W. AHLEN AND K. H. CEDERLUND.

HOTBED AND RUN-OUT TABLE MECHANISM.

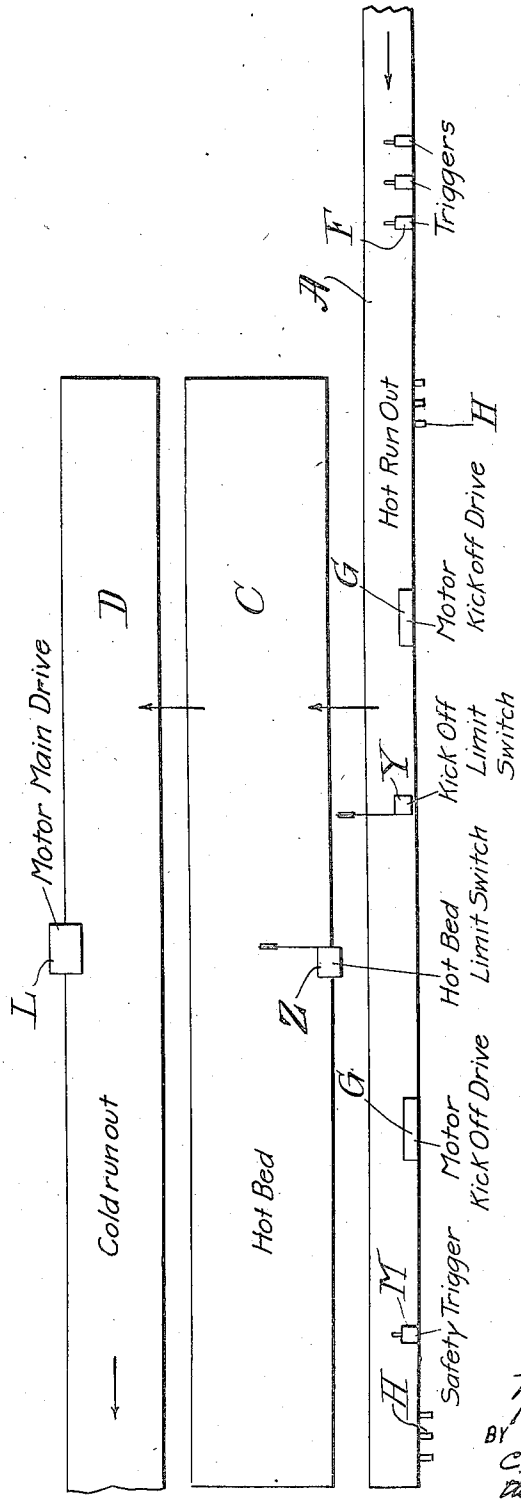
APPLICATION FILED MAY 25, 1915.

1,310,231.

Patented July 15, 1919.

4 SHEETS—SHEET 1.

Fig. 1.



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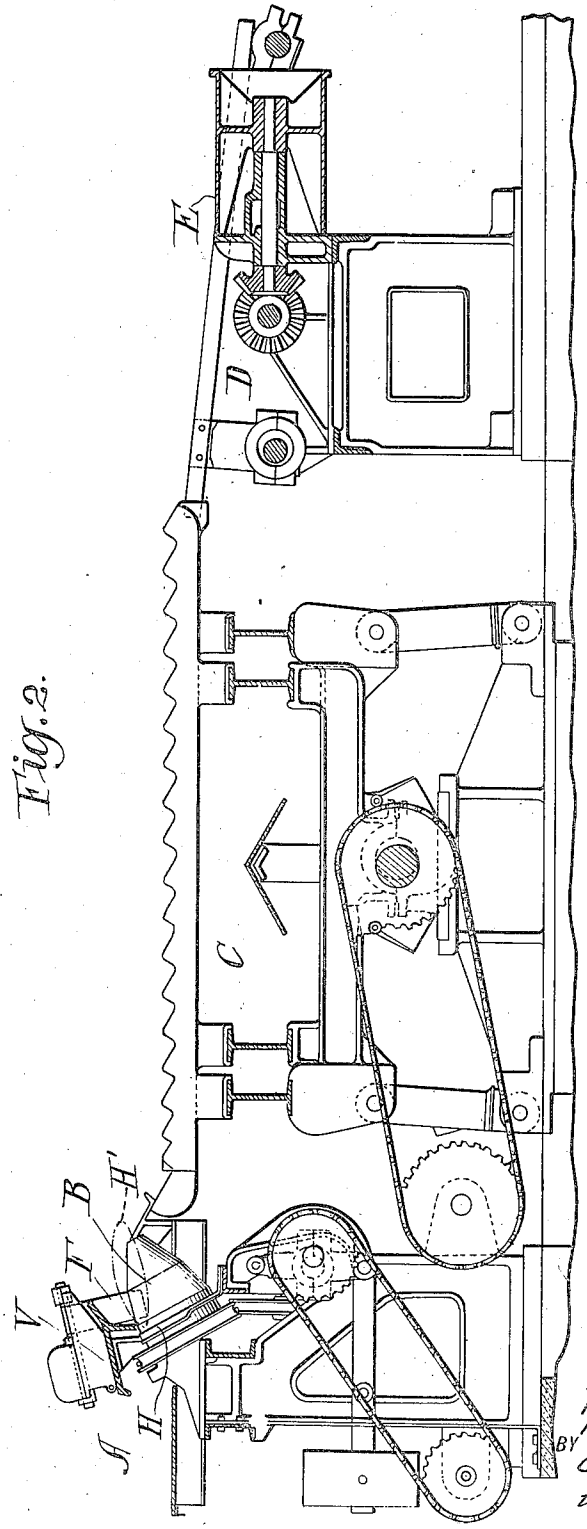


