Nov. 10, 1953 E. A. MATTESON 2,658,752

SHEET HANDLING APPARATUS

Original Filed March 10, 1947 9 Sheets-Sheet 1

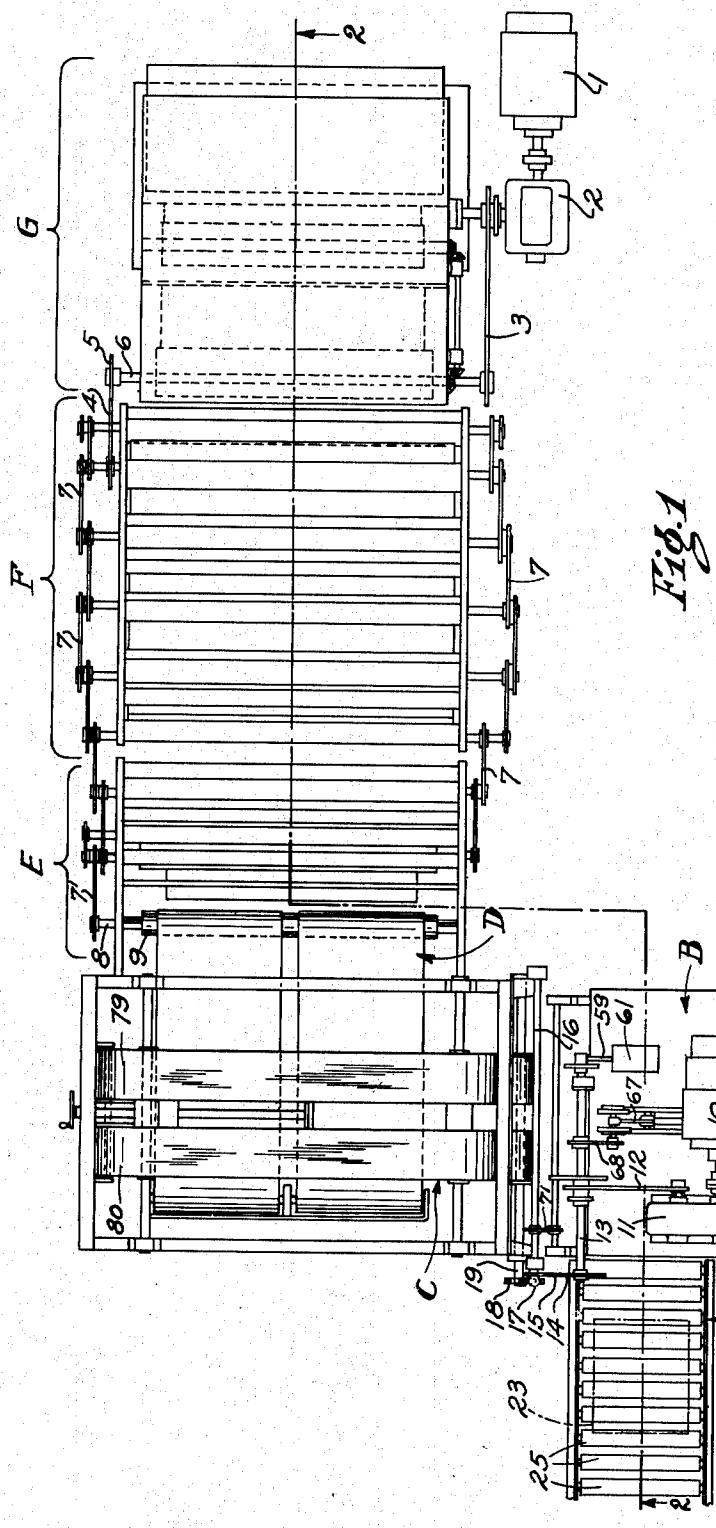


Fig. 1

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SHEET HANDLING APPARATUS

Original Filed March 10, 1947 9 Sheets-Sheet 2

