Dec. 27, 1932. J. W. STEELE ET AL. 1,892,590

METAL SHEET STACKING MACHINE

Filed Oct. 30, 1929. 2 Sheets-Sheet 1

Fig. 1.

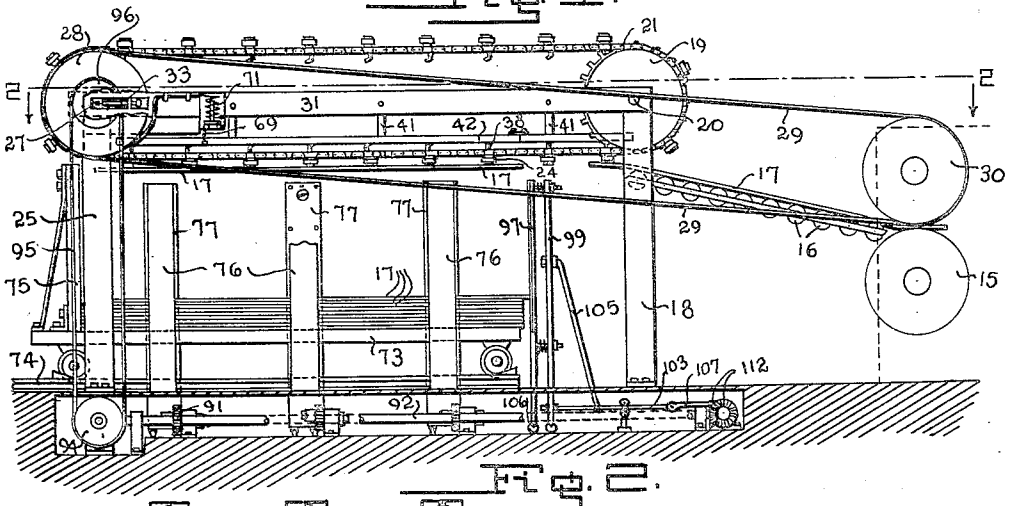


Fig. 2.

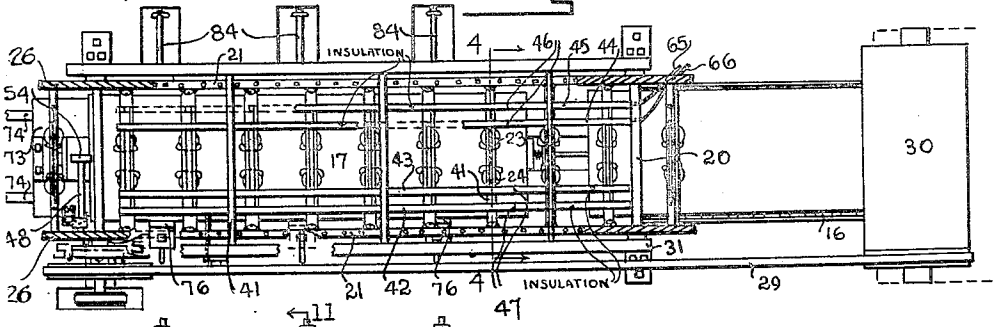


Fig. 3.

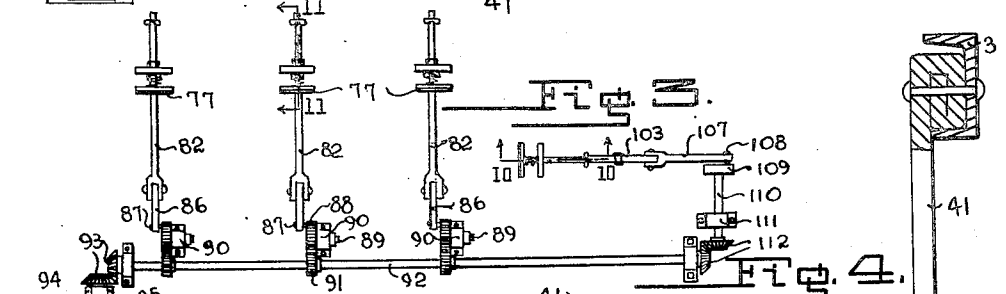


Fig. 4.