Fig. 2.

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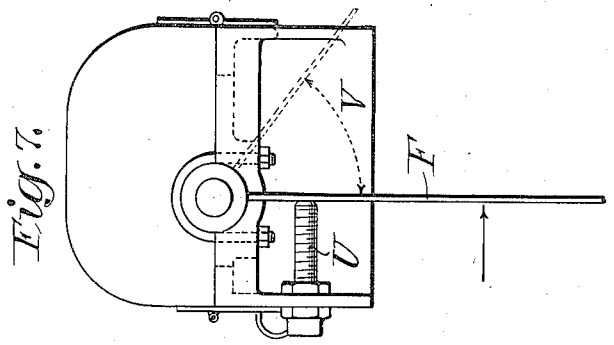


Fig. 7.

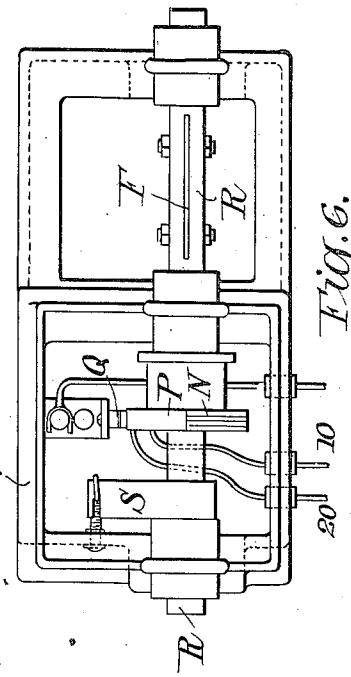


Fig. 5.

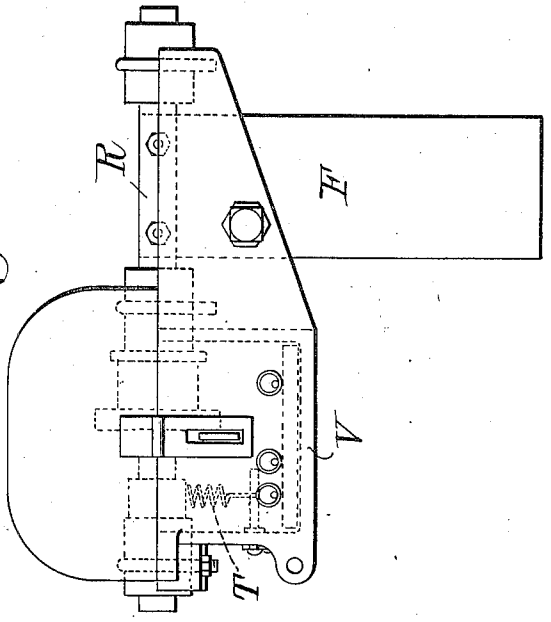


Fig. 6.

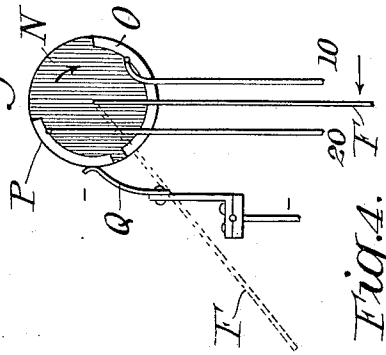


Fig. 3.