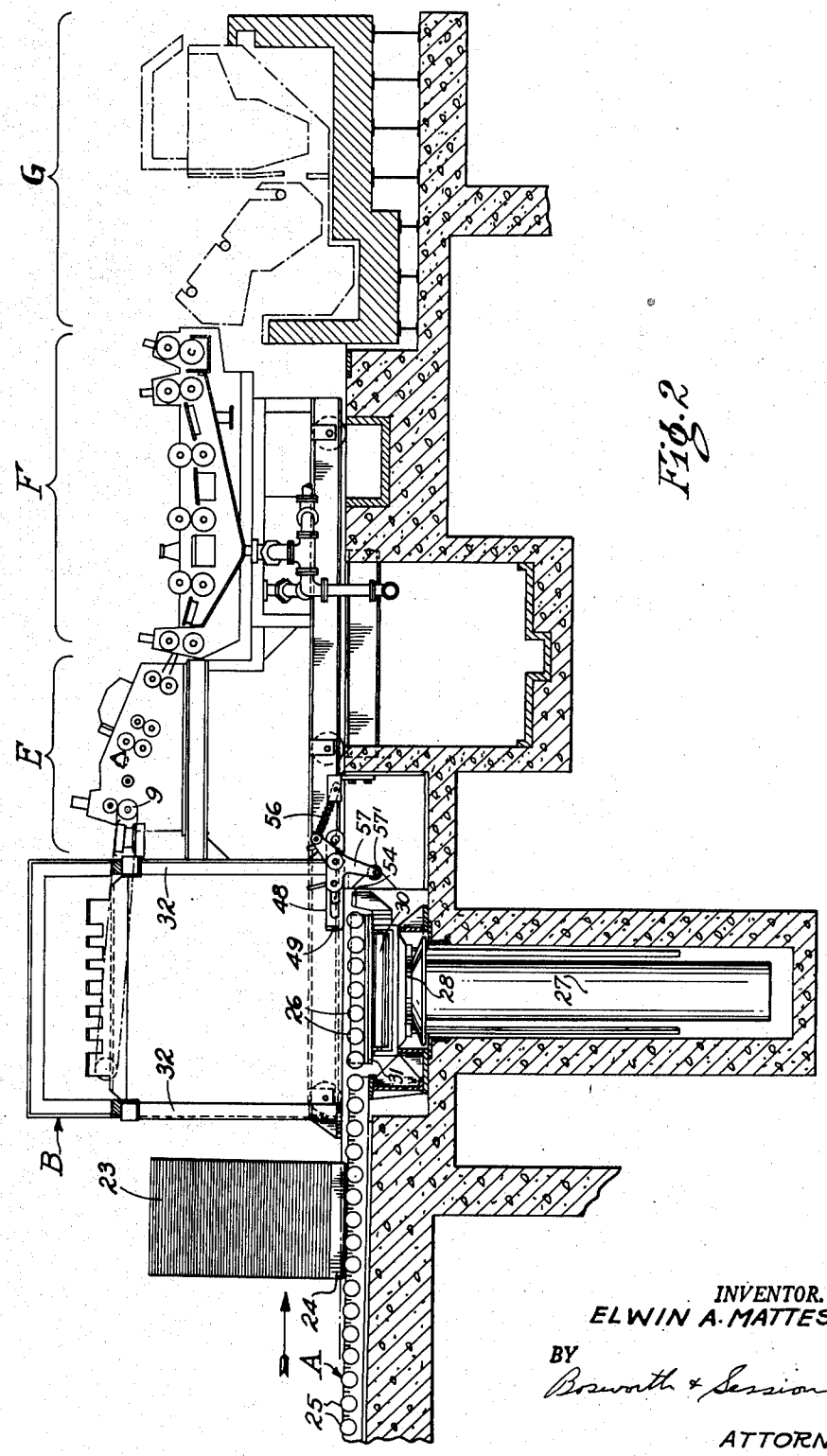


Fig. 2

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SHEET HANDLING APPARATUS

Original Filed March 10, 1947 9 Sheets-Sheet 3

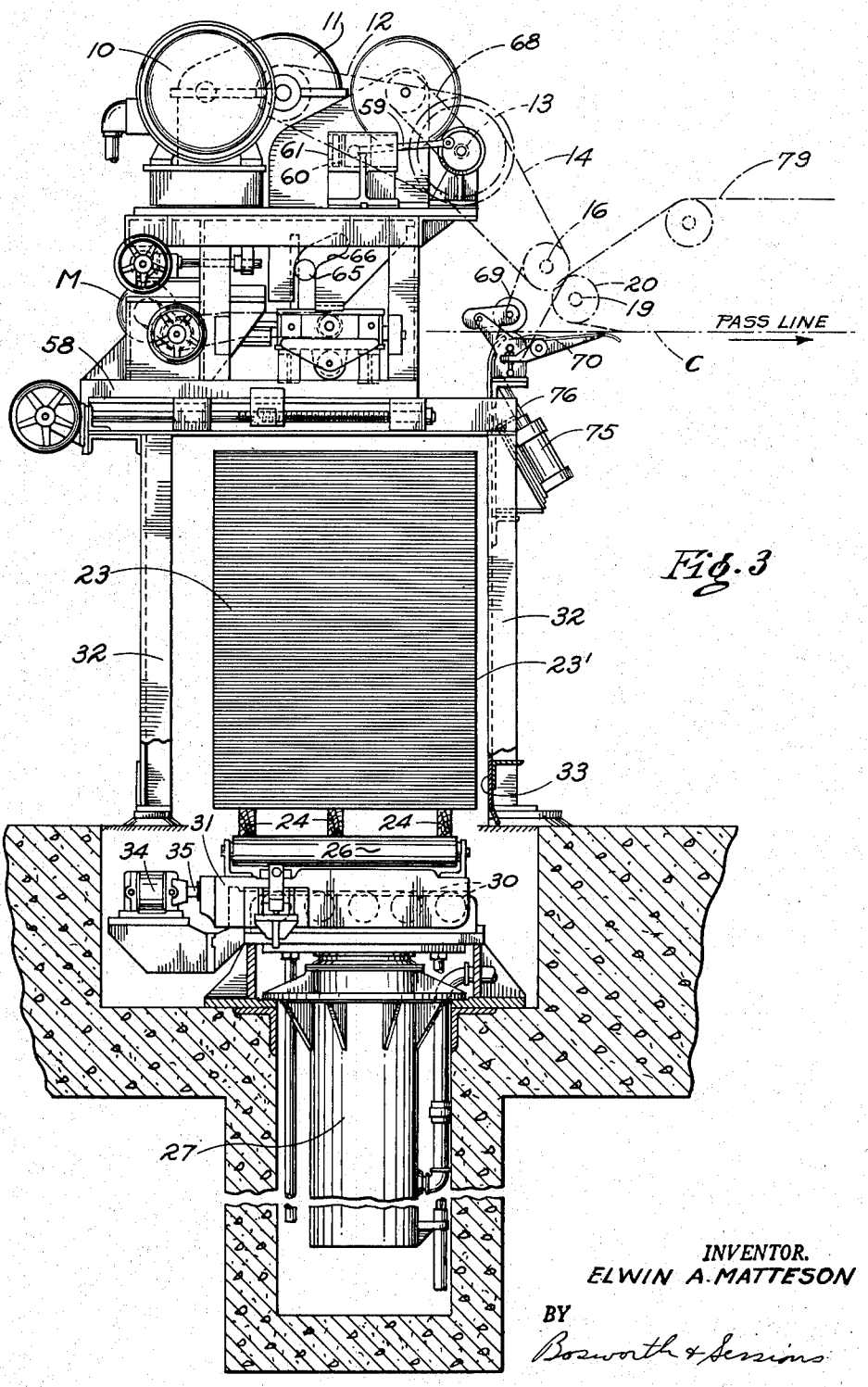


Fig. 3

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SHEET HANDLING APPARATUS