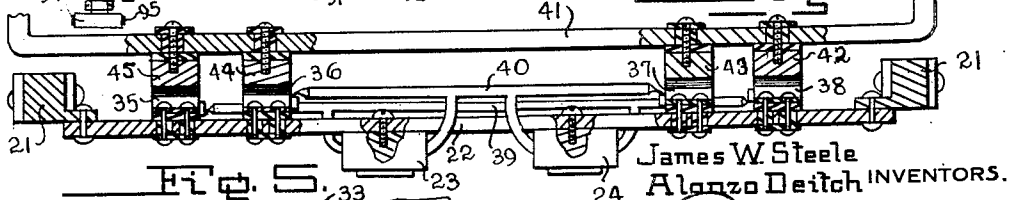
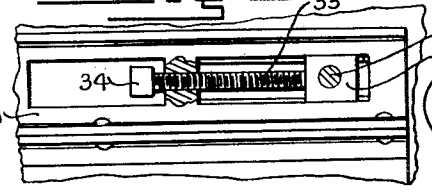


Fig. 5.



James W. Steele
Alonzo Deitch INVENTORS.

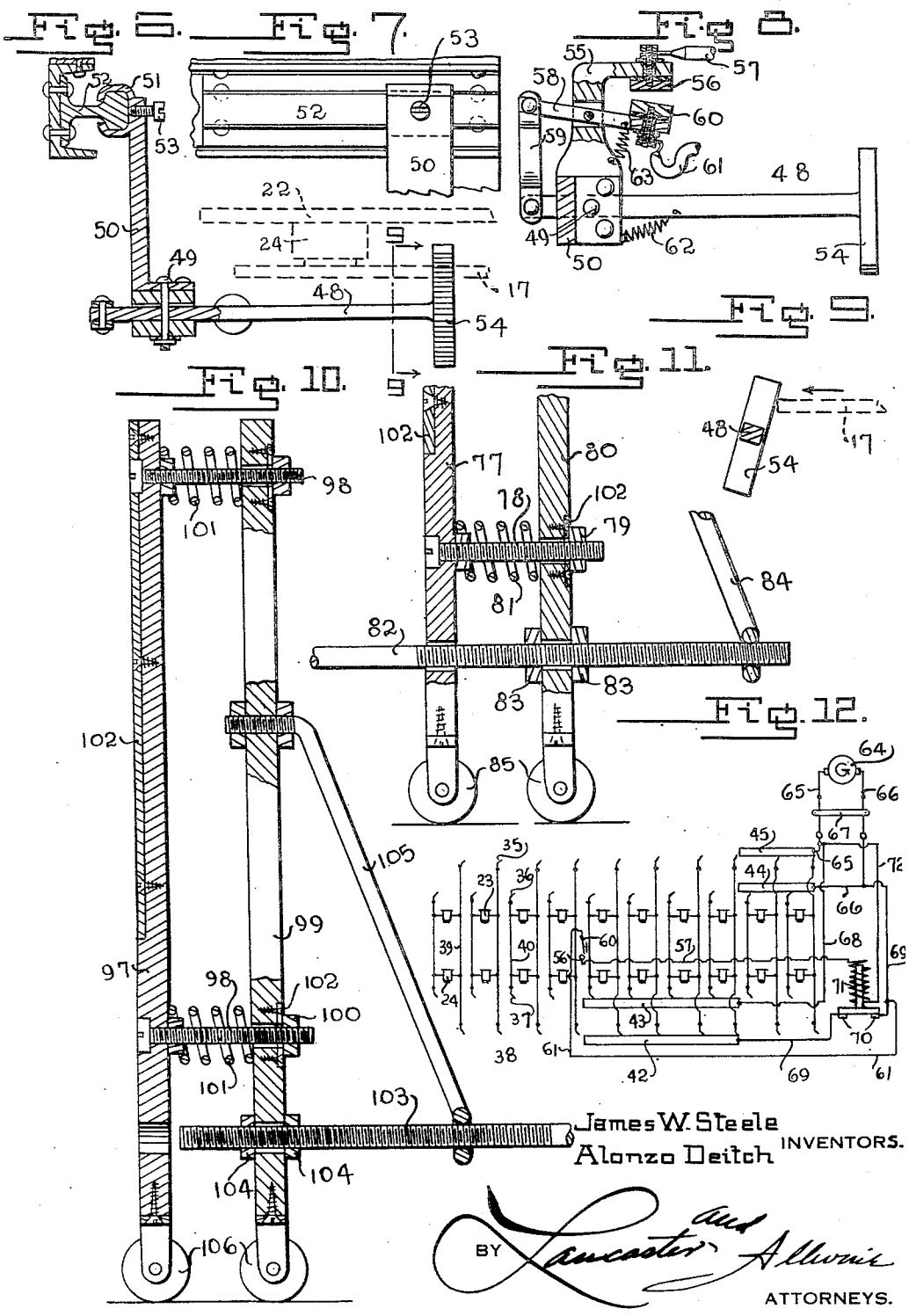
BY Lancaster and Allwine

ATTORNEYS.

Dec. 27, 1932. J. W. STEELE ET AL 1,892,590

METAL SHEET STACKING MACHINE

Filed Oct. 30, 1929 2 Sheets-Sheet 2



Patented Dec. 27, 1932 1,892,590

UNITED STATES PATENT OFFICE

JAMES W. STEELE, OF ELM GROVE, WEST VIRGINIA, AND ALONZO DEITCH, OF MARTINS FERRY, OHIO, ASSIGNORS OF ONE-THIRD TO HARRY CY THOMAS, OF MARTINS FERRY, OHIO

METAL SHEET STACKING MACHINE

Application filed October 30, 1929. Serial No. 403,642.

The present invention relates to material handling and more particularly to a machine for stacking or piling sheets of metal or the like by use of electromagnets.

An object of the present invention is to provide a machine of this character which is adapted to catch and stack metal sheets as they come from the cold rolls, levelers, stencil machines and the like, as used in iron or tin mills.

Another object of the present invention is to provide a machine which will do the work of a number of workmen in catching metal sheets from a rolling mill, carrying the sheets to a suitable position for stacking, and to stack the sheets in proper registry to the desired height upon a truck or other movable platform which may be subsequently moved into position so that the stacked sheets may be easily connected to a suitable hoist and conveyor for transporting the stack of sheets to any suitable point of delivery about the mill.

