

Feb. 17, 1942.

E. F. BORON ET AL

2,273,689

SHEET STACKER

Filed March 16, 1940

3 Sheets-Sheet 1

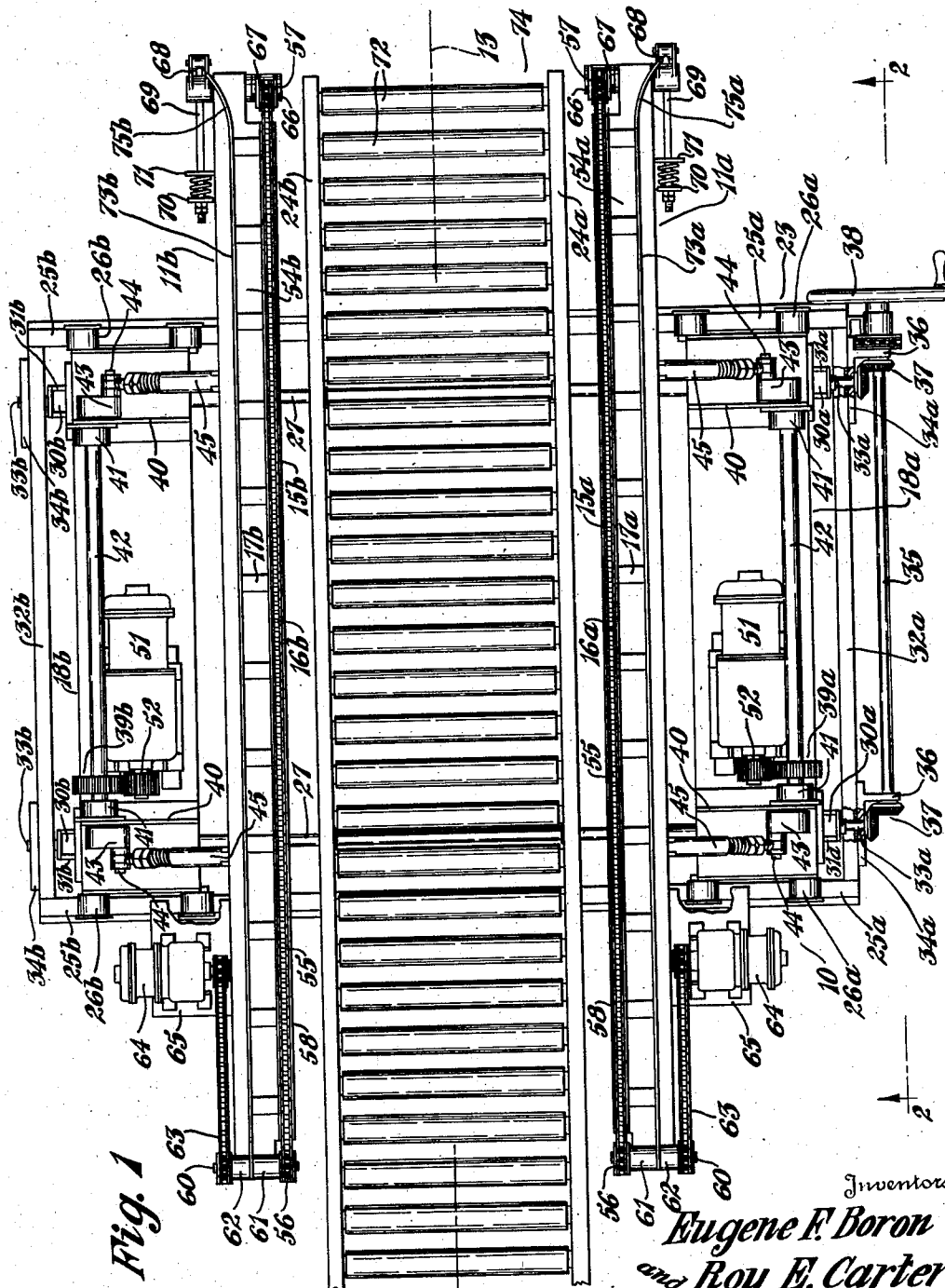


Fig. 1

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3 Sheets-Sheet 2

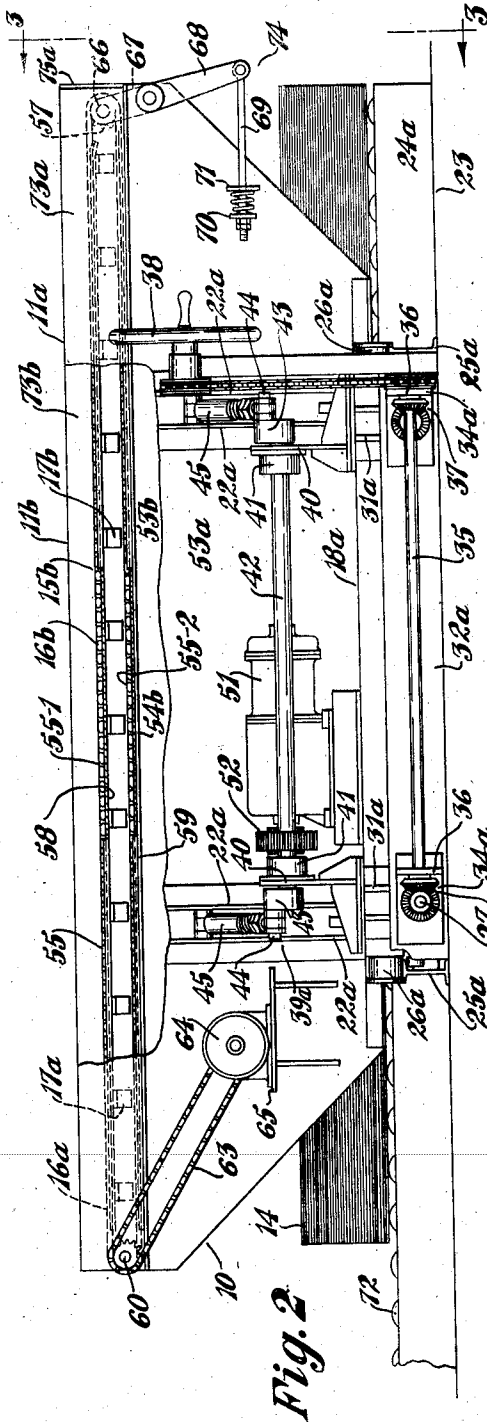


Fig. 2

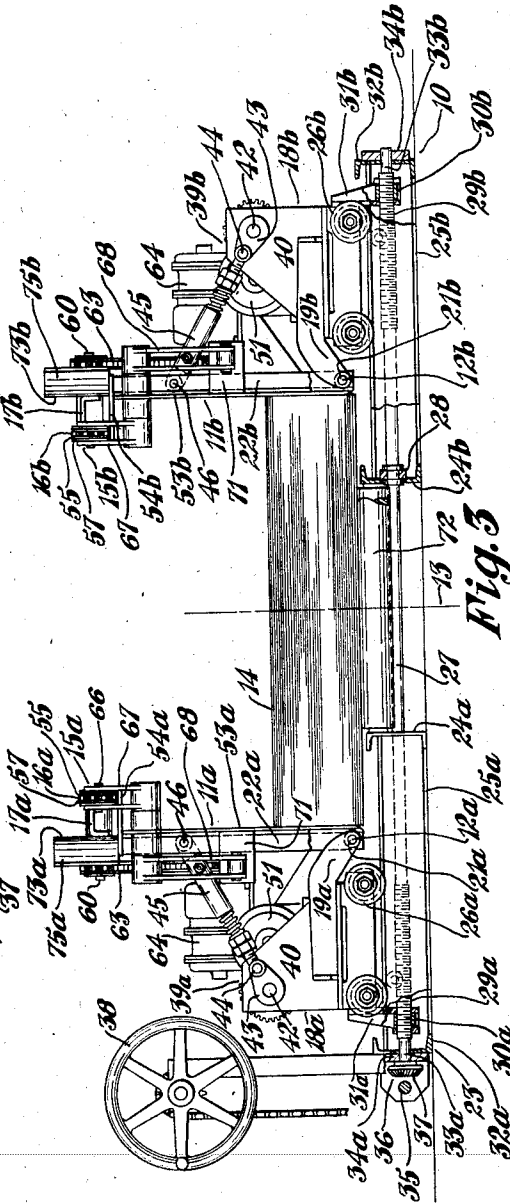


Fig. 3

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3 Sheets-Sheet 3

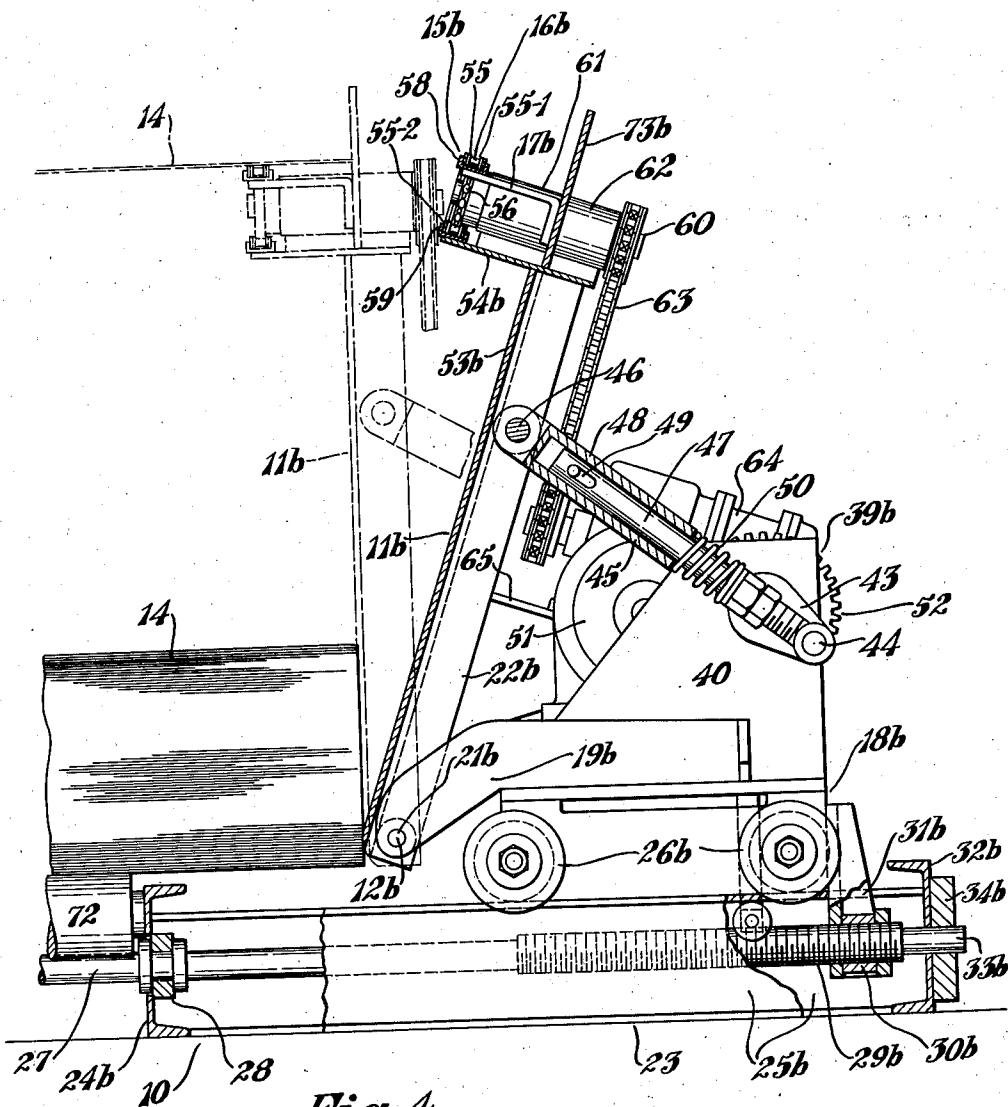


Fig. 4

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UNITED STATES PATENT OFFICE

2,273,689

SHEET STACKER

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Application March 16, 1940, Serial No. 324,370

24 Claims. (Cl. 271—89)

Our invention relates to apparatus for stacking sheets and more particularly for stacking metal sheets as the sheets are discharged from processing apparatus such as a roll stand, a roller leveler, a sheet oiler, or a shear line, and the like.

Such sheets move in a generally horizontal direction lengthwise of themselves as they are discharged from the processing apparatus which imparts a lengthwise velocity to each sheet until discharged. For example in the operation of a roll stand, the rolls impart the lengthwise velocity to each sheet as long as any part of the sheet is engaged in the nip of the rolls. As soon as the entire sheet is discharged from the rolls its lengthwise velocity drops off, and the longer the sheet the more rapid is its loss of roll imparted lengthwise velocity after discharge from the rolls.