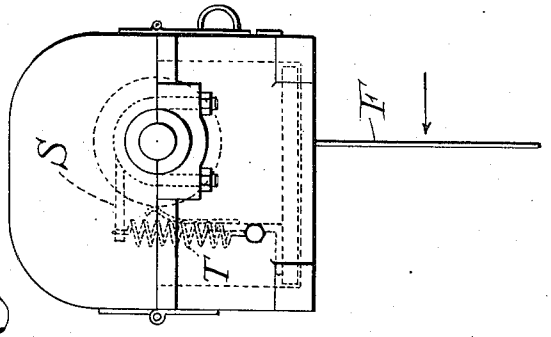


Fig. 4.

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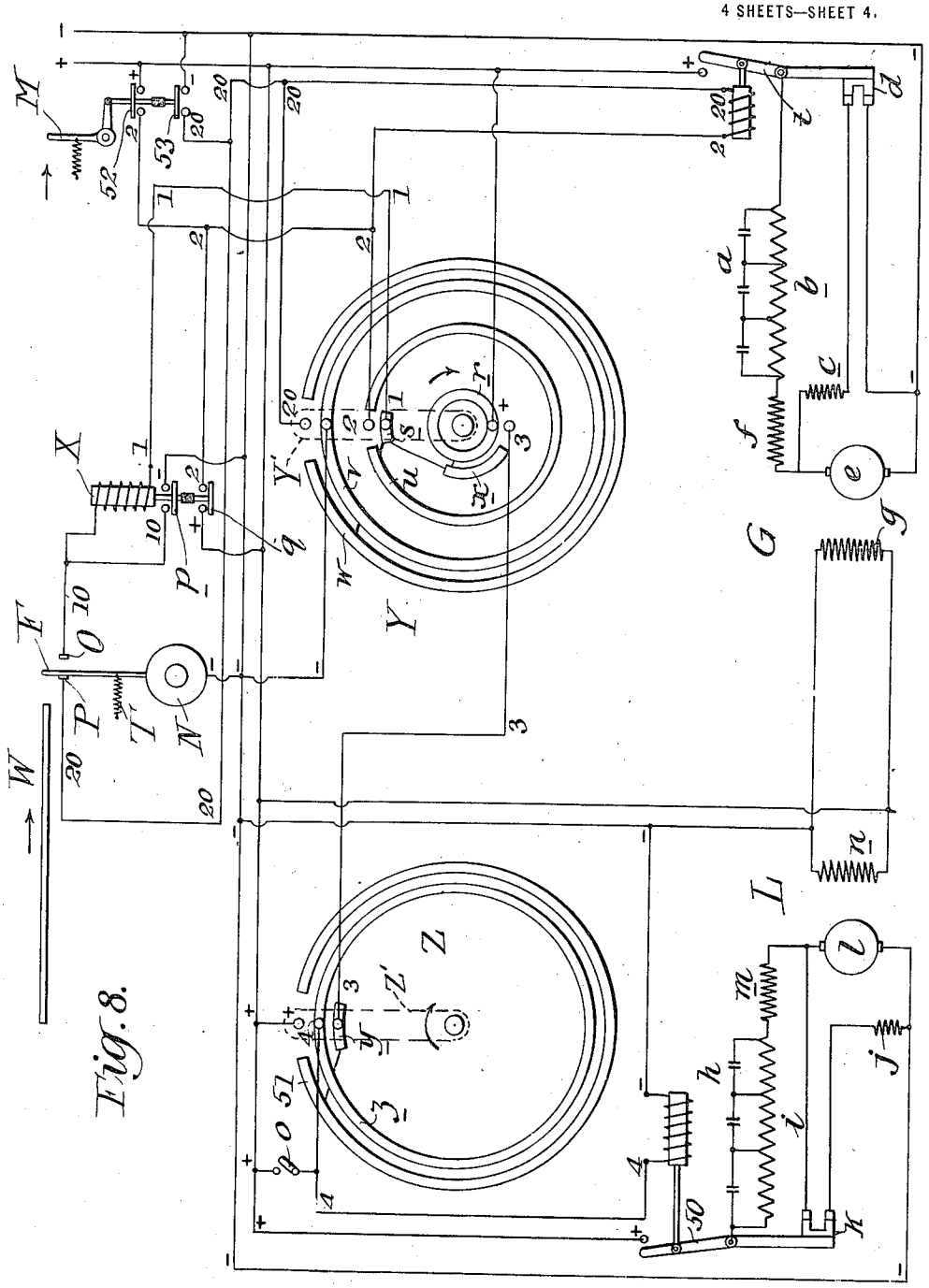


Fig. 8.