Another object of the present invention is to provide improved means for registering the sheets in the stack after they have been delivered to the stack and for automatically accomplishing this purpose, and to provide a registering mechanism of this character which may be adjusted to sheets of different sizes within practical limits, and to provide a machine which may be connected to the rolling mill so as to operate in proper timed relation therewith for receiving the sheets one at a time and stacking and registering the sheets without the necessity of any individual adjustment or control on the part of the workmen.

The invention also aims at the provision of an improved construction of magnet control wherein certain of the magnets may catch a sheet from the rolling mill while simultaneously certain other magnets of the machine operate to carry a prior fed sheet to the stack and release the sheet when brought into proper position over the stack without releasing the next adjacent sheet entering the machine from the rolling mill.

A still further object of the invention is to provide an improved circuit control system for the magnets to insure the proper operation of the magnets in sequence for performing the various functions during the catching, the traveling and the releasing of the sheets through the machine.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawings, wherein like symbols refer to like or corresponding parts throughout the several views,

Figure 1 is a side elevation of an automatic sheet stacker constructed according to the present invention and as applied to the delivery rolls of a cold roll mill, certain parts being broken away for the sake of clearness.

Figure 2 is a top plan view of the same, the upper portion of the machine being shown in section on the line 2—2 of Figure 1.

Figure 3 is a detail plan view of the sheet registering mechanism.

Figure 4 is an enlarged transverse section taken on the line 4—4 of Figure 2 showing the support for the magnets and the current distributing means associated therewith.