In sheet steel rolling mills, as distinguished from continuous strip steel rolling mills, it has become desirable to process steel sheets as long as 12 feet or more and as wide as 54 inches or more. It is also frequently desirable to stack such sheets a greater distance away from the roll stand or other processing apparatus than would be reached by the lengthwise velocity of the sheets imparted to the sheets by the processing apparatus.

Satisfactory sheet stacking by any method or apparatus requires: first, that the sheets be easily moved to the desired stack location; second, that each sheet be suitably supported throughout its entire length until dropped onto the stack or pile; and third, that the sides of the stack or pile formed by the edges of the several sheets be kept straight as the stack or pile builds up by the stacking one upon the other of successive sheets.

No completely satisfactory apparatus for stacking steel sheets having lengths up to 12 feet or more and widths up to 54 inches or more, while being processed in a usual rolling mill or otherwise, has been available prior to the present invention.

Accordingly, the objects of the present invention include the provision of improved sheet stacking apparatus particularly adapted for stacking steel sheets and which is capable of satisfactorily stacking sheets of any desired length and of various widths.

Further objects of the present invention include the provision of improved sheet stacking apparatus adapted in an improved manner to support the edges of a sheet throughout the entire length of the sheet until the sheet has reached the desired location of the stack and has been dropped to build up the stack.

Further objects of the present invention include the provision of improved sheet stacking apparatus adapted in an improved manner to impart any desired lengthwise velocity or feed speed to a sheet being moved to the desired stack location, regardless of whether or not the sheet has any roll imparted lengthwise velocity or otherwise.

Further objects of the present invention include the provision of improved sheet stacking apparatus adapted in an improved manner to build up a stack with straight sides formed by the edges of the several sheets of the pack.

Further objects of the present invention include the provision of such an improved sheet stacking apparatus in the form of a unitary machine having a simplified construction enabling easy and economical manufacture, operation, and maintenance.