Original Filed March 10, 1947 9 Sheets-Sheet 4

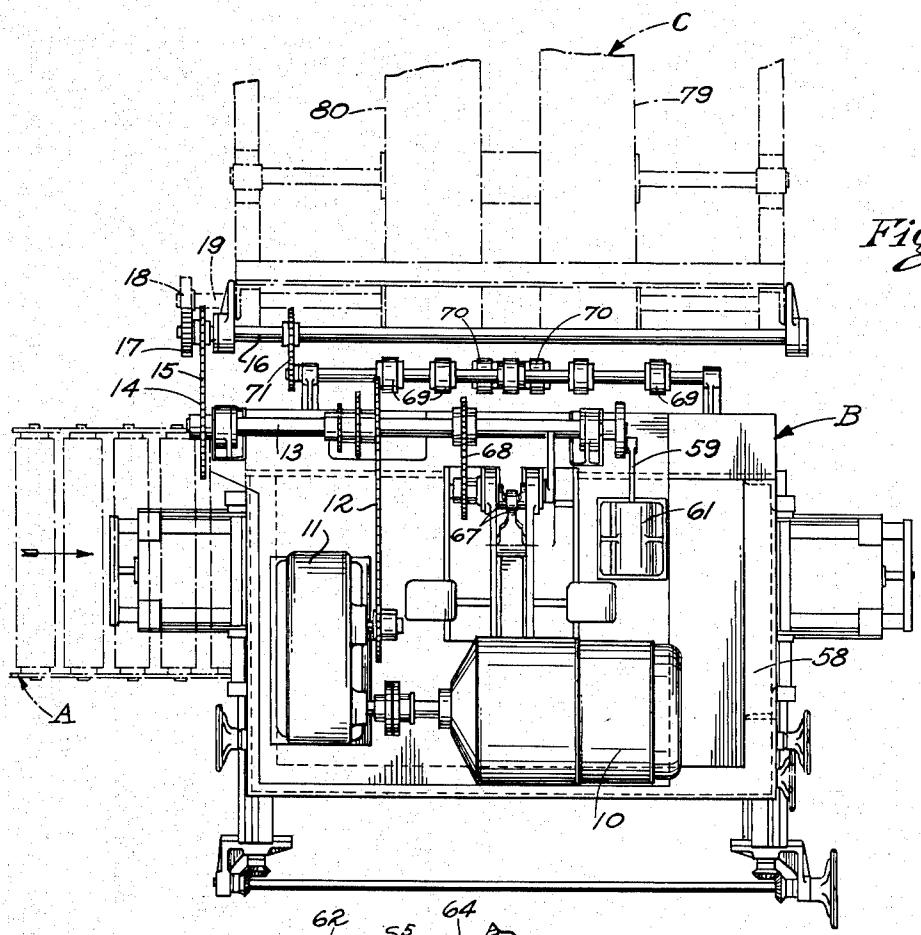


Fig. 4

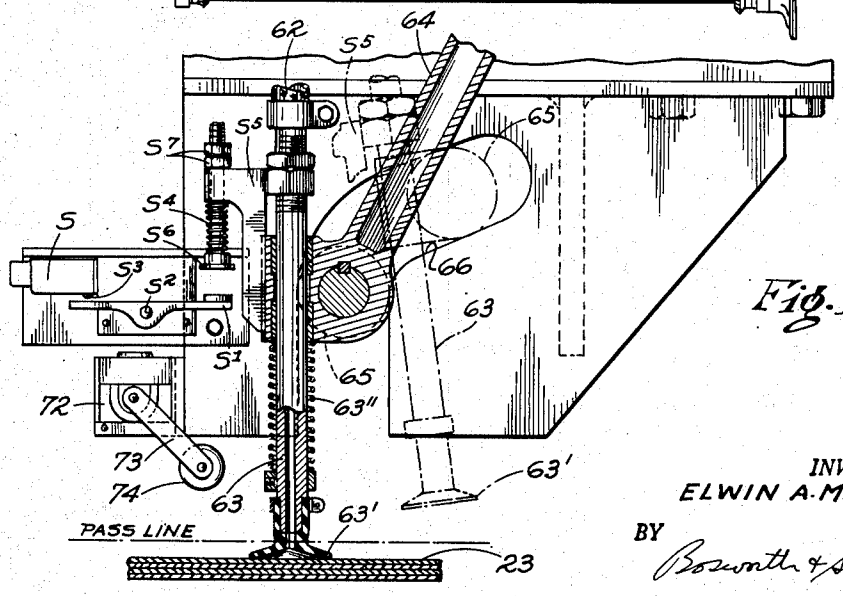


Fig. 12

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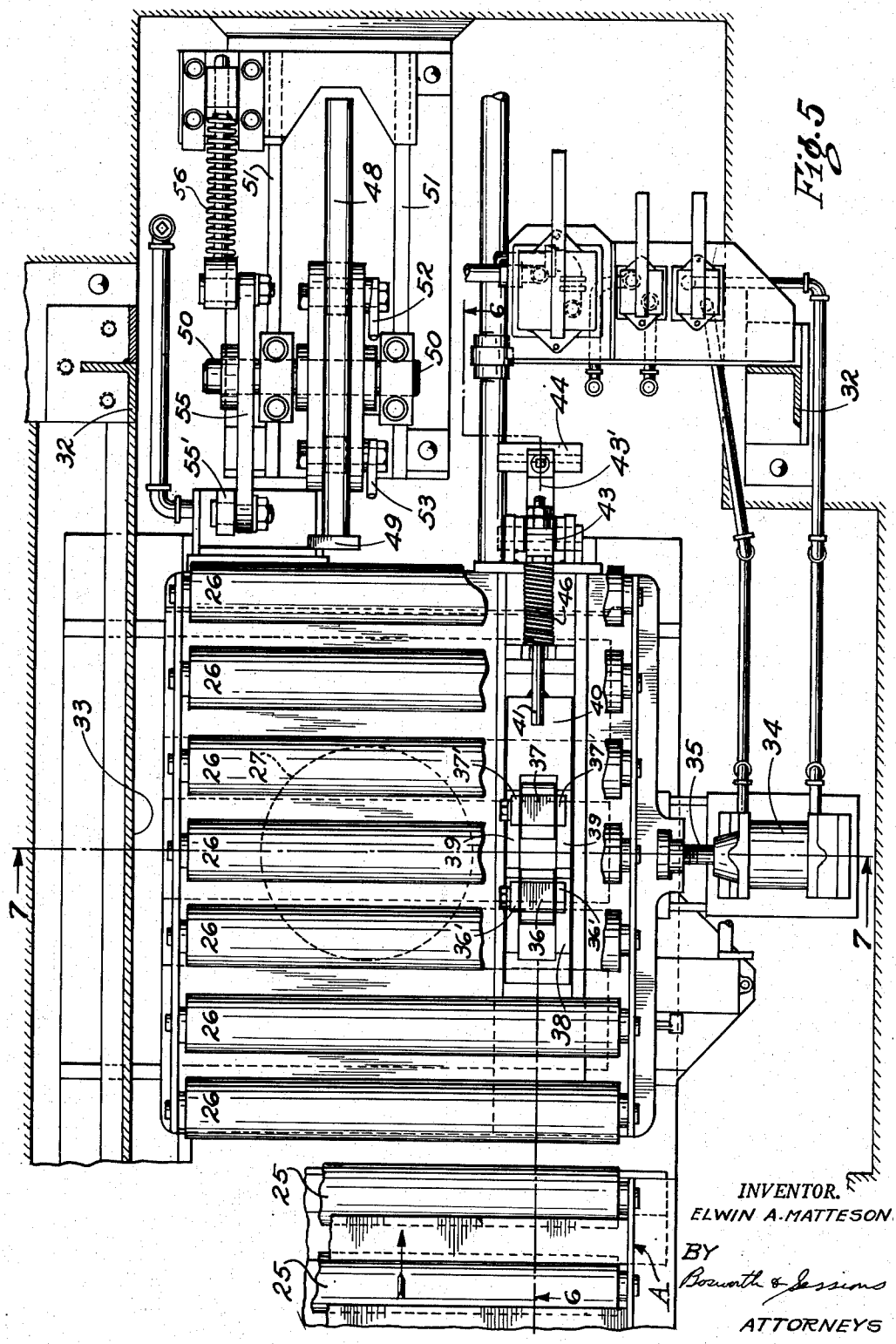
BY Bosworth & Sessions