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UNITED STATES PATENT OFFICE.

WILLIAM AHLEN AND KARL H. CEDERLUND, OF DUQUESNE, PENNSYLVANIA.

HOTBED AND RUN-OUT TABLE MECHANISM.

1,310,231. Specification of Letters Patent. Patented July 15, 1919.

Application filed May 25, 1915. Serial No. 30,476.

To all whom it may concern:

Be it known that we, WILLIAM AHLEN, a subject of the King of Sweden, and KARL H. CEDERLUND, a citizen of the United States, residing in Duquesne, Pennsylvania, have invented certain new and useful Improvements in Hotbed and Run-Out Table Mechanism, of which the following is a specification.

This invention aims to provide certain improvements in mechanism for operating and controlling the run outs and hot bed of a bar rolling mill and similar apparatus.

The accompanying drawings illustrate an embodiment of the invention.

Figure 1 is a diagrammatic plan of the hot bed with adjacent portions of the hot run out and the cold run out and showing the locations of the several motors and controlling devices;

Fig. 2 is a cross section through the hot bed and the two run outs;

Fig. 3 is a diagrammatic face elevation of one of the triggers and the electrical connections controlled thereby;

Fig. 4 is a full face elevation of the same;

Fig. 5 is a plan thereof;

Fig. 6 an end face elevation thereof;

Fig. 7 a rear face elevation thereof;

Fig. 8 is a diagram of the circuits of the controlling mechanism.

Referring to the embodiment of the invention illustrated, the hot run out A receives the bar from the mill and carries it along on rollers B until its full length, usually of several hundred feet, is alongside the hot bed C. The bar is then kicked off from the hot run out onto the hot bed where it is shifted laterally step by step by means of the usual racks across the hot bed and onto the cold run out D provided with rollers E. The cold run out is so arranged as to collect a number of bars and then lower them upon the rollers E, which convey them to the shears. The bars move in the direction of the arrows shown in Fig. 1. They are conveyed one at a time along the hot run out and then shifted therefrom in succession onto the hot bed so that there is generally a number of bars on the hot bed located at successive points in the width and in the course of transfer to the cold run out. The racks of the hot bed have a circular motion, the alternate racks being assembled in two groups, each of which moves upward and to the right alternately so as to pick up the bars and convey them step by step across the hot bed. This is a known type of hot bed and run outs. The controlling mechanism of our invention may be applied either to this or to other styles of hot bed and run outs.

A trigger or other device for starting the controller is arranged slightly in advance of the point to which the rear end of the bar must travel along the hot run out before it can be kicked off to the hot bed. A controller is provided which starts its cycle of operations as soon as the bar passes the trigger, but not before this time. The controller secures the proper sequence of operations, as follows. The operation of the hot bed rack is begun only after the kick off has moved the bar to such a position that the hot bed rack may properly receive it. After the kick off has moved a bar to the desired position it must be returned and stopped in position to act properly on the next bar from the mill. The hot bed rack is also stopped in position to receive the next bar from the kick off, and is stopped accurately in position so as to prevent the bars from being kinked while cooling. The bars follow each other out of the mill very closely. If a bar from the mill reaches the trigger which controls the master switch before the cycle of operations on the previous bar has been completed, the operations on the previous bar will nevertheless proceed without interference; and as soon as the bed has completed its cycle of operations on the first bar it will be ready to handle the second bar. The apparatus is also arranged to empty the hot bed at any time desired without interfering with the operation of the kick off. The controller is also equipped with a safety device to prevent a bar from running off the end of the hot run out if for any cause the usual operation fails.

Referring to Fig. 1, the main trigger F is located along the hot run out slightly in advance of the hot bed. Three such triggers are illustrated. Any one is sufficient, but three are provided for additional safety in case of the breakage of one or two. The motors for driving the kick offs are illustrated at G and the kick offs adjacent to opposite ends of the hot bed are illustrated at H, it being understood that there is a number of such kick offs at suitable intervals. The kick off limit switch, whose function and operation is described hereinafter, is shown

at Y, the hot bed limit switch at Z and the motor which constitutes the main drive for the apparatus at L. Near the end of the hot run out is located the safety trigger M. The path of the end of a kick off is shown in dotted lines at H', Fig. 2.