The foregoing and other objects are attained by the apparatus, parts, combinations, and sub-combinations of the present invention, the nature of which is set forth in the following general statement, and preferred embodiments of which are set forth in the following description, and which are particularly and distinctly pointed out and set forth in the appended claims forming part hereof.

The nature of the improved sheet stacking apparatus of the present invention may be stated in general terms as including two longitudinally extending laterally movable frames or members which may be power operated and which have a clear space laterally therebetween and which preferably swing about lower longitudinally extending pivoting axes and which are of any desired length and which in combination with associated parts are adapted to receive and drop into the clear space between each other sheets of any desired length.

Each swinging frame has operatively mounted above its pivoting axis, sheet edge conveying and supporting means including a power driven endless belt conveyor. The endless belt conveyors preferably operate on cantilever supporting members extending towards each other from the inner opposite sides of the swinging frames.

Each frame has a motor drive means mounted thereon and drive connected with the conveyor thereon.

Means may be provided for varying the lateral distance between the swinging frames to accommodate sheets of varying widths.

Below the conveyor and its cantilever supporting members on each frame, there is pro-

vided stack side straightening means, which may be in the form of a longitudinally extending plate.

A roller conveyor is located between the swinging frames, and successive sheets are received and dropped between the swinging frames to build up a stack on the roller conveyor as hereinafter set forth in greater detail.

By way of example, an embodiment of the improved apparatus hereof is illustrated in the accompanying drawings forming part hereof, in which:

Figure 1 is a top plan view of one embodiment of the improved apparatus hereof in the form of a unitary steel sheet stacking machine with the parts in their relative positions for receiving and conveying a sheet to the location where it is dropped to build up the stack;

Fig. 2, a side elevation view thereof looking in the directions of the arrows 2—2, Fig. 1, with portions broken away and shown in section, and showing a partially built up stack of sheets;

Fig. 3, an end elevation view thereof looking in the direction of the arrows 3—3, Fig. 2, with portions broken away and shown in section; and

Fig. 4, an enlarged fragmentary view with portions in section similar to Fig. 3, but showing certain parts in full lines in their sheet dropping positions, and in dot-dash lines in their sheet receiving and conveying positions.

Similar numerals refer to similar parts throughout the several views.

The illustrated embodiment of the improved apparatus hereof is a unitary steel sheet stacking machine indicated generally by 10, and includes two laterally spaced and longitudinally extending power operated swinging frames or members, indicated generally by 11a and 11b respectively, which pivot about parallel and horizontal lower longitudinally extending axes 12a and 12b respectively on opposite sides of the vertical longitudinal center plane of the machine indicated by the dot-dash line 13.

The swinging frames 11a and 11b have a clear space laterally between each other, are of any desired length, and in combination with associated parts are adapted to receive and drop into the clear space between each other steel sheets 14 of any desired length.

The swinging frames 11a and 11b have operatively mounted above their pivoting axes 12a and 12b respectively, sheet edge conveying and supporting means indicated generally by 15a and 15b respectively, and which as shown include power driven endless chain belt conveyors 16a and 16b respectively, which operate on cantilever supporting members 17a and 17b respectively extending towards each other from the inner opposite sides of the swinging frames 11a and 11b.

The pivotal mountings of the swinging frames 11a and 11b are as shown respectively upon separate laterally spaced longitudinally extending carriages indicated generally by 18a and 18b, and which include respectively cantilever supporting and pivoting arms 19a and 19b which extend towards each other from the opposite inner sides of the carriages 18a and 18b and which are pivotally connected as by pins 21a and 21b between the lower ends of pairs of vertical angle members 22a and 22b of the frames 11a and 11b respectively.

The unitary sheet stacking machine 10 has a base indicated generally by 23 which as shown includes laterally spaced longitudinally extending channel members 24a and 24b parallel and

symmetrically spaced on opposite sides of the center plane 13. From the outer sides of the channels 24a and 24b pairs of longitudinally spaced rail members 25a and 25b extend laterally and at right angles to the center plane 13.

At each end of the carriage 18a there is operatively mounted as shown a set of wheels 26a, and similarly at each end of the carriage 18b there is operatively mounted as shown a set of wheels 26b, and the wheels 26a roll on the rail members 25a and the wheels 26b roll on the rail members 25b.

To accommodate sheets of varying widths in the sheet stacking machine 10, lateral positioning means are provided for varying the lateral spacings of the carriages 18a and 18b and thus of the swinging frames 11a and 11b pivoted on the carriages. As shown the lateral positioning means includes longitudinally spaced shafts 27 extending laterally through apertures formed in the channel members 24a and 24b, each shaft being journaled in a double thrust bearing 28 mounted on the channel member 24b. Oppositely inclined threaded portions 29a and 29b are formed on each shaft 27 on the outside of the channel members 24a and 24b, respectively, and the threaded shaft portions 29a and 29b extend below the carriages 18a and 18b respectively.