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SHEET HANDLING APPARATUS

Original Filed March 10, 1947 9 Sheets-Sheet 5



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SHEET HANDLING APPARATUS

Original Filed March 10, 1947 9 Sheets-Sheet 6

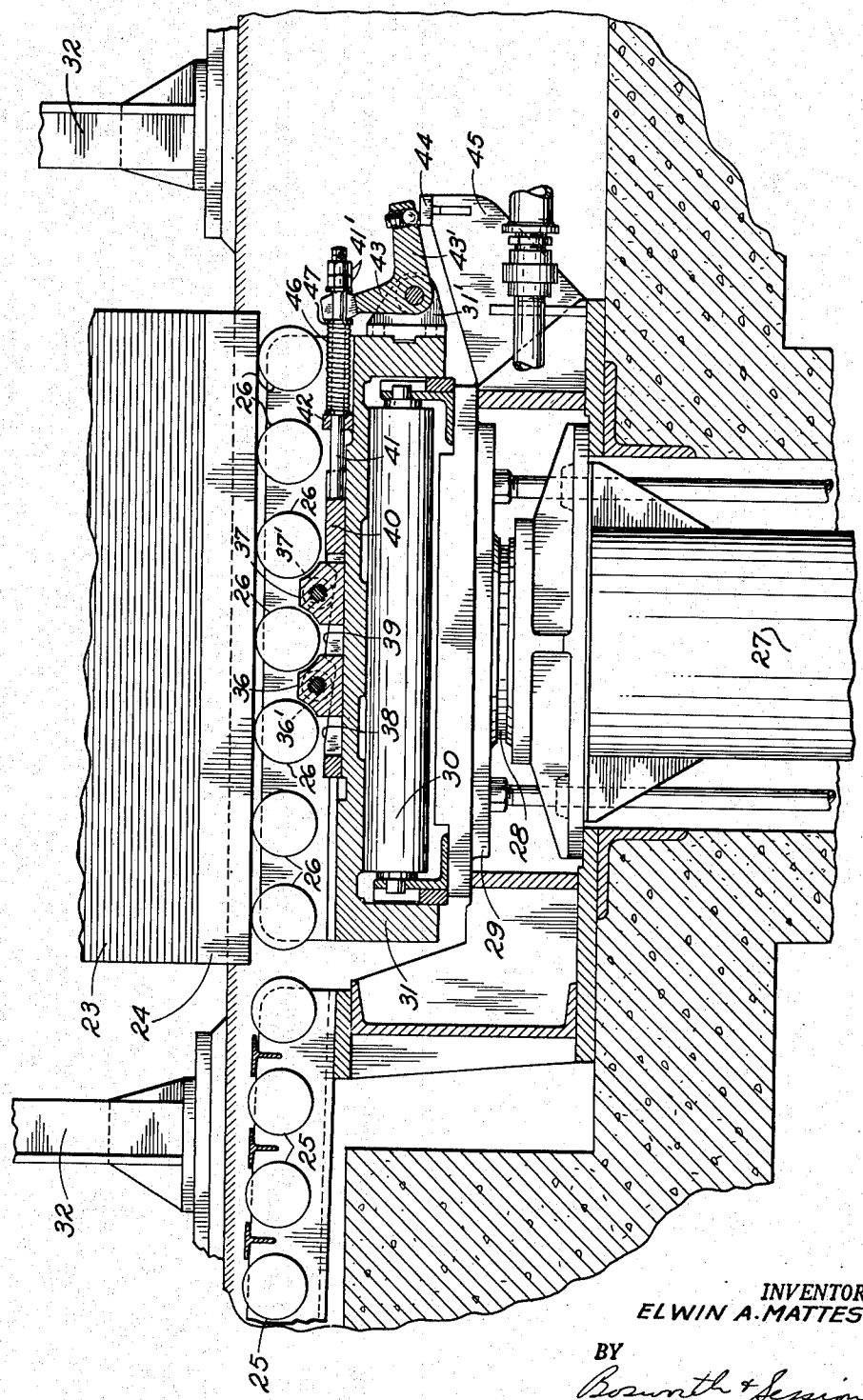


Fig. 6

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SHEET HANDLING APPARATUS

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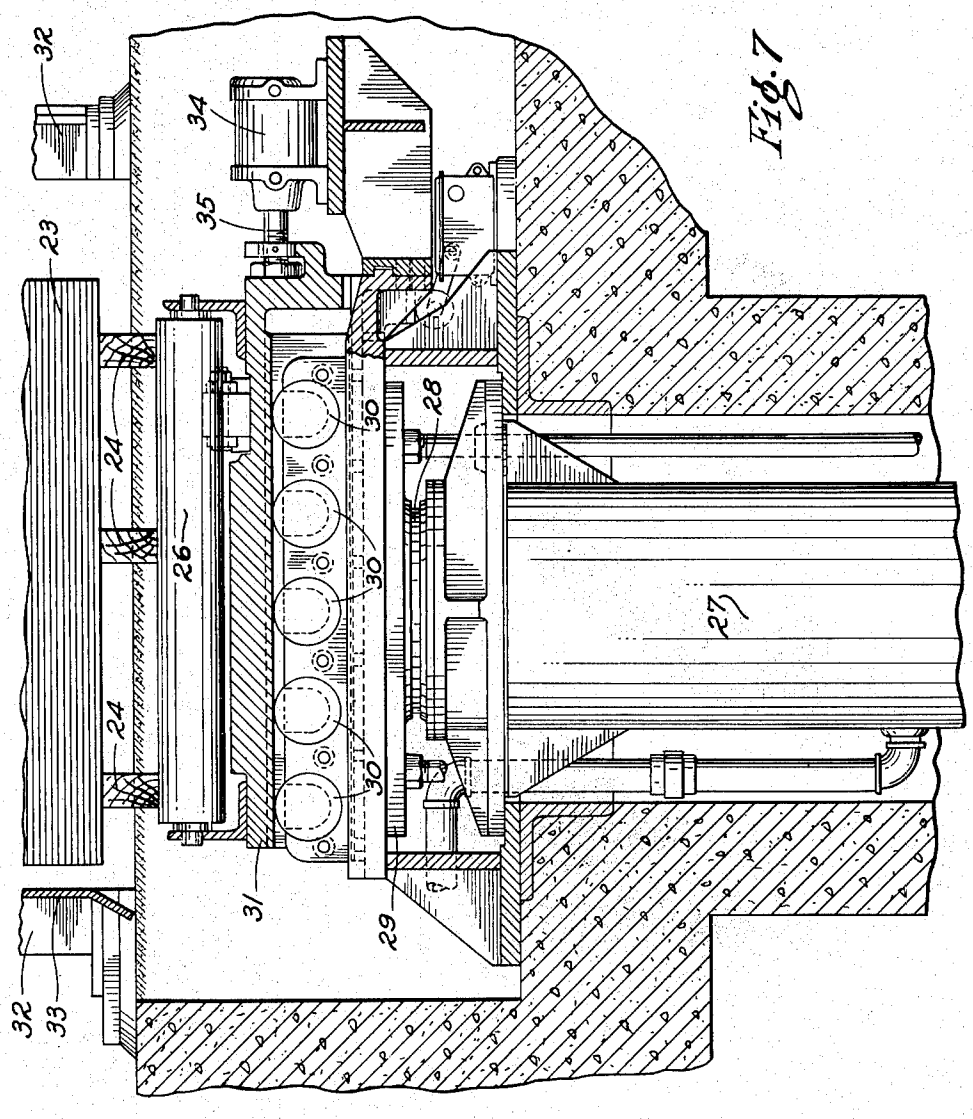