The triggers F and connections are shown in detail in Figs. 3 to 7. The trigger is fixed to a rotatable member N carrying a pair of contact rings O and P separated from each other and connected respectively to electrical wires or cables 10 and 20. A spring terminal Q connected to the negative wire of the main circuit, hereinafter referred to, bears against the cylindrical surface of the drum N, normally making contact with the segment P. A rod advancing along the hot run out strikes the trigger F in the direction of the arrow and swings it to about the dotted line position shown, the rod then passing under the trigger and holding it up in this dotted line position. This movement shifts the connection of the spring terminal Q from the segment P to the segment O, or from the wire 20 to the wire 10, and maintains the latter connection until the rear end of the bar passes, whereupon the trigger swings back to the vertical position and restores the original connections. The drum N is mounted on a shaft R rotating in suitable bearings, the blade or trigger F being fixed in this shaft at one side of the drum. On the same shaft R at the opposite end of the drum is an arm S connected to the upper end of a spring T tending to pull it down and to swing the trigger F down against the adjustable stop U (Fig. 7) which holds it in a vertical position or approximately so. The base V of the trigger-operated mechanism is mounted, as shown in Fig. 2, above and at one side of the rollers B of the hot run out, with the trigger F projecting downward between successive rollers B in the path of the bar carried on said rollers.

The controlling switches, resistances and the like of the several motors are of the ordinary type and are not illustrated in detail as to their mechanical construction, but are shown diagrammatically in the complete circuit in Fig. 8.

The trigger F is normally held by means of the spring T in such a position as to make contact from the minus wire, through P, to the wire 20. When the bar W strikes the trigger it connects the minus wire, through O with the wire 10. The trigger is held in this position until the rear end of the bar passes the trigger, whereupon the latter is restored to the normal position shown.

A set up relay X when actuated closes two electrical circuits, 10 to minus and 2 to plus, these circuits being insulated from each other.

A kick off limit switch indicated as a whole at Y is driven from the line shaft of the kick offs by chain or gearing with such a ratio that the limit switch makes one complete revolution for each operating cycle of the kick off. This kick off limit switch is shown of the face plate style for the sake of clearness, the contact disk being supposed to revolve while the finger remains stationary; but it may be of the drum style or of any other suitable style.

A hot bed limit switch Z is driven by chain or gear from the line shaft of the hot bed racks with such ratio that the switch will make one complete revolution for each operating cycle of the hot bed rack. This hot bed limit switch, like the kick off limit switch, is illustrated as of the face plate style with the disk revolving, but may be of any other suitable style.

The kick off motor G is provided with an ordinary automatic accelerating magnetic switch controller comprising a series accelerating switch *a*, a starting resistance *b* and a braking resistance *c* with switch *d*, the armature of this kick off motor being shown at *e*, series field at *f* and shunt field at *g*.

Similarly, the hot bed motor L is provided with a series accelerating switch *h*, a starting resistance *i*, a braking resistance *j* and a switch *k* therefor; the armature of this hot bed motor being indicated at *l*, the series field at *m* and the shunt field at *n*.

A small bed-clearing switch *o* of the knife type is used to close the circuit of the hot bed rack and to continue the hot bed motor in operation when it is desired to empty the bed without adding further bars from the hot run out.

The safety trigger M is similar in mechanical construction to the trigger F and is arranged to make two contacts when actuated by a bar, one from 2 to plus, and the other from 20 to minus, the two contacts being insulated from each other.

The switches Y and Z are indicated diagrammatically, the construction being old and well known. A contact finger Y' or Z', which is indicated diagrammatically, extends upwardly in fixed position from the axis or center of the switch. These contact fingers Y' and Z' will be formed of insulating material in order to prevent short circuiting through the finger Y' and Z'. When desired, however, such finger may be made in sections with one section insulated from the other or others. The wires leading to each ring or segment of the switches have their ends connected by small circles which may represent binding screws or contacts, these binding screws being fastened to the stationary finger Y' or Z'. The fingers Y' and Z' are adapted to cause the binding screws or contacts thereon to bear on the

rings or segments shown, when these rings or segments are turned to bring them under an opposite contact on the finger and to cause each binding screw or contact to become electrically connected to the ring or segment in whose line or path it lies when the rings or segments are in position under or opposite said binding screws or contacts.

The operation of the various devices in the circuits just described is as follows. When the bar W coming from the mill on the hot run out strikes the trigger F a short distance in advance of the hot bed this trigger is moved to the right as described and completes the circuit minus to 10. This closes the circuit of the relay X, through the coil of the relay, the wire 1 and the segment S, which is connected by the contact finger to the plus main as hereinafter described; and its operation lifts the contact disks p and q, the disk p also closing the circuit minus to 10 so that the relay holds its own circuit closed. The other terminal of the relay coil is connected to the plus wire of the main circuit through the kick off limit switch, the connection being from the plus segment, which is a complete ring r to the small segment s, the contact finger Y', Fig. 8, being supposed to extend fixedly from the center of the disk upward. The circuits remain closed as described as long as the trigger is held forward by the bar.