Figure 5 is an enlarged fragmentary view partly in section of the slack adjustment for one of the rolls which carries the magnet's chain or belt.

Figure 6 is an enlarged fragmentary view partly in section of the automatic trip and its mounting for releasing the sheets when brought into register with the stack.

Figure 7 is an inner side elevation of same, the lower portion being broken away.

Figure 8 is a horizontal section taken through the automatic trip or releaser for the sheets, the section being taken through the lower portion of Figure 6.

Figure 9 is a transverse section taken through the trip on the line 9—9 of Figure 6 and showing in dotted lines a sheet in engagement with the trip.

Figure 10 is a vertical longitudinal section taken through the end registering device adapted to engage the sheets for aligning the same in the stacks.

Figure 11 is a similar view taken through

one of the registering devices located at one side of the stack, on the line 11—11 of Figure 3, and

Figure 12 is a diagrammatic view of one arrangement of the electric circuit for controlling the magnets at their different position during the operation of the machine.

Referring now to the drawings, and first to Figures 1 and 2, 15 designates a pair of delivery rolls of a cold roll mill and from which outwardly and upwardly extends a roller platform or support 16 adapted to support and guide a sheet of metal 17 which is ejected by the rolls 15 as shown.

The stacker of this invention is mounted at the outer upper end of the support or platform 16 and at its forward end, or the end adjacent the platform 16, is provided with a pair of uprights 18 between the upper ends of which are mounted toothed wheels or drums 19 supported on a transverse shaft 20, the wheels 19 and the shaft 20 forming a reel or drum adapted to support an endless belt or conveyor 21. The conveyor 21 may be of the chain type with the links arranged to intermesh with the teeth of the wheels 19, the structure providing an independent chain at each side of the machine as shown in Figure 2. The conveyor 21 is provided at suitably spaced points with cross-bars 22 which, as shown in Figure 4, are each provided with a pair of outwardly projecting magnets 23 and 24 which are located inwardly of the side chains of the conveyor 21 and in proper position for engaging the upper surface of the sheets 17 as the latter are delivered from the support 16 beneath the lower run of the conveyor 21.

At the rear end of the stacker is disposed a pair of uprights or posts 25 between the upper ends of which are mounted a pair of toothed wheels 26 carried on a transverse shaft 27, the wheels 26 and the shaft 27 providing a drum at the rear end of the machine and adapted to support the rear end of the conveyor 21. The conveyor 21 may be driven in any suitable manner in such direction that the lower run of the conveyor travels from the front to the rear end of the machine, and in the present instance the shaft 27 is provided upon one end with a pulley or wheel 28 over which passes a belt 29, the latter passing over a pulley or wheel 30 which is mounted upon the shaft of one of the delivery rolls 15 of the rolling mill. The conveyor 21 is therefor driven at the desired rate of speed with respect to the delivery rolls 15 so that the sheets of metal 17 will travel through the machine at the same rate of speed as they are delivered from the rolls 15. The standards or posts 18 and 25 form part of the main frame of the machine and are connected together at their upper ends by the side bars or beams 31. The chain or conveyor 21 is maintained under the proper tension by adjustment of the shaft 27, and as shown in Figure 5, the shaft 27 is journaled in a block 32 which is formed in the side rail 31, and is held in position therein by a set screw 34 which is threaded through a portion of the side beam 31 and is provided with a head by means of which the screw 33 may be turned up against the block 32 for forcing the same rearwardly and maintaining the conveyor 21 under the desired tension.

It is of course understood that there are a pair of these blocks 32, one located in each side beam 31 so that the rear reel may be uniformly adjusted at opposite ends.

Referring now particularly to Figure 4, each cross arm or bar 22 is provided near each end and outwardly of the magnets 23 and 24 with contact brushes 35 and 36 at one end and brushes 37 and 38 on its opposite end. These brushes are mounted in insulated relation upon the bar 22, and the outer brushes 35 and 38 are connected together and to one side of each of the magnets 23 and 24 by an electric conductor 39. The inner brushes 36 and 37 are connected together and to the opposite sides of the magnets 23 and 24 by a second conductor 40. Electric current may thus be supplied to the magnets 23 and 24 from either end of the cross-bar 22 as will hereinafter appear.