Fig. 7

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SHEET HANDLING APPARATUS

Original Filed March 10, 1947 9 Sheets-Sheet 8

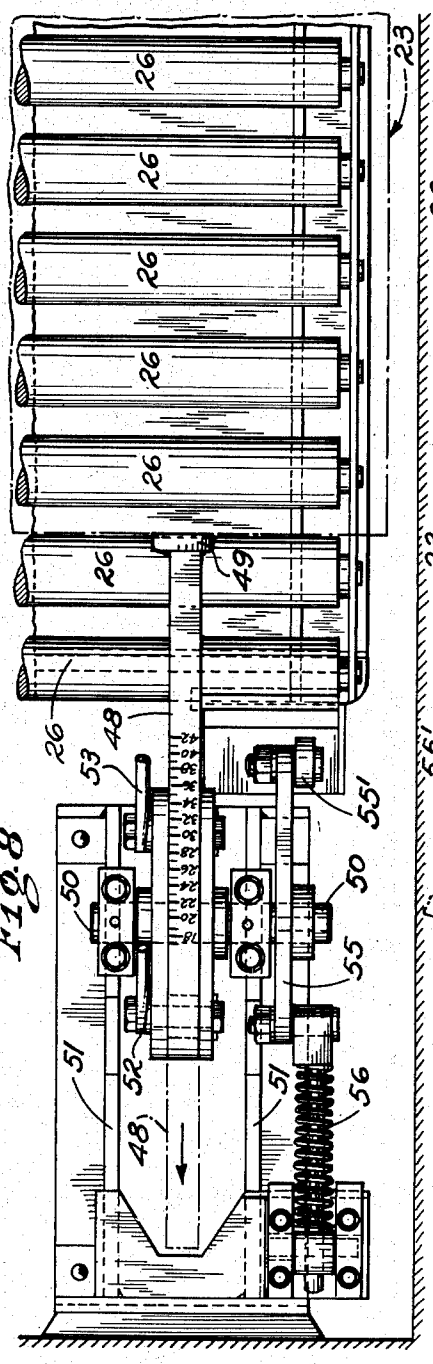


Fig. 8

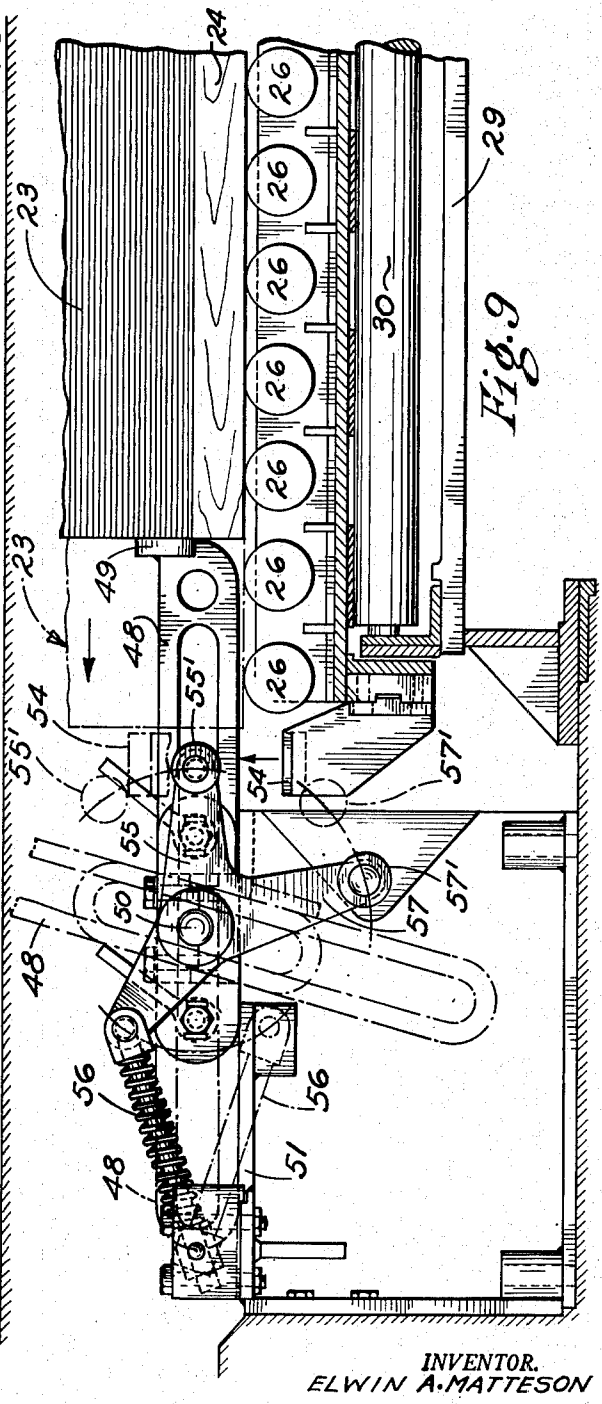


Fig. 9

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SHEET HANDLING APPARATUS

Original Filed March 10, 1947 9 Sheets-Sheet 9

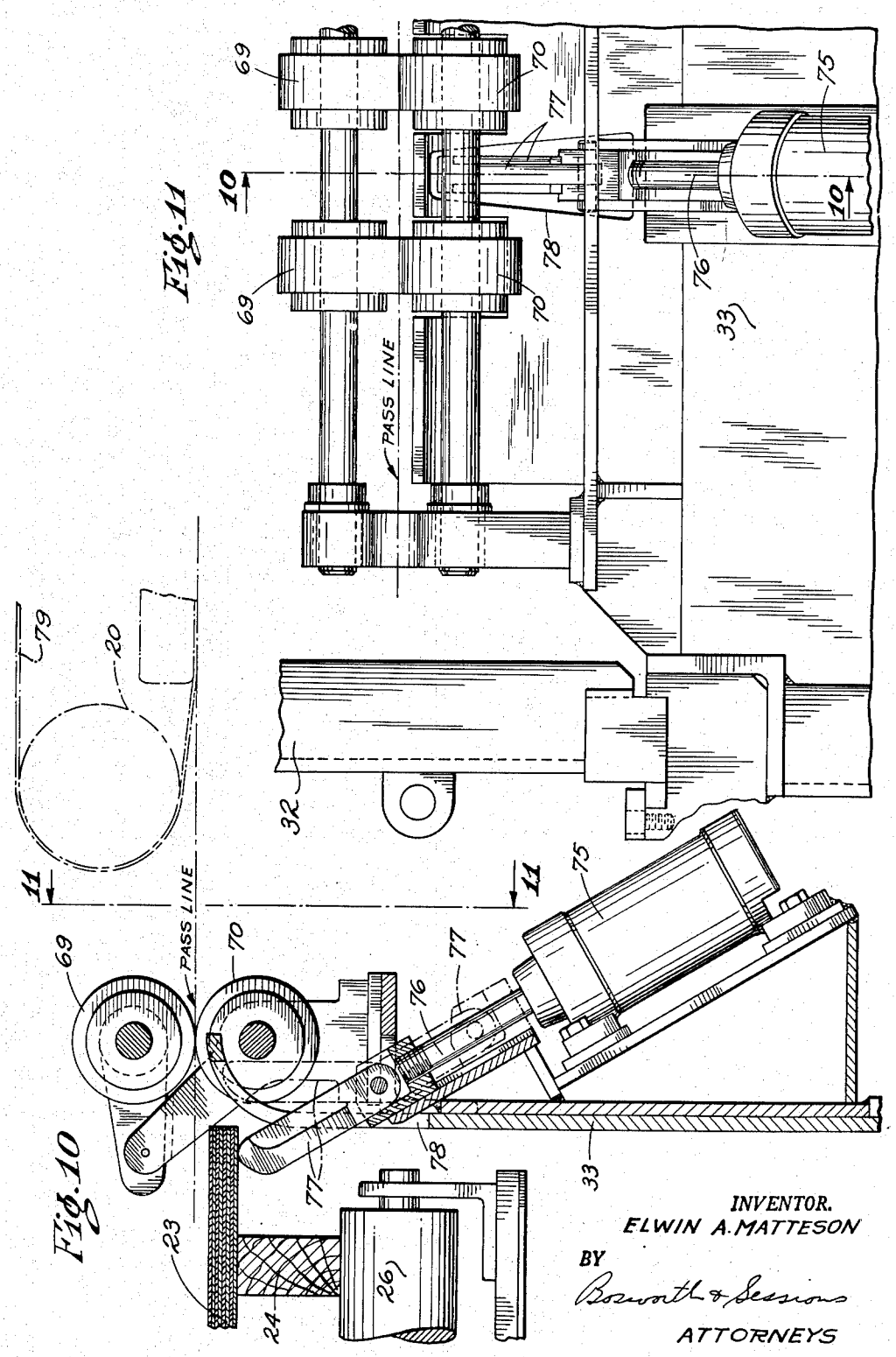


Fig. 11

Fig. 10

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Patented Nov. 10, 1953

2,658,752

UNITED STATES PATENT OFFICE

2,658,752

SHEET HANDLING APPARATUS

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Original application March 10, 1947, Serial No. 733,475. Divided and this application March 22, 1951, Serial No. 217,017

9 Claims. (Cl. 271—62)

1

This invention relates to sheet handling apparatus and more particularly to certain improvements in mechanisms for handling sheets of steel or the like while being fed to a tin plate or galvanizing line. My apparatus may also, as will be evident to those skilled in the art, be adapted for other sheet handling applications where it is desired to remove sheets one at a time from a single pack, arrange them in a column, and convey the sheets in column arrangement to a further processing operation.

In present day tin plate lines, as employed in the production of tin coated steel sheets, it is customary to pass the sheets continuously through a pickling machine and then into and through the tin pot. In apparatus used prior to my invention for carrying out these operations the sheets have been brought to the head of the line in piles or packs. Mechanisms have been provided for taking the sheets therefrom one at a time and conveying them through the pickling machine and tin pot. Such arrangements require that the pack from which the sheets are fed not be permitted to become exhausted, as it is undesirable to permit gaps or blank spaces to occur as the sheets are fed through the tin pot.