As the rear end of the bar passes the trigger the latter springs back to the position indicated making an electrical connection from minus to 20. This completes the circuit through the coil which operates the main switch t of the kick off motor; the current passing from the plus wire of the main circuit through the contact plate q of the relay X to the wire 2, thence to the coil of the main switch t and back by way of the wire 20 and the trigger contact P to the minus wire of the main circuit. The closing of the main switch t starts the kick off motor by means of the automatic controller.

As soon as the kick off motor starts, the line shaft driven thereby transmits a synchronous movement through chains or gears to the kick off limit switch Y. The first movement of this switch connects the ring r through the segment u, and button on the contact finger (all of the rings or segments turning relatively to the contact finger Y'), so as to form a connection from the plus wire to the wire 2 which continues during nearly the entire rotation of the switch. The same movement connects the minus ring v by means of the segment w (and contact finger Y') which is connected with the wire 20 so that this connection also is maintained throughout practically an entire revolution of the switch. Immediately thereafter the connection to the segment s and wire 1 is broken, which releases the relay X and allows its contact plates p and q to drop, breaking the contacts at these points and leaving the relay in condition for a repetition of the previous operation when the next bar comes along from the mill. The closing of the circuit plus to 2 and the circuit minus to 20 by the limit switch Y holds the main switch t closed even though the former circuits through its coil be broken by the dropping of the plate q of the relay and the second advancement of the trigger F by the next bar (this second advancement breaking the circuit which was formerly maintained from minus to 20 through N). The main switch t of the kick off motor is thereafter held closed until the corresponding limit switch Y has completed a revolution; and similarly the kick off motor is continued in operation until it has completed its cycle independently of the position of the relay X and trigger F.

At the end of a revolution of the limit switch Y both sides of the circuit which operates the main switch t are broken; that is the plus ring r is disconnected from the segment u of the wire 2, and the minus ring v is disconnected from the segment w of the wire 20. The opening of the main switch t applies the switch d of the dynamic braking coil c to stop the motor, the braking switch d being closed when the main switch t is open by the usual mechanism, one arrangement of which is shown diagrammatically in Fig. 8. The kick off motor is thus stopped automatically at the initial point of its cycle and the kick off limit switch Y stops likewise.

The hot bed motor is started from the kick off limit switch Y at a determined point in the cycle of the kick off motor and its limit switch Y. For this purpose the switch Y has a segment x connected to a wire 3 which in turn is connected to a short segment y of the hot bed limit switch Z; the segment y being connected by the usual contact finger (in the initial position of the hot bed switch) to a contact ring z which is connected to a wire 4 leading to one of the terminals of the coil by which the main switch 50 of the hot bed motor is operated. The opposite terminal of the coil of the switch 50 is connected continuously to the minus wire of the main circuit. As soon as the kick off motor has advanced sufficiently to transfer the bar from the hot run out onto the hot bed the kick off limit switch Y, advancing with its motor, brings the advance end of the segment x to the uppermost point so as to make a connection from plus to 3 and thus to close the circuit through the coil of the main switch 50 of the hot bed motor, and this starts the latter through its automatic controlling circuits h, i and m. The hot bed limit switch Z has

a segment 51 constituting nearly a complete circle with its ends slightly overlapping the ends of the short segment *y*, the segment 51 being connected to the plus wire of the circuit. Thus a connection from the plus wire of the circuit to the wire 4 is made directly by the hot bed limit switch soon after it starts and just before the entire connection through the kick off limit switch Y and the wire 3 is broken by the passing of the segment *y* out of contact with the finger of the switch Z. The direct connection plus to 4 through the hot bed limit switch Z is maintained for nearly a complete revolution; that is, practically to the end of the cycle of operations of the hot bed motor.

The segment *x* of the limit switch Y passes under the finger of the switch and maintains the circuit through 3 until the limit switch Z has advanced sufficiently to make the direct contact plus to 4 through the segments *z* and 51; the segment *x* of the switch Y passing out of contact shortly after the direct connection is made through the switch Z. Therefore, when the switch Z has made practically a complete revolution and the segment 51 has passed out from under the contact finger of the switch, breaking the direct contact plus to 4, the circuit through the wire 3 is also open; therefore, the circuit through the coil of the main switch 50 of the hot bed motor will be broken and this switch will open, cutting off current from the motor. At the same time the dynamic brake switch *k* will close (by means of the usual mechanism), such as that shown diagrammatically in Fig. 8, and the dynamic braking resistance *j* will be brought into the circuit and the motor will be stopped at the initial point of its cycle of operations.