A suitably threaded thrust nut 30a is screwed on each shaft portion 29a, and each nut 30a is secured to the lower end of a bracket 31a the upper end of which is secured to the carriage 18a as shown adjacent one of the sets of wheels 26a. Similarly, a suitably threaded thrust nut 30b is screwed on each shaft portion 29b, and each nut 30b is secured to the lower end of a bracket 31b, the upper end of which is secured to the carriage 18b.

As shown the base 23 includes bearing channel members 32a and 32b extending respectively between the outer ends of the rail members 25a and the outer ends of the rail members 25b.

The outer end 33a of each shaft 27 extends through registering apertures in the bearing channel member 32a and in a bearing block 34a secured thereto and in which the shaft end 33a is journaled. Similarly the outer end 33b of each shaft 27 extends through registering apertures in the bearing channel member 32b and in a bearing block 34b secured thereto and in which the shaft end 33b is journaled.

For simultaneously turning the shafts 27, a drive shaft 35 extends longitudinally along the outside of the channel member 32a and is journal mounted thereon as by longitudinally spaced bearing brackets 36. Each end 33a of each shaft 27 is operatively connected with the drive shaft 35 as by a bevel gear set indicated generally by 37. As shown a hand wheel 38 is operatively mounted on a suitable bracket and is provided with a chain and gear connection with the drive shaft 35, whereby manual turning of the hand wheel 38 serves to turn the drive shaft 35. The shaft 35 may also be turned by any desired power means not shown.

The power operations of the swinging frames 11a and 11b as shown are effected by electric motor driven mechanical means indicated generally by 39a and 39b and operatively interposed respectively, between the swinging frame 11a and the carriage 18a, and between the swinging frame 11b and the carriage 18b.

The electric motor driven mechanical frame swinging means 39a and 39b as shown each in-

cludes a set of longitudinally spaced bearing bracket plates 40 on its respective carriage 18a or 18b. Each bearing bracket plate 40 is apertured to register with the bore of a bearing block 41 mounted thereon. A drive and crank shaft 42 extends through the registering apertures of each set of the bearing bracket plates 40 and the journalling bores of the bearing blocks 41. Each shaft 42 is parallel with the pivoting axes 12a and 12b, and on its ends beyond its bearing bracket plates 40 there are secured equal throw cranks 43 having axially aligned crank pins 44.

Each crank pin 44 is pivotally connected with one end of a connecting rod 45, the other end of which is pivotally connected between one of the pairs of vertical angle members 22a or 22b of the adjacent swinging frame 11a or 11b as by a pivot pin 46, and the pivot pins 46 have aligned axes on each swinging frame 11a or 11b.

Each connecting rod 45, as best shown in Fig. 4, includes separate members 47 and 48 extending towards each other from the end pivotal connections, and being movable endwise with respect to each other, and having a slot and pin connection 49 with each other, and having a compression spring 50 interposed between suitable stops, one stop on each separate connecting rod member 47 and 48, whereby a positive pull and a resilient push is exerted by each connecting rod 45 on the swinging frame 11a or 11b to which it is connected.

Each frame swing means 39a and 39b, as shown, also includes an electric drive motor 51 mounted on its carriage 18a or 18b and having a driving connection with its shaft 42 as by a gear train 52.

The swinging frames 11a and 11b for certain purposes of the present improvements include stack side straightening means below their conveyors 16a and 16b and cantilever conveyor supporting members 17a and 17b, and as shown the stack side straightening means are longitudinally extending side plates 53a and 53b secured respectively to the upwardly extending angle members 22a and 22b of the frames 11a and 11b.

The side plates 53a and 53b also strengthen the frames 11a and 11b and mount certain of the parts of the conveyors 16a and 16b and their drive means, as hereinafter set forth.

As shown the upper edges of the plates 53a and 53b are aligned with the upper ends of the angle members 22a and 22b respectively. Cantilever chain support plates 54a and 54b extend inwardly towards each other from the upper ends of the angle members 22a and 22b and the upper edges of the side plates 53a and 53b respectively, the chain support plates 54a and 54b being below the cantilever supporting members 17a and 17b respectively.

Each endless chain belt conveyor 16a and 16b includes an endless chain belt 55 operating around a belt drive sprocket wheel 56 mounted at one end of its frame 11a or 11b and about a belt tightening sprocket wheel 57 operatively mounted at the other end of its frame 11a or 11b.

The upper portion 55-1 of each chain extends over all its upper cantilever supporting members 17a or 17b, and as shown there is interposed between each set of cantilever supporting members 17a and 17b and the upper chain portion 55-1 supported thereby an upwardly opening chain guide channel 58.

The lower portion 55-2 of each chain extends over its lower cantilever chain support plate 54a or 54b, and as shown there is inter-

posed between each chain support plate 54a and 54b and the lower chain portion 55-2 supported thereby an upwardly opening chain guide channel 59.

