacent stationary members, means for imparting vertical reciprocating movement to said movable members, said vertical movement being such that the work-engaging surfaces of said movable members travel substantially equal distances above and below the work-supporting surfaces of said stationary members, means for imparting horizontal reciprocating movement to said movable members, driving means including a positive drive clutch connecting said vertical and said horizontal reciprocating means whereby the upper half of the vertical movement of said movable members takes place while they are moving in one direction horizontally and the lower half of said vertical movement of said movable members takes place while they are moving in the opposite direction horizontally, and means for disengaging said clutch.

5. A hot bed comprising alternate stationary and movable members adapted to support work, said movable members being adapted to move each in a vertical plane between the adjacent stationary members, means for imparting vertical reciprocating movement to said movable members, said vertical movement being such that the work-engaging surfaces of said movable members travel substantially equal distances above and below the work-supporting surfaces of said stationary members, means for imparting horizontal reciprocating movement to said movable members, a detachable driving connection between said vertical and said horizontal reciprocating means whereby the upper half of the vertical movement of said movable members takes place while they are moving in one direction horizontally and the lower half of said vertical movement of said movable members takes place while they are moving in the opposite direction horizontally, and means for disengaging said detachable driving connection.

6. A hot bed comprising alternate stationary and movable members adapted to support work, said movable members being adapted to move each in a vertical plane between the adjacent stationary members, means for imparting vertical reciprocating movement to said movable members, said vertical movement being such that the work-engaging surfaces of said movable members travel substantially equal distances above and below the work-supporting surfaces of said stationary members, means for imparting horizontal reciprocating movement to said movable members, driving connections between said vertical and said horizontal reciprocating means whereby the upper half of the vertical movement of said movable members takes place while they are moving in one direction horizontally and the lower half of said vertical movement of said movable members takes place while they are moving in the opposite direction horizontally, said driving connections including means for reversing the direction of said horizontal movement relative to said vertical movement.

7. In a hot bed upon which linear materials are placed side by side and caused to progress from the receiving side to the delivery side of said hot bed, step by step, transversely of their length, alternate stationary and movable members adapted to support said linear materials, means for imparting vertical and horizontal reciprocating movements to said movable members whereby said linear materials are periodically lifted off from said stationary members by said movable members, moved transversely of the hot bed a short distance and again deposited upon said stationary members, means for reversing the direction of said horizontal reciprocating movement relative to said vertical movement whereby the direction of progress of said materials across said hot bed is reversed, and a stop adjacent to one side of said hot bed, said stop forming an abutment to arrest the progress of said materials toward said side.

8. A hot bed comprising two sets of members for supporting work, one of said sets of members being movable, means for imparting vertical reciprocating movement to said movable members, means for simultaneously imparting horizontal reciprocating movement to said movable members whereby the resulting path described by said movable members is approximately elliptical, and detachable connections between said vertical and said horizontal movement imparting means whereby said horizontal movement may be stopped.

9. A hot bed comprising two sets of members for supporting work, one of said sets of members being movable, means for imparting vertical reciprocating movement to

said movable members, means for imparting horizontal reciprocating movement to said movable members, detachable driving means connecting said vertical and said horizontal reciprocating means whereby when said vertical reciprocating means is operated said vertical and said horizontal movements are caused to take place simultaneously and means for operating said vertical reciprocating means.

10. A hot bed comprising two sets of members for supporting work, one of said sets of members being movable, means for imparting vertical reciprocating movement to said movable members, means for simultaneously imparting horizontal reciprocating movement to said movable members whereby the resulting path described by said members is approximately elliptical, and means for reversing the direction of said horizontal reciprocating movement relative to the direction of said vertical reciprocating movement.

11. A hot bed comprising two sets of members for supporting work, one of said sets of members being movable, means for imparting vertical reciprocating movement to said movable members, means for imparting horizontal reciprocating movement to said movable members whereby the resulting path described by said members is approximately elliptical, means for reversing the direction of said horizontal reciprocating movement relative to the direction of said vertical reciprocating movement and means adjacent to one side of said hot bed adapted to arrest the progress of movement of the work toward said side.

12. A hot bed comprising two sets of members for supporting work, one of said sets of members being movable, means for imparting vertical reciprocating movement to said movable members, means for simultaneously imparting horizontal reciprocating movement to said movable members and means for adjusting the extent of movement of the top surfaces of said movable members above and below the top surfaces of the other set of members.

13. A hot bed comprising two sets of members for supporting work, one of said sets of members being movable, a revoluble driving shaft, an eccentric on said shaft, means connecting said eccentric and said movable members whereby the rotation of said eccentric imparts vertical reciprocating movement to said movable members, a second revoluble shaft also having an eccentric, means connecting said eccentric on said second revoluble shaft and said movable members whereby rotation of said second shaft imparts horizontal reciprocating movement to said movable members, means for rotating said first named shaft, and detachable driving connections between said first and said

second named shafts whereby they may be rotated simultaneously or said first named shaft may be rotated while said second named shaft remains stationary.

5 14. A hot bed comprising two sets of members for supporting work, one of said sets of members being movable, a revoluble driving shaft, an eccentric on said shaft, means
10 connecting said eccentric and said movable members whereby the rotation of said eccentric imparts vertical reciprocating movement to said movable members, a second revoluble shaft also having an eccentric, means
15 connecting said eccentric on said second revoluble shaft and said movable members

whereby rotation of said second shaft imparts horizontal reciprocating movement to said movable members, means for rotating said first named shaft, detachable driving connections between said first and said
20 second named shafts whereby they may be rotated simultaneously or said first named shaft may be rotated while said second named shaft remains stationary, and means
25 preventing the rotation of said second shaft when said driving connections are disconnected.

In testimony whereof I affix my signature.

WILLIS McKEE.