When it is desired to operate without the automatic switches which stop the motors at the end of each separate revolution, in order to collect several bars on the cold run out at one time for example, this may be done by means of a bed-clearing switch *o* which makes a direct connection from the plus wire of the main circuit to the wire 4 at one end of the coil of the main switch 50 of the hot bed motor. This will start the hot bed motor and keep it in operation regardless of the limit switches Z and Y until the clearing switch *o* is again opened.

If for any reason the main trigger F or the set up relay X fails to operate, the kick off will not operate and the bar will continue on the hot run out until it strikes the safety trigger M at the end of the hot run out farthest from the mill. This will establish a connection from the plus main to the wire 2 through the contact plate 52, and from the minus main to the wire 20 through the contact plate 53. These contacts will thus close the circuit through the coil of the main switch *t* and will start the motors and limit switches as before.

In either case the controlling apparatus will not start its cycle of operations until the end of the bar has passed the main trigger and the proper sequence of operations will follow, the hot bed rack being set in position after the bar has been kicked off from the hot run off onto the bed. The positively driven limit switches and the dynamic braking circuits control the series of operations accurately and safely. This permits of the safe handling of bars following each other very closely; the contacts of the limit switches closing circuits which parallel the trigger-controlled circuits immediately after the operation of the kick off motor commences. The cycle of the controlling mechanism may be divided into five successive stages as follows.

(1) During the passage of a bar past the trigger F the relay X remains closed and holds the contact plus to 2 closed, but the contact from the main switch *t* and the line 20 is broken at the trigger so that there is no operation of the motors.

(2) As soon as the first bar passes the trigger and the latter returns to its initial position the circuit of the main switch *t* is closed so that the kick off starts.

(3) The kick off switch continues its own motor in operation independently of the trigger and positively stops it at the end of a cycle of its operations.

(4) During the operation of the kick off motor, as soon as the kick off has transferred the bar from the hot run out to the hot bed and returning below the level of the next bar on the run out, the hot bed motor is started by means of the kick off limit switch. The starting of the hot bed motor causes its limit switch to close the circuit controlling the starting switch of the hot bed motor. The hot bed motor is then maintained in operation until it completes its cycle, independently of the operation of the kick off, and is stopped in its initial position.

(5) The arrival of the kick off limit switch at the end of a revolution restores the circuits controlling the kick off motor to their original position, so that this motor can be started again only after a second bar passes the trigger. And the arrival of the hot bed limit switch at the end of a revolution opens the circuit controlling the hot bed motor so that the latter can be started again only through the kick off limit switch.

Though we have described with great particularity of detail a particular apparatus embodying our invention, yet it is not to be understood therefrom that the invention is restricted to the particular embodiment described. Various modifications thereof in detail and in the arrangement of the parts may be made by those skilled in the art with-

out departing from the invention and the mechanism may be applied to the controlling of other types of hot bed and run out either in the form shown or with suitable modifications to adapt it to the requirements of the type of hot bed and run out in question.

What we claim is—

1. In a hot bed and run out table mechanism, in combination, a kick off for shifting a bar transversely from the hot run out on to the hot bed, a motor for operating said kick off, automatic means for starting said motor and means for causing said motor to operate said kick off through a complete cycle of operations thereof independently of the position of said automatic means after said motor is started.

2. In a hot bed and run out table mechanism, in combination, a hot bed adapted to receive a succession of bars at one side and to shift them in succession, step by step, toward the opposite side, a motor for operating said hot bed, automatic means for starting said motor, and means for causing said motor to operate said hot bed through a complete cycle of operations thereof independently of the position of said automatic means after said motor is started.

3. In an apparatus of the class described, in combination, a kick off motor, automatic means for starting said motor and means for causing said motor to make a complete cycle of operations independently of the position of said automatic means after said motor is started, a hot bed motor, automatic means for starting said hot bed motor when said kick off motor has advanced to a determined point and means for causing said hot bed motor to make a complete cycle of operations independently of the position of its automatic starting means after said hot bed motor is started.