Objects of my invention include the provision, in sheet handling apparatus of the type described, of apparatus which is readily adjustable to accommodate packs of sheets of varying sizes; the provision of sheet handling apparatus for tin plate lines or the like which positively and effectively transfers sheets from a pack; the provision of an improved elevator mechanism for handling a pack of sheets whereby the top of the pack will automatically be maintained in proper position relative to means for removing the sheets one at a time from the top of the pack; and, in general, the provision of an efficient, rugged, sheet handling apparatus which may be operated continuously without interruption even while fresh packs of sheets are being placed in feeding position.

The above and other objects of my invention will appear from the following description of one embodiment thereof, reference being had to the accompanying drawings in which my sheet handling apparatus is illustrated as incorporated in a tin plate line and in which:

Figure 1 is a plan view of a tin plate line incorporating my improved sheet handling apparatus.

Figure 2 is a vertical cross sectional view, drawn to the same scale as Figure 1, and taken substantially on line 2—2 of Figure 1.

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Figure 3 is an enlarged side elevation, partly in cross section, of the pack elevator and sheet feeding apparatus, the view being taken looking toward the conveyor which brings the packs of sheets to the elevator.

Figure 4 is a plan view of the apparatus shown in Figure 3.

Figure 5 is an enlarged plan view showing the discharge end of the incoming pack conveyor, the top of the elevator structure, the elevator brake mechanism, the adjustable pack stop, etc.

Figure 6 is a vertical cross sectional view of the apparatus shown in Figure 5, taken on line 6—6 of Figure 5, a pack being shown in position on the elevator.

Figure 7 is a vertical cross sectional view taken on line 7—7 of Figure 5.

Figure 8 is a fragmentary enlarged plan view illustrating the adjustable pack stop for positioning different size packs on the elevator.

Figure 9 is a side elevation of the apparatus shown in Figure 8.

Figure 10 is a detached side elevational view showing one of the auxiliary supporting means for maintaining the bottom part of a pack in feeding position while the elevator is being lowered and reloaded.

Figure 11 is a side elevation of the apparatus shown in Figure 10, taken substantially on line 11—11 of Figure 10.

Figure 12 is a fragmentary cross sectional detail showing one of the suction pick up heads of the sheet lifting or transfer mechanism.

In its general aspects, my invention contemplates the employment of an elevator mechanism for maintaining the top sheet of a pack of sheets in proper position to be picked up by a sheet feeding device, removed from the top of the pack and fed to a magnetic belt conveyor adapted to maintain the sheets by magnetic attraction against the under side of the lower reach of the belt. By this means the sheets are removed from a single pack and conveyed in properly spaced single file relation. A second belt conveyor, extending preferably at substantially right angles to the magnetic belt conveyor and disposed therebeneath, is adapted to receive sheets from the magnetic conveyor and move them in column arrangement to any desired apparatus for further processing the sheets.

Referring particularly to Figures 1 and 2, the general arrangement of my improved sheet handling mechanism as incorporated in a tin plate line includes the incoming pack conveyor A, the pack elevator and sheet feeding or transferring

mechanism B, the cross conveyor C for conveying the sheets removed from the top of the pack in aligned single file arrangement, and the longitudinal conveyor assembly D on which the sheets are conveyed in parallel columns into the doubles throw-out mechanism generally indicated at E. The pickling unit F and the tin pot G may be of any desired type. Those portions of the tin-plate line indicated by C, D, E, F and G are described and claimed in copending application Serial No. 733,475, filed March 10, 1947, for "Sheet Handling Apparatus," of which the present application is a division.

Before describing my improved sheet handling apparatus in detail, it may be pointed out that the driving motor 1 (Figure 1) is connected through a gear box 2 and a suitable chain and sprocket connection 3 to drive the feed rolls which convey the sheets in parallel columns through the tin pot G. The feed rolls of the pickling unit F and doubles throw-out device E are driven through a chain 4 from the sprocket 5 on the tin pot entering roll shaft 6. The various feed rolls of the pickling unit and the doubles throw-out device are connected by a series of chain and sprocket connections which are best seen in Figure 1 and are indicated as a group by reference numeral 7. Driven chain 7' establishes driving connection from the entering feed roll of the doubles throw-out mechanism E to the shaft 8 which carries the supporting and drive roll 9 of the longitudinal conveyor D.

Again referring to Figure 1, the drive motor 10 for the sheet feeding mechanism is mounted on the top of the fixed housing of the elevator B. This motor, in addition to operating the sheet feeding mechanism as will be described later, is connected through a gear box 11 and chain drive 12 to a line shaft 13 which carries a sprocket 14 at its outer end. A chain 15 establishes driving connection from the sprocket 14 to a line shaft 16 supported on the frame structure of the cross conveyor C. Driving connections between shaft 16 and shaft 19 are provided by gears 17 and 18 (see Figure 4). The belts of the cross conveyor D are supported and driven by rollers 20 which are mounted on and secured to the shaft 19.

Having described above the general arrangement of the apparatus shown in the drawings, the various elements making up my improved sheet handling apparatus will now be described.

Packs of sheets 23, supported on suitable skids or pallets 24, are conveyed to the elevator and sheet feeding unit B on the pack conveyor A which, in its illustrated embodiment, comprises a series of freely rotatable and suitably supported rollers 25. When a pack is to be positioned on the elevator the supporting platform of the elevator is lowered to its bottom position, as seen in Figures 2, 3 and 6, with pack supporting rollers 26 in alignment with the rollers 25 of the conveyor A. The pack may then be pushed off the conveyor A onto the rolls 26 which are then locked in position, by means which will be later described, to prevent further movement of the pack.

The elevator mechanism comprises essentially a hydraulic cylinder 27 which carries a suitable plunger 28 having the elevator head frame 29 secured thereto. In order to permit the pack to be positioned properly in respect to the feeding apparatus which lifts the sheets one at a time off of the top of the pack, the elevator head 29 is provided with a series of platform supporting rollers 30 having their axes extending at right angles to the axes of the conveyor rolls 25 and

the pack supporting rolls 26. These pack supporting rolls 26 are mounted on a movable platform 31 which, as is clearly seen in Figure 6, is supported on the rollers 30 for limited movement transversely of the direction of movement of the incoming pack.

The sheet feeding mechanism for removing sheets one at a time from the top of the pack is supported on elevator housing columns 32 and a pack guiding and locating plate 33 (see Figures 3, 5 and 10) extends across the two of these columns which are adjacent the cross conveyor C. The function of this guide plate 33 is to insure that the edges of the sheets, which are to be the leading edges thereof as the sheets are fed from the top of the pack to the cross conveyor C, are always maintained in the same position relative to the sheet feeding device regardless of the size of the sheets making up the pack. Thus, after a pack has been moved onto the supporting rolls 26 from the incoming conveyor A and before the sheet feeding apparatus is operated to remove sheets from the top thereof, fluid pressure is applied to the cylinder 34 which contains a piston connected by a piston rod 35 to the movable elevator platform 31 which carries the pack supporting rolls 26. As the platform 31 is mounted on the rollers 30 it will be moved to the right (as seen in Figure 3) by the piston rod 35 until the face 23' of the pack 23 engages the surface of the guide plate 33. During the lifting movement of the elevator to feed the pack upwardly and maintain the top thereof in proper position for removal of sheets therefrom the fluid pressure is preferably maintained on the piston in cylinder 34 so that even though the face 23' of the pack may be slightly out of vertical alignment the sheets will always be held in proper position to be picked up by the feeding apparatus.

