

Aug. 18, 1953

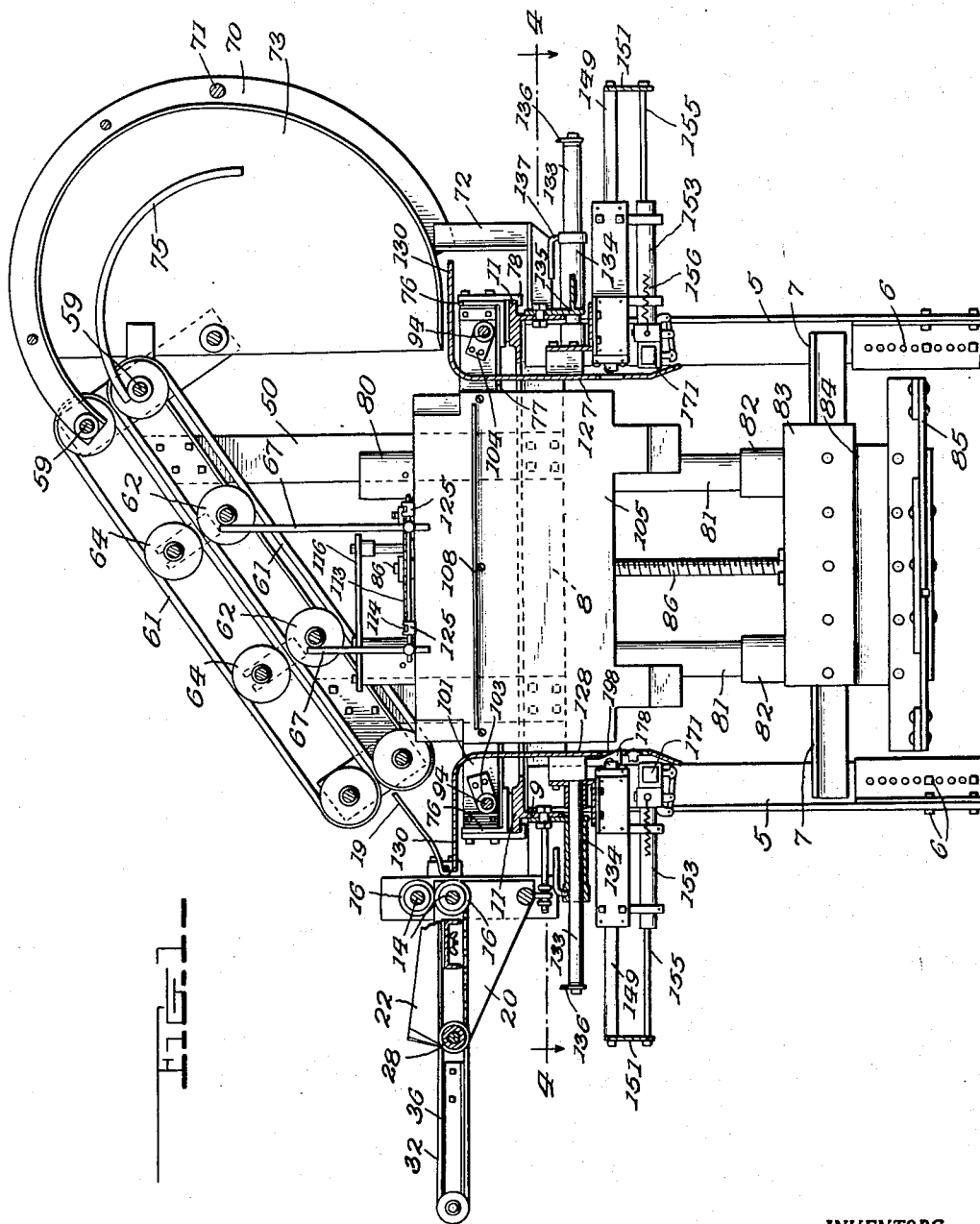
S. R. JOHNSON ET AL

2,649,302

METAL SHEET STACKER

Filed Oct. 31, 1949

16 Sheets-Sheet 1



INVENTORS
Scott R. Johnson and
Charles T. Walter
BY

Mann, Porter, Miller & Stewart
attys.

Aug. 18, 1953