4. In an apparatus of the class described, in combination, a kick off motor, automatic means for starting said motor and means for causing said motor to make a complete cycle of operations and to stop at the end of such cycle independently of the position of said automatic means after said motor is started, a hot bed motor, automatic means for starting said hot bed motor when said kick off motor has advanced to a determined point and means for causing said hot bed motor to make a complete cycle of operations and to stop at the end of such cycle independently of the position of its automatic starting means after said hot bed motor is started.

5. In a hot bed and run out table mechanism, in combination, a hot run out adapted to convey a hot bar lengthwise, a trigger adapted to be operated by such a bar and to be released when the bar passes, mechanism for moving such bar laterally, and a motor for operating said mechanism and having controlling circuits which are rendered operative only by an operation and a subsequent release of said trigger.

6. In an apparatus of the class described, in combination, a trigger adapted to be operated by a bar and to be released when the bar passes, and a motor having controlling circuits which are rendered operative only by an operation and a subsequent release of said trigger, and a safety trigger adapted to be operated by a bar after the latter has passed the first trigger, said controlling circuits adapted to be rendered operative also upon such operation of the safety trigger.

7. In a hot bed and run out table mechanism, in combination, a kick off for shifting a bar transversely from the hot run-out to the hot bed, a motor for operating said kick-off, automatic means for closing a controlling circuit of said motor and a kick off switch operated from said motor and closing a circuit controlling said motor parallel with the circuit closed by said automatic means.

8. In a hot bed and run out table mechanism, in combination, a hot bed adapted to receive a succession of bars at one side and to shift them in succession step by step toward the opposite side, a motor for operating said hot bed, automatic means for closing a controlling circuit of said motor and a hot bed switch operated from said motor and closing a circuit controlling said motor parallel with the circuit closed by said automatic means.

9. In an apparatus of the class described, in combination, a kick off motor, automatic means for closing a controlling circuit of said motor and a kick off switch operated from said motor and closing a circuit controlling said motor parallel with the circuit closed by said automatic means, a hot bed motor having a controlling circuit which is closed by said kick off switch at a determined point in the advance of the kick off motor and a hot bed switch operated from the hot bed motor and closing a circuit controlling said hot bed motor parallel with the circuit closed by said kick off switch.

10. In an apparatus of the class described, in combination, a kick off motor, automatic means for closing a controlling circuit of said motor, a kick off limit switch operated from said motor and closing a circuit controlling said motor parallel with the circuit closed by said automatic means and causing said motor to make a complete cycle of operations and to stop at the end of such cycle, a hot bed motor having a controlling circuit which is closed by said kick off limit switch at a determined point in the advance of the kick off motor and a hot bed limit switch operated from said hot bed motor and closing a circuit controlling said hot bed motor parallel with the circuit closed by said kick off limit switch and causing said hot bed motor to make a complete cycle of

operations and to stop at the end of such cycle.

11. In an apparatus of the class described, in combination, a motor, an electrically controlled main switch for said motor, a set-up relay for closing a break in the circuit of said switch, and a trigger which in its normal position closes another break in said circuit and which in its deflected position closes a break in the circuit through said relay, whereby an operation of the trigger first operates said relay to close one break in the circuit of the switch and then closes a second break in the same circuit and causes the closing of the switch.

12. In an apparatus of the class described, in combination, a motor, an electrically controlled main switch for said motor, a set-up relay for closing a break in the circuit of said switch, and a trigger which in its normal position closes another break in said circuit and which in its deflected position closes a break in the circuit through said relay, whereby an operation of the trigger first operates said relay to close one break in the circuit of the switch and then closes a second break in the same circuit and causes the closing of the switch and a safety trigger in line with the first trigger and adapted when deflected from its normal position to completely close a circuit through said switch.

13. In an apparatus of the class described, in combination, a motor, an electrically controlled main switch for said motor, a set-up relay for closing a break in the circuit of said switch, and a trigger which in its normal position closes another break in said circuit and which in its deflected position closes a break in the circuit through said relay, whereby an operation of the trigger first operates said relay to close one break in the circuit of the switch and then closes a second break in the same circuit and causes the closing of the switch, a limit switch for stopping the motor after an operating cycle thereof, said limit switch being driven from said motor to make a complete operation for each operating cycle of the motor, said limit switch in its normal position closing a second break in the circuit of said relay and opening a shunt around the circuit through the trigger in its normal position, said limit switch when operated closing a direct circuit of the main switch and then breaking the circuit of the relay to prevent operation thereof by the trigger and also closing said shunt around the trigger to cause the holding of the main switch closed until the limit switch makes a complete revolution.

In witness whereof we have hereunto signed our names.

WILLIAM AHLEN.
KARL H. CEDERLUND.