As noted above the pack supporting rolls 26 of the elevator are provided with braking means so that, after the skid or pallet 24 is positioned thereon, at least some of the rolls 26 may be locked to prevent further movement of the pack. This braking apparatus is best seen in Figures 5 and 6 and comprises a pair of shoe members 36 and 37 which extend up between adjacent rolls 26. These shoes 36 and 37 are supported on the upper face of the platform 31 and are provided with rollers 36' and 37' which rest upon the inclined cam surfaces 38 and 39. These cam surfaces 38 and 39 form a part of a sliding yoke member 40 which carries an operating rod 41 at one end. This rod extends through a guide bearing member 42 on the platform 31 and the upper arm 43 of a bell crank brake operating lever which is pivotally supported on a bracket 31' carried by platform 31. The lower arm 43' of this bell crank lever is adapted to engage a flange 44 on the stationary base frame 45 of the elevator structure when the elevator is in its lowest or pack receiving position. Disposed between the bearing 42 and the upper end of arm 43 is a compression spring 46 which, acting through the end of arm 43 and the nuts 41', normally tends to move the rod 41, yoke 40 and inclined surfaces 38 and 39 to the right (as seen in Figure 6). Such movement of the inclined surfaces 38 and 39 will lift the brake shoes 36 and 37 into engagement with the adjacent rollers 26 thus braking these rollers and preventing movement of the pack relative thereto. However when the elevator is lowered to its bottom position, as seen in Figure 6, the arm 43' of the bell crank engages the fixed

flange 44 moving the upper arm 43 of the bell crank to the left. During this movement, through the engagement of the arm 43 with the shoulder 47 on the rod 41, the rod 41, yoke 40, and inclined surfaces 38 and 39 are moved to the left thus permitting the brake shoes 36 and 37 to drop out of braking engagement with the adjacent rollers 26.

From the above description it will be seen that the brake mechanism for the rollers 26 is automatically disengaged when the elevator is lowered to receive a pack of sheets. However as soon as the elevator starts its upward travel and the bell crank arm 43' moves away from the flange 44, the spring 46 will cause the brake shoes 36 and 37 to engage and lock the three center rolls 26, thus preventing shifting of the pack on the elevator platform.

When a pack of sheets is moved onto the elevator platform it is, of course, desirable to stop the pack so that it is centered on the elevator regardless of the length of the sheets making up the pack. I have, therefore, provided an adjustable stop which may be set in accordance with the length of the sheets making up the pack to center the pack properly on the elevator. It will be understood that in speaking of "sheets" herein the term "length" is used to express the dimension of the sheet parallel to the direction of movement of the pack as it moves on the pack conveyor A and the term "width" of the sheet means the dimension thereof at right angles to the direction of travel of the pack on the conveyor A. The pack stop mechanism is seen in Figure 5 and is illustrated in detail in Figures 8 and 9. It comprises essentially an adjustable arm 48 having a pack engaging head 49. This arm is pivotally supported on a shaft 50 carried by the stationary frame 51 and may be adjusted to vary the position of the head toward or away from the elevator platform by means of clamp screws 52 and 53. As seen in Figure 8 the arm 48 is preferably graduated to indicate the proper setting for the length of the packs being handled.

As the arm 48, at least when set for relatively short sheets, will extend over the top of the elevator platform when in its bottom position the arm 48 must be movable out of the way when the elevator is lifted. The pivotal support of the arm 48 on the shaft 50 permits this movement which is positively effected by engagement of a bracket 54 with the end of operating arm 55 which in turn is keyed to the shaft 50. Thus, when the elevator is lifted from the position shown in Figure 9 the bracket 54 will engage the arm 55 and swing the pack stop 48 upwardly as indicated in the dot and dash lines. This movement is facilitated by the provision of a snap-over spring mechanism 56. Another operating arm 57 is provided which will be engaged by the bracket 54 during downward movement of the elevator and will return the stop arm 48 into pack engaging position automatically whenever the elevator is lowered to receive a new pack. In other words, when the elevator is raised from the position shown in Figure 9 the top of the bracket 54 engages the roller 55' on arm 55 and swings the stop arm 48 up out of the way of the elevator. So also, when the elevator is lowered the under side of the bracket 54 engages the roller 57' and causes the arm 48 to be swung back into pack stopping position.

The operation of the above described elevator apparatus will now be explained. As is seen in Figure 2, a pack of sheets 23 supported on a skid or pallet 24 is moved along the incoming pack conveyor A onto the supporting rollers 26 on the elevator head. Movement of the pack 23 onto the elevator is limited by the pack stop 49 which is adjusted so that it will stop the pack with its longitudinal center line lying substantially on the center line of the elevator. Next the pack is moved transversely of its incoming direction of movement (to the right in Figure 3) until the pack face 23' engages the guide plate 33, this movement being effected by the fluid pressure unit 34 acting on the elevator platform 31 through the connecting rod 35. The elevator is now started on its upward movement, the brake shoes 36 and 37 promptly engaging the central group of pack supporting rolls 26 and preventing the pack from shifting longitudinally, and the pack stop 49 being kicked out of the way by the bracket 54.

Mounted on a platform 58 which is supported by the columns 32 is the sheet feeding mechanism which is generally indicated on the drawings by the reference character M. As the details of this mechanism do not form a part of the present invention and as any suitable apparatus for removing sheets one at a time from the top of a pack and feeding them into the nipping rolls 69 and 70 may be employed, only sufficient description will be given to show the relation of the sheet feeding mechanism to the rest of my apparatus.

The drive motor 10, through suitable chain and sprocket connections, operates the crank arm 59 (Figure 3) which is connected to a piston 60 operating in a cylinder 61. This cylinder is connected by a flexible tube 62 (seen only in Figure 12) to the oscillating suction head members 63. These suction heads are mounted on the end of an operating arm 64 on which is a cam roller 65 which is guided by and operates in cam slot 66. The arm 64 is connected through suitable linkage (not shown) to the crank 67 which is driven by the motor 10 through the line shaft 13 and drive chain 68.

In the operation of this apparatus the elevator is raised until the top sheet of the pack is disposed as illustrated in Figure 12, just slightly below the pass line of the cross conveyor. When the motor 10 is operated the suction cups 63' of the suction heads 63 will be caused to engage the surface of the top sheet. These suction cups are preferably of resilient material such as rubber and the stroke of piston 60 in cylinder 61 is so timed that suction will be created as the cup 63' engages the plate and will be released when the edge of the sheet enters the nipping rolls 69—70. This suction is applied to the cups 63' through tubes 62 and the hollow bores in the heads 63. It will be understood that although only a single suction head 63 and cup 63' are illustrated a plurality of heads 63 will be carried by the arm 64 and disposed at spaced places on the surface of the sheet. Thus, when the suction heads 63 are lifted and moved forward as indicated by the dot-dash line in Figure 12, they will pick up the top sheet of the pack and move its leading edge into the nipping rolls 69 and 70. These rolls, as is best seen in Figure 4, are supported on the stationary elevator frame structure and are driven from the line shaft 16 by a suitable chain and sprocket drive 71. As the sheets leave the nipping rolls they are picked up by the cross conveyor C.

The maximum upward movement of the elevator is limited by a suitable limit switch 72 (Figure 12). This switch has an operating arm 73 carrying a sheet engaging roller 74 at its outer end. If the top sheet of a pack engages roller

74 during upward movement of the elevator and moves the arm 73 into a predetermined position the elevator controls will be actuated to stop the elevator, thus preventing possible damage to the sheet feeding mechanism.