As shown each chain belt drive sprocket wheel 56 is secured on the inner end of a cantilever shaft 60 journaled in bearing blocks 61 and 62 secured on opposite sides of one end of one of the frames 11a or 11b. Each shaft 60 extends on opposite sides of its frame 11a or 11b, and the outer end of each shaft has a drive connection as by chain and sprocket means 63 with an electric drive motor 64 mounted on a bracket 65 on the outside of the plate 53a or 53b of its frame 11a or 11b.

As shown each chain belt tightening sprocket wheel 57 is journaled on a shaft 66 on the upper end of the upper arm 67 of a lever pivotally mounted intermediate its ends in bearing blocks on opposite sides of one of the plates 53a or 53b. The upper lever arm 67 is on the inside of its plate 53a or 53b and the lower lever arm 68 is on the outside thereof.

The lower end of each lower lever arm 68 is pivotally connected with one end of a rod 69, the other end of which has a compression spring interposed between an adjustable abutment 70 thereon and a fixed abutment 71 on the associated plate 53a or 53b.

The longitudinally extending channel members 24a and 24b are as shown associated with a plurality of transversely extending rollers 72 to provide a roller conveyor upon which the sheets 14 may be dropped to build up a stack.

The several electric motors 51 and 64 are connected with suitable sources of electric power through well known control means which may be manually or automatically operated as may be desired and which are not shown.

As shown, the frames 11a and 11b include longitudinally extending guide and mounting plates 73a and 73b which are located respectively on top of the chain support plates 54a and 54b. The cantilever supporting members 17a and 17b as shown are mounted on the plates 73a and 73b respectively, and each plate 73a and 73b mounts one set of the bearing blocks 61 and 62 and the cantilever shaft 60 journaled therein.

At the sheet entrance end 74 of the machine 10, the guide and mounting plates 73a and 73b have oppositely and outwardly flaring end portions 75a and 75b respectively.

In the operation of the improved sheet stacking machine 10, its sheet entrance end 74 is located for example adjacent the discharge side of a roll stand not shown. There may be a considerable distance between the entrance end 74 of the sheet stacking machine 10 and the roll stand or other apparatus from which sheets are delivered to the sheet stacking machine 10, and conveyors not shown may be utilized to deliver sheets 14 to the stacking machine 10.

In any event, each sheet 14 as it approaches the sheet stacking machine 10, has a lengthwise velocity which is substantial in order to attain a satisfactory rate of production for the plant as a whole where the stacking machine 10 is being used.

The endless chain belt conveyors 16a and 16b are run at the same speed as or somewhat faster than the lengthwise velocities of the sheets 14 approaching the stacking machine 10.

Accordingly, the advancing end of each sheet 14 enters between the flaring end portions 75a and 75b of the guide plates 73a and 73b, and

moves onto the upper moving portions 55—1 of the conveyors 16a and 16b, and regardless of the length of the sheet 14, it is moved and supported at its edges by the conveyors 16a and 16b throughout its entire length until it has reached the position between the swinging frames 11a and 11b where it is to be dropped.

The frames 11a and 11b are then moved away from each other by swinging on their axes 12a and 12b respectively as shown in Fig. 4, and the sheet 14 drops into the clear space between the frames 11a and 11b onto the conveyor rollers 72 or other sheets thereon to build up a pack.

The frames 11a and 11b are then swung back to their positions shown in Figs. 1, 2, and 3, ready to receive, convey, and drop another sheet, and the side plates 53a and 53b abut against the edges of the sheets in the pack and thus straighten the sides of the pack.

After the pack built up on the conveyor rollers 72 is of a desired size it is removed in the usual manner.

By providing the conveyor 16a on the frame 11a with a separate drive motor 64 on the frame 11a and independent of the drive motor 51 for the swing means 39a for the frame 11a, and also by providing the conveyor 16b on the frame 11b with another separate drive motor 64 on the frame 11b and independent of the other drive motor 51 for the swing means 39b for the frame 11b, it is made certain that the belts 55 of the conveyors 16a and 16b continuously run at the same speed as or somewhat faster than the lengthwise velocities of the sheets 14 approaching the stacking machine, and that the independent motors 51 for the swing means 39a and 39b will operate the swing means 39a and 39b to swing the frames 11a and 11b and the conveyors and other means and parts carried thereon without in any way changing the speed of the conveyor belts 55. Consequently, the sheets 14 may be caught, conveyed, and stacked by the stacking machine 10, as fast as they are delivered to the machine.

The embodiments of the present improvements illustrated and described herein are by way of example, and the scope of the present invention is not limited to the same or to the particular details thereof, but is commensurate with any and all novel subject matter contained herein which may at any time properly under the patent laws be set forth in the claims hereof or originating herein, and the elements of any such claims are intended to include their functional or structural equivalents.

We claim:

1. In stacking apparatus for metal sheets and the like, two longitudinally extending endless belt conveyors having a clear space laterally therebetween, the conveyors being adapted in a first position to receive and convey and support the entire length of opposite edges of a sheet moved onto the conveyors, two motor drive means, each motor drive means being drive connected with one of the conveyors, and means for moving the motor drive means and the conveyors laterally away from and back to the first position for dropping a conveyed sheet into the clear space between the conveyors.

2. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space laterally therebetween, an endless belt conveyor on each frame for receiving and conveying and supporting the entire length of opposite sides of a sheet introduced be-

tween the frames above the clear space, a motor drive means on each frame drive connected with the conveyor thereon, and means for moving the frames and the conveyors and motor drive means thereon laterally away from and towards each other.

3. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space laterally therebetween, an endless belt conveyor on each frame for receiving and conveying and supporting the entire length of opposite sides of a sheet introduced between the frames above the clear space, a motor drive means on each frame drive connected with the conveyor thereon, and means operatively mounting the frames and the conveyors and motor drive means thereon for swinging about longitudinally extending laterally spaced pivoting axes.

4. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space laterally therebetween, cantilever members on each frame extending laterally towards the cantilever members of the other frame, an endless belt conveyor operatively mounted on the cantilever members of each frame, the endless belt conveyors being adapted to receive and convey and support the entire length of a sheet introduced between the frames above the clear space, a motor drive means on each frame drive connected with the conveyor thereon, and means for moving the frames and the conveyors and motor drive means thereon laterally away from and towards each other.

5. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space laterally therebetween, cantilever members on each frame extending laterally towards the cantilever members of the other frame, an endless belt conveyor operatively mounted on the cantilever members of each frame, the endless belt conveyors being adapted to receive and convey and support the entire length of a sheet introduced between the frames above the clear space, a motor drive means on each frame drive connected with the conveyor thereon, and means operatively mounting the frames and the conveyors and motor drive means thereon for swinging about longitudinally extending laterally spaced pivoting axes.

6. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space laterally therebetween, means including a driven endless belt conveyor on each frame for receiving and conveying and supporting the entire length of opposite sides of a sheet introduced between the frames above the clear space, means securing each conveyor against lateral movement with respect to the frame, and means for moving the frames laterally away from and towards each other, and stack side straightening means on the inner side of each frame and movable therewith.

7. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space laterally therebetween, means including a driven endless belt conveyor on each frame for receiving and conveying and supporting the entire length of opposite sides of a sheet introduced between the frames above the clear space, and means operatively mounting the frames for swinging about longitudinally extending laterally spaced pivoting axes, and stack side straightening means on the inner side of each frame.

8. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space laterally therebetween, means including a driven endless belt conveyor on each frame for receiving and conveying and supporting the entire length of opposite sides of a sheet introduced between the frames above the clear space, means securing each conveyor against lateral movement with respect to its frame, and means for moving the frames laterally away from and towards each other, and a longitudinally extending stack side straightening plate on the inner side of each frame and movable therewith.

9. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space laterally therebetween, means including a driven endless belt conveyor on each frame for receiving and conveying and supporting the entire length of opposite sides of a sheet introduced between the frames above the clear space, and means operatively mounting the frames for swinging about longitudinally extending laterally spaced pivoting axes, and a longitudinally extending stack side straightening plate on the inner side of each frame.

10. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space laterally therebetween, an endless belt conveyor on each frame for receiving and conveying and supporting the entire length of opposite sides of a sheet introduced between the frames above the clear space, belt tightening means on each frame operatively associated with the conveyor thereon, a motor drive means on each frame drive connected with the conveyor thereon, and means for moving the frames and the conveyors and other means thereon laterally away from and towards each other.

11. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space laterally therebetween, an endless belt driven conveyor on each frame for receiving and conveying and supporting the entire length of opposite sides of a sheet introduced between the frames above the clear space, each conveyor including a belt drive wheel and a belt tightening wheel and an endless belt operating around the wheels, first bearing means secured on the frame and journalling the belt drive wheel and second bearing means movable with respect to the frame and journalling the belt tightening wheel and yielding means mounting the second bearing means on the frame and urging the second bearing means and belt tightening wheel away from the belt drive wheel, and means for moving the frames and the conveyors thereon away from and towards each other.

12. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space laterally therebetween, an endless belt driven conveyor on each frame for receiving and conveying and supporting the entire length of opposite sides of a sheet introduced between the frames above the clear space, each conveyor including a belt drive wheel and a belt tightening wheel and an endless belt operating around the wheels, first bearing means secured on the frame and journalling the belt drive wheel and second bearing means movable with respect to the frame and journalling the belt tightening wheel and means mounting the second bearing means on the frame and applying a force on the second bearing means and belt tightening wheel directed away from the belt drive wheel, and

means for moving the frames and the conveyors thereon away from and towards each other.

13. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space extending laterally therebetween, each frame including a longitudinally extending plate having an inner stack side straightening face and upper and lower edge faces, an endless belt conveyor on each frame including an endless belt adjacent the upper edge face and spaced inwardly from the inner side face of the plate, means securing each conveyor against lateral movement with respect to its frame, and means for moving the frames with their plates and the conveyors thereon laterally away from and towards each other.

14. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space extending laterally therebetween, each frame including a longitudinally extending plate having an inner stack side straightening face and upper and lower edge faces, an endless belt conveyor on each frame including an endless belt adjacent the upper edge face and spaced inwardly from the inner side face of the plate, and means operatively mounting the frames with their plates and the conveyors thereon for swinging about longitudinally extending laterally spaced pivoting axes adjacent the lower edge faces of the plates.

15. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space extending laterally therebetween, each frame including a longitudinally extending plate having an inner stack side straightening face and upper and lower edge faces, conveyor means on each frame adjacent the upper edge face and spaced inwardly from the inner side face of the plate, means securing each conveyor against lateral movement with respect to its frame, and means for moving the frames with their plates and the conveyors thereon laterally away from and towards each other.

16. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space extending laterally therebetween, each frame including a longitudinally extending plate having an inner stack side straightening face and upper and lower edge faces, conveyor means on each frame adjacent the upper edge face and spaced inwardly from the inner side face of the plate, and means operatively mounting the frames with their plates and the conveyors thereon for swinging about longitudinally extending laterally spaced pivoting axes adjacent the lower edge faces of the plates.

17. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space extending laterally therebetween, each frame including upper and lower and inner and outer sides and the inner sides of the frames being opposite each other on opposite sides of the clear space, an endless belt conveyor on each frame including an endless belt adjacent the upper side and spaced inwardly from the inner side of the frame, and drive means for the conveyor on each frame including a motor on the outer side of the frame, stack side straightening means on the inner side of each frame below the conveyor belt, and means for moving the frames and the conveyors and other means thereon laterally away from and towards each other.

18. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space extending laterally therebe-

tween, each frame including upper and lower and inner and outer sides and the inner sides of the frames being opposite each other on opposite sides of the clear space, an endless belt conveyor on each frame including an endless belt adjacent the upper side and spaced inwardly from the inner side of the frame, and drive means for the conveyor on each frame including a motor on the outer side of the frame, stack side straightening means on the inner side of each frame below the conveyor belt, and means operatively mounting the frames and the conveyors and other means thereon for swinging about longitudinally extending laterally spaced pivoting axes adjacent the lower sides of the frames.

19. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space extending laterally therebetween, each frame including upper and lower and inner and outer sides and the inner sides of the frames being opposite each other on opposite sides of the clear space, conveyor means on each frame adjacent the upper side and spaced inwardly from the inner side of the frame, and drive means for the conveyor means on each frame including a motor on the outer side of the frame, stack side straightening means on the inner side of each frame below the conveyor means, and means for moving the frames and the conveyors and other means thereon laterally away from the towards each other.

20. In stacking apparatus for metal sheets and the like, two longitudinally extending frames having a clear space extending laterally therebetween, each frame including upper and lower and inner and outer sides and the inner sides of the frames being opposite each other on opposite sides of the clear space, conveyor means on each frame adjacent the upper side and spaced inwardly from the inner side of the frame, and drive means for the conveyor means on each frame including a motor on the outer side of the frame, stack side straightening means on the inner side of each frame below the conveyor means, and means operatively mounting the frames and the conveyor means and other means thereon for swinging about longitudinally extending laterally spaced pivoting axes adjacent the lower sides of the frames.

21. In stacking apparatus for metal sheets and the like, two laterally spaced carriages having a clear space therebetween, two longitudinally extending frames, means mounting each frame on one of the carriages for movement with respect to the carriage and towards and away from

the other frame, an endless belt conveyor on each frame for receiving and conveying and supporting the entire length of one of the opposite sides of a sheet introduced between the frames above the clear space, one drive means operatively interposed between each frame and its carriage for moving the frame towards and away from the other frame, and a second drive means operatively mounted on each frame and drive connected with the conveyor thereon.

22. In stacking apparatus for metal sheets and the like, two laterally spaced carriages having a clear space therebetween, two longitudinally extending frames, means mounting each frame on one of the carriages for swinging on the carriage towards and away from the other frame about a longitudinally extending axis, an endless belt conveyor on each frame for receiving and conveying and supporting the entire length of one of the opposite sides of a sheet introduced between the frames above the clear space, one drive means operatively interposed between each frame and its carriage for swinging the frame towards and away from the other frame, and a second drive means operatively mounted on each frame and drive connected with the conveyor thereon.

23. In stacking apparatus for metal sheets and the like, two laterally spaced carriages having a clear space therebetween, two longitudinally extending frames, means mounting each frame on one of the carriages for movement with respect to the carriage and towards and away from the other frame, conveyor means on each frame, one drive means operatively interposed between each frame and its carriage for moving the frame towards and away from the other frame, and a second drive means operatively mounted on each frame and drive connected with the conveyor means thereon.

24. In stacking apparatus for metal sheets and the like, two laterally spaced carriages having a clear space therebetween, two longitudinally extending frames, means mounting each frame for swinging on one of the carriages and towards and away from the other frame about a longitudinally extending axis, conveyor means on each frame, one drive means operatively interposed between each frame and its carriage for swinging the frame towards and away from the other frame, and a second drive means operatively mounted on each frame and drive connected with the conveyor means thereon.

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