The side bars 31 of the main frame are provided at spaced intervals throughout the length of the frame with downwardly arched or depending brackets 41. The brackets 41 overhang the lower run of the conveyor 21 and are provided across their lower sides with four longitudinally extending and spaced apart and insulated contact rails 42, 43, 44 and 45. These contact rails are arranged immediately above the respective brushes 35, 36, 37 and 38.

As is indicated in Figure 2, the contact rails 44 and 45 are connected in the opposite sides of an electric circuit and are live rails back to the point indicated at 46 so as to supply current to the magnets 23 and 24 during the first part of the travel of the magnet when at the lower run of the conveyor, the current being supplied through the brushes 35 and 36 which wipe over the contact rails 44 and 45. This arrangement is to energize the magnets 23 and 24 for picking up the forward end of the sheet 17 as it is forced upwardly over the support 16. The remaining rear portions of the rails 44 and 45 are of insulating material, such as wood, or otherwise suitably mounted or formed so as to be electricity non-conducting and are merely for the purpose of maintaining an even pressure upon the brushes 37 and 38 so as to equalize the cross-arms or bars 22 during the entire rearward travel of the arms.

The rails 42 and 43 are constructed in a reverse manner to the rails 44 and 45 inas-

much as the forward end portions of the rails 42 and 43 are of insulating material, or are otherwise mounted so as not to conduct electricity to the brushes 35 and 36 during the initial rearward movement of the magnets. The insulating sections of the rails 42 and 43 extend rearwardly to the point indicated at 47 which is preferably slightly in advance of the break between the sections of the rails 44 and 45 so that at no time will the magnets 23 and 24 be cut out of the circuit through the brushes 35 and 36 or the brushes 37 and 38.

This arrangement of the rails and brushes is for the purpose of permitting of the independent control of the magnets at the rear portion of the lower run of the conveyor 21 for releasing the sheets 17 at certain times and without disturbing the connection of the magnets 23 and 24 which are at the forward end of the lower run so that the magnets may be picking up a second sheet 17 while the first sheet is being released or dropped into the stack.

In order to release the sheet 17 when it is brought by the lower run of the conveyor 21 into approximate position above the stack, as shown in Figure 1, the machine is provided with an automatic circuit breaker which is actuated by the sheet itself as it is brought into proper position for release.

Referring now to Figures 2, and 6 to 9, a trip lever 48 is pivotally mounted upon a pin 49 in a bracket 50. The bracket 50 extends upwardly and is provided with a socket 51 which slidably engages the ball head of a rail 52 which is secured along the inner side of one of the side bars 31 of the frame near the inner end of the machine. The bracket 50 may thus be slid longitudinally of the machine into various positions for taking care of sheets of metal 17 which are of different lengths. A set screw 53 may be carried by the socket 51 for binding the latter upon the rail 52 when the desired adjustment is reached.

The outer end of the trip arm 48 is provided with a shoe 54 which, as shown in Figure 9, is preferably inclined downwardly and rearwardly with respect to the machine and is of sufficient vertical length to engage plates 17 which may vary in position, thickness or which otherwise may be out of normal vertical line. It will also be noted that the shoe 54 by its inclination will be readily freed from the sheet 17 as the latter drops onto the stack without injury to the arm 48, the result being obtained by the inclined position of the shoe 54.

The bracket 50 is also provided at its lower end with a rearwardly extending arm 55 which has an inwardly bent or extending portion carrying a fixed contact 56 connected to a wire 57, as shown in Figure 8. The arm 55 also carries, in advance of the contact 56, a pivoted arm 58 which extends across or through the arm 55 and is connected by a link 59 to the outer end of the trip arm 48, beyond the pivot 49 thereof.

The inner end of the pivoted arm 58 carries a movable contact 60 which is disposed in line with the fixed contact 56 and is adapted to be moved there-against by the swinging of the arm 58 through the link 59 and the movement of the trip arm 48. The movable contact 60 is connected to a wire 61.

The trip arm 48 is provided with a spring 62, and the pivoted arm 58 is provided with a spring 63, both springs, 62 and 63, being connected to the bracket 50 forwardly of their respective arms 48 and 58 so as to normally urge the inner ends of the arms forwardly to break the circuit between the wires 57 and 61 and to move the trip arm 48 into position for receiving the rear edge of the next sheet 17. The switch is thus normally maintained in open position.

Referring now to the diagrammatic view. Figure 12, showing the various circuits, contacts and the like, which may be used in the electrical system employed, 64 designates the generator or other source of current supply in a branch circuit from the feed wires 65 and and 66. A switch 67 is shown for completely cutting off the current from the machine. The forward short sections of the rails 44 and 45 are adapted to be at all times, when the switch 67 is closed, in circuit with the feed wires 65 and 66 as shown in the diagram. The rear relatively long sections of the rails 42 and 43 are adapted to be normally closed in a branch circuit from the feed wires 65 and 66, but to at times be cut out of the circuit. For accomplishing this result, the rail 43 is connected by a branch wire 68 to the feed wire 65 while the rail 43 is connected by a branch wire 69 to the feed wire 66, but includes contacts 70 of a circuit breaker 71.

The circuit breaker 71 is normally closed so as to normally supply circuit to the rails 42 and 43. The sheet actuated switch, shown in Figure 8, may be termed a trip switch and the fixed contact 56 thereof is connected by its wire 57 to one side of the coil or solenoid of the circuit breaker 71 while the movable contact 60 is connected by its wire 61 to the branch wire 69 and to the feed wire 66. The opposite side of the coil or solenoid of the circuit breaker 71 is connected to the feed wire 65 by a branch wire 72.

The sheets 17 are adapted to be stacked upon a truck 73 or other movable platform, and in the present instance the truck is disclosed as mounted upon rails 74 so that when the desired number of sheets have been stacked upon the truck 73 the truck may be rolled out of the machine to any desired position so that the stack of sheets may be disposed of as is found convenient and necessary. The truck 73 is of less width than the sheets

17 so that access may be had to the edge of the sheet for properly registering and stacking the same, and the truck 73 is provided upon its rear end with an upstanding transversely disposed abutment or wall 75 against which the rear ends of the sheet 17 are adapted to be forced.

Spaced along one side of the machine is a plurality of standards or abutments 76 which are preferably stationary and rigid. Along the opposite side of the machine, and in registry with the fixed abutment 76 are a series of movable abutments or pushers 77.

Each movable abutment or pusher 77, as shown in detail in Figure 11, comprises a vertical plate having a rearwardly extending guide pin 78 which may be threaded for adjustably receiving upon its rear end a nut 79. The rear end of the guide pin 78 extends slidably through an opening formed in a back plate 80 while a spring 81 is disposed between the plates 77 and 80 for normally urging the same apart, and the nut 79 limits this separation of the plates 77 and 80.

A rod 82, extending transversely of the machine and beneath the rails or tracks 74, extends slidably through the lower ends of the boards 77 and 80 and is adjustably connected by binding nuts 83 or the like to the board 80. A brace 84 is adjustably disposed upon the outer end portion of the rod 82 and extends upwardly and is secured to the board 80 at a suitable height for bracing the board 80 and maintaining it in upright position. The boards 77 and 80 of the movable abutment are mounted on rollers 85 or the like to facilitate ease in operation as the abutment is drawn back and forth at the side of the machine.

As shown in Figure 3, the rods 82 extend toward the side of the machine at which the fixed abutments 76 are located, and are pivotally connected by links 86 to eccentric pins 87 carried by gear wheels 88 mounted on shafts 89 disposed in suitable supports 90.

The gear wheels 88 mesh with pinions 91 which are carried by a shaft 92 which extends lengthwise of the machine along the adjacent side thereof and which, at the rear end of the machine, is connected by beveled gears 93 with a drive pulley 94 having a suitable shaft and bearing as shown. The pulley 94 may be connected by a belt 95 with a pulley 96 mounted on the shaft 27 so as to operate the movable abutments or pushers 77 in proper timed relation with the operation of the conveyor 21 and the rolling mill. The movable abutments or pushers 77 are adapted to engage the lateral edges of the sheets 17 after they have been dropped from the magnets 23 and 24 and push the sheets laterally against the fixed abutments 76 so as to properly position the sheets 17 upon the platform 73.

At the front or forward end of the machine is disposed another movable abutment or pusher 97, shown in detail in Figure 10. The pusher 97 is in the form of a vertically disposed board provided with outwardly extending pins 98 which slidably engage through a back-board 99, and the latter is held upon the pins by adjustable nuts 100. Springs 101 are carried by the pins 98 between the boards 97 and 99 to normally urge the board 97 forwardly or outwardly with respect to the pusher structure.

All of the pushers may be provided with base or wear plates 102 which are of relatively hard material so as to take care of wear upon the various parts of the pushers. As shown in Figure 10, the lower ends of the boards 97 and 99 are provided with openings therethrough adapted to freely receive a rod 103, and the latter is adjustably secured to the back-board 99 by binding nuts 104 or the like for moving the pusher with the rod 103. A brace 105 is adjustably mounted upon the rod 103 and extends upwardly and is secured to the back-board 99 at a suitable height for bracing the same and maintaining it in upright or vertical position. The lower end of the boards 97 and 99 are also provided with rollers 106 to facilitate the reciprocating movement of the pusher 97.

As shown in Figure 3, the rod 103 extends forwardly with respect to the machine and is connected by a connecting rod 107 with a pin 108 eccentrically mounted in a disc 109 carried on a shaft 110 having a suitable bearing 111 and connected by beveled gears 112 to the shaft 92. All of the pushers or movable abutments are therefore reciprocated by rotation of the shaft 92.

In operation, when the delivery rolls 15 of the roller mill operate the stacking machine is set in motion and operated through the belt 29.

As a sheet 17 is delivered from the rolls 15 over the support 16, the forward end of the sheet 17 is brought into proximity with the forward end of the lower run of the conveyor 21. The pairs of magnets 23 and 24 as they travel downwardly over the forward reel are closed in the circuit by the brushes 35 and 36 coming into contact with the live portion of the rails 44 and 45 and the magnets therefor grasp the forward end of the sheet of metal 17 and draw the same rearwardly during the travel of the lower run of the conveyor. The magnets 23 and 24 are maintained energized by the brushes 37 and 38 which traverse the live portion of the rails 42 and 43 after the brushes 35 and 36 have passed from the forward portion of the rails 44 and 45 so that the sheet 17 is maintained in contact with the successive pairs of magnets 23 and 24.

As soon however as the sheet 17 is carried rearwardly into the machine and in approximate position over the truck 73, the rear end of the sheet 17 engages the shoe 54 and swings

the trip arm 48 to operate or close the trip switch. When the trip switch is closed the circuit breaker 71 is operated to break circuit between the contacts 70 and thus de-energize or cut the rails 42 and 43 out of the circuit. The sheet of metal 17 is now permitted to drop onto the platform 73 or onto the stack which has already been deposited.

The sheet 17, when released from the magnets 23 and 24, falls relatively quickly to the stack, and as the pushers or movable abutments are operated at a relatively low speed, and are connected by the belt 95 to the conveyor 21, they are so timed as not to interfere with the falling of the sheet 17 but to come up into engagement with the sheet subsequent to their falling into position. The side stackers 77 yieldingly engage the sides of the sheets 17 and shift the same on the stack over toward the stationary abutment 76 while the end stacker 97 engages against the forward ends of the sheets 17 and forces them backwardly against the stationary abutment or wall 75 which is carried by the truck 73. Thus, the sheets 17 are automatically placed on the truck 73 and automatically aligned by lateral and endwise shifting of the sheets. The springs 81 and 101 prevent buckling or injury to the sheets and also injury to the mechanism as when the sheets are brought up against the end and lateral stationary abutments the springs will then yield during the further advance movement of the mechanism.

It is obvious that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims:

What is claimed is:—

1. In a stacker for metallic sheets, a series of electric magnets; means for carrying said electric magnets in train along a horizontal path; and means for energizing the magnets during the travel of the same along said path for engaging and carrying sheets of metal, and means for de-energizing certain only of said magnets for releasing said sheets of metal at a pre-determined point for stacking.

2. In an automatic sheet metal stacker a conveyor; a plurality of magnets carried by the conveyor; means for energizing said magnets to engage and support sheets of metal and trip means for de-energizing the magnets only at the delivery end of said conveyor to free said sheets at said delivery end.

3. In an automatic sheet metal stacker, a conveyor comprising a pair of parallel chains; cross-arms connecting the chains; a pair of magnets mounted on each cross-arm; brushes carried by the cross-arms and connected to the respective magnets; contact rails arranged above the lower run of the conveyor and in line with said brushes; means for supplying current to said rails, and means for de-energizing certain of the magnets at one end of the conveyor.

4. In an automatic sheet metal stacker, a conveyor comprising a pair of spaced chains; cross-arms connecting the chains; magnets mounted on the cross-arms; brushes carried by the cross-arms and connected to the respective magnets; contact rails mounted above the lower run of the conveyor and adapted for engagement by said brushes, means for supplying current to said rails for energizing said magnets; a trip device arranged at one end of the conveyor adapted for engagement by sheets of metal carried by the magnets; and means connected to the trip device and to said rails for de-energizing the latter for releasing said sheets of metal.

5. In an automatic sheet metal stacker, a conveyor, a plurality of cross-arms carried by the conveyor and spaced throughout the length thereof; magnets mounted on the cross-arms, brushes carried by the cross-arms and connected to said magnets; independent sets of contact rails arranged above the lower run of said conveyor and adapted for engagement with said brushes, said rails having overlapping electric conducting and non-conducting sections; and a trip device operable by a sheet of metal carried by the magnet for de-energizing the rear portion of one set of rails for de-energizing the magnets and releasing the sheet of metal, the electric conducting portion of the opposite set of rails remaining in conductive relation whereby to at all times energize the magnets at the entering end of the conveyor.

6. In an automatic sheet metal stacker, a conveyor; a plurality of arms carried by the conveyor; magnets mounted on said arms; brushes carried by the arms and arranged in pairs near opposite ends thereof and connected to the respective magnets; a pair of rails arranged at each side of the machine in line with said brushes, one set of rails having a forward conducting portion and a rear insulation portion, the other set of rails having a forward insulating portion and a rear conducting portion; means for including the conducting portion of the first set of rails continuously in circuit; means for connecting the rear conducting portions of the other set of rails normally in circuit and including a circuit breaker; and a trip device mounted beneath the inner end of the conveyor adapted for engagement by sheets of metal carried by the magnets for closing a circuit through said circuit breaker and de-energizing the magnets in registry with the rear portions of said second set of rails.

7. In an automatic sheet metal stacker, a conveyor; magnets mounted upon said conveyor; means for energizing said magnets

during the forward movement of same; and means for selectively deenergizing certain of said magnets at a predetermined point during the forward movement of the same.

8. In an automatic sheet metal stacker, an endless conveyor; magnets carried by said conveyor; brushes carried by said conveyor and connected to said magnets; and independent sets of contact rails arranged above the lower run of said conveyor and adapted for engagement with said brushes, said rails having overlapping electric conducting and non-conducting sections.

9. In an automatic sheet metal stacker, an endless conveyor; a plurality of magnets spaced upon the conveyor; means for feeding sheets of metal beneath one end of the conveyor; means for continuously energizing said magnets at the forward lower run of the conveyor for engaging and carrying said sheets of metal toward the delivery end of the conveyor; means for energizing said magnets from adjacent the forward lower run of the conveyor until the sheets reach the delivery end and means for de-energizing said magnets as the sheets reach said delivery end.

JAMES W. STEELE.
ALONZO DEITCH.