As sheets are taken off the top of the pack the level of the pack goes down and the suction head 63 and suction cup 63' will have to reach down farther to engage and pick up the top sheet from the pack. The spring 63'' permits this variable movement of the head 63 while the cam roller 65 and the lower end of the operating rod 64 have a constant path of movement, the spring 63'' being merely compressed to a greater extent at the bottom of the stroke when the pack level is relatively high than when the pack level is low. To maintain the level within the desired range I provide a micro-switch S, mounted on the stationary elevator housing, and a switch actuating lever S^1, pivotally mounted on a supporting pin S^2. One end of lever S^1 is positioned to engage the micro-switch operating button S^3 while its opposite end is disposed in the path of movement of spring mounted plunger S^4 which is supported in a bracket S^5 carried by and moving with the suction head 63.

When the level of the pack 23 (see Figure 12) falls, the head 63 will have to reach down farther to pick up successive sheets. This will cause the lower end S^6 of plunger S^4 to approach the operating end of lever S^1. The normal position of plunger S^4 may be adjusted by means of nuts S^7 to give the desired inching control of the elevator. Suitable connections are provided from the micro-switch S to solenoid operated valves (not shown) for controlling the flow of fluid to the hydraulic elevator cylinder 27 so that, when the end S^6 of plunger S^4 engages the lever S^1, the micro-switch will be operated to actuate the valves to cause the elevator to be lifted. The lifting operation will continue as long as the micro-switch is closed but will stop when the switch closes. Thus when the level of the top of the pack is lifted sufficiently so that the plunger head S^6 fails to strike the operating lever S^1 at the bottom of the stroke of the suction head 63, upward movement of the elevator will not take place. Of course, as soon as the pack level again falls enough to permit head S^6 to strike lever S^1 the micro-switch will operate to start the elevator up again. By the micro-switch inching device described above the top of the pack is maintained at a level well within the operating limits of the sheet feeding mechanism M. Thus the elevator is moved upwardly in a series of small increments so that the top of the pack is always maintained in proper position for sheets to be fed therefrom into the nipping rolls 69–70.

Another feature of my improved elevator and sheet feeding mechanism is the provision of means for supporting the last relatively small bottom portion (for example the last 1'') of each pack in elevated position where it may be operated on by the sheet feeding device while the elevator is lowered, a new pack loaded thereon and the elevator again raised into operating position. Thus feeding operations are not interrupted during the time required to load a new pack onto the elevator. This mechanism consists essentially of a plurality of auxiliary pack supporting devices which are disposed on three sides of the pack. In the drawings only the supporting device which engages the pack at the side adjacent the nipper rolls 69 and 70 is illustrated, it being understood that other generally similar devices, suitably mounted to accommodate varying pack lengths, are employed on the adjacent ends of the pack. A cylinder 75 (see Figure 10) contains a piston having a piston rod 76 extending diagonally upwardly and carrying a pivotally mounted supporting finger 77 at its upper end. The guide plate 33 is slotted at 78 to permit the finger 77 to project therethrough into sheet supporting position as shown in Figure 10.

Suitable fluid pressure connections and control valves, not shown, are provided for the cylinder 75 so that the piston rod 76 can be moved into its extended pack supporting position or withdrawn out of the way as desired by the operator. The pivotal connection of the finger 77 to the end of the piston rod 76 permits the finger to be swung away from the pack, as seen in dot and dash lines in Figure 10, during upward movement of the pack and then to drop into supporting position when the under surface of the bottom sheet of the pack reaches the desired elevation. While the finger 77 and its associated supporting members hold the bottom portion of the pack in feeding position the elevator is lowered a new pack loaded thereon, and the elevator again raised so that the top of the pack comes up under the bottom sheet of the last part of the preceding pack, the fingers 77 being swung out of the way by the upward movement of the new pack.

The function of the pack elevating and sheet feeding apparatus is to handle packs of sheets in such a manner that a continuous and uninterupted flow of single sheets may be fed from the tops of a series of packs into a pair of nipping or feed rolls which move the sheets in single file and in properly spaced relation to the cross conveyor C which carries them in single file in a direction transversely of the general direction of movement of sheets through the tin plate line. In its illustrated embodiment, the cross conveyor C comprises a pair of parallel spaced flexible belts 79 and 80 supported adjacent the nipping rolls 69 and 70 by the drive roll 20 (Figure 3).

It will be seen from the above description of my improved sheet handling apparatus that I have provided a simple, rugged, and efficient mechanism in which the sheets are not subjected to handling by mechanisms which might tend to bend or buckle the sheets or injure their surfaces. A wide range of sheet sizes may be handled. With my apparatus it is only necessary to keep the elevator mechanism loaded with a single pack of sheets. Before one pack is completely exhausted another pack may be placed in feeding position so that operation of the apparatus is continuous.

Although I have described the illustrated embodiment of my sheet handling apparatus in considerable detail, it will be understood by those skilled in the art that variations and modifications may be made in the form and arrangement of parts which make up my apparatus and that various equivalent mechanisms may be substituted for those herein illustrated without departing from the spirit of my invention. I do not therefore wish to be limited to the particular construction and arrangement herein shown and described but claim as my invention all embodiments thereof coming within the scope of the appended claims.

I claim:

1. In apparatus for handling metal sheets or the like, the combination of an elevator having a support for a pack of sheets thereon, means for conveying a pack of sheets onto said support

when said elevator is in lowered position, a guide member extending upwardly adjacent to said support and parallel to the direction of movement of said pack onto said support, motor means carried by said elevator for continuously urging said pack in a direction substantially at right angles to the path of movement of said pack onto said support whereby the edges of at least some of the sheets in said pack are retained in contact with said guide member during upward movement of said pack on said elevator, and means for removing sheets one at a time from the top of said pack.

2. Sheet handling apparatus as in claim 1 in which said guide member extends vertically at the side of said support toward which said pack is urged by said motor means.

3. Sheet handling apparatus as in claim 2 in which said motor means take the form of a fluid pressure motor.

4. Sheet handling apparatus comprising an incoming pack conveyor, a pack elevator, a platform on said elevator, pack supporting rollers carried by said platform and adapted to receive packs from said incoming conveyor, a brake for said rollers, biasing means operating to prevent rotation of at least some of said rollers when said elevator is raised above its bottom position and to release said rollers when said elevator reaches its bottom position, fluid pressure actuated means for urging said platform in a direction transversely of the direction of travel of the incoming packs, and a vertically extending guide member positioned at the side of said elevator toward which said platform is urged by said fluid pressure actuated means and adapted to be engaged by and guide the sheets of a pack during upward movement of said elevator.

5. In sheet handling apparatus of the type described, an incoming pack conveyor, a pack elevator having a head and a pack supporting platform mounted on said head for limited movement relative thereto in a direction transverse to the direction of movement of the packs on said incoming conveyor, pack supporting rollers carried by said platform and adapted to receive packs from said incoming conveyor, a brake for said rollers, spring means operating to prevent rotation of at least some of said rollers when said elevator is raised above its bottom position and to release said rollers when said elevator reaches its bottom position, motor means for urging said platform in a direction transversely of the direction of travel of the incoming packs, and a vertically extending guide member positioned at the side of said elevator toward which said platform is urged by said motor means and adapted to be engaged by and guide the plates of a pack during upward movement of said elevator.

6. In a pack-handling elevator, a plunger, a head frame on the plunger, a first set of rollers mounted on the head frame, a platform movably mounted on the first set of rollers, a motor on the head frame continuously urging the platform transversely of the axes of the first set of rollers, and, mounted on the platform, a second set of rollers the axes of which run transversely of the axes of the first set of rollers.

7. A pack-handling elevator as in claim 6 in which a brake system which is moveable with the platform acts on the second set of rollers.

8. A pack-handling elevator as in claim 7 in which the brake system includes an energizing spring carried by the platform.

9. A pack-handling elevator as in claim 8 in which the platform carries means acting on the spring to de-energize the brake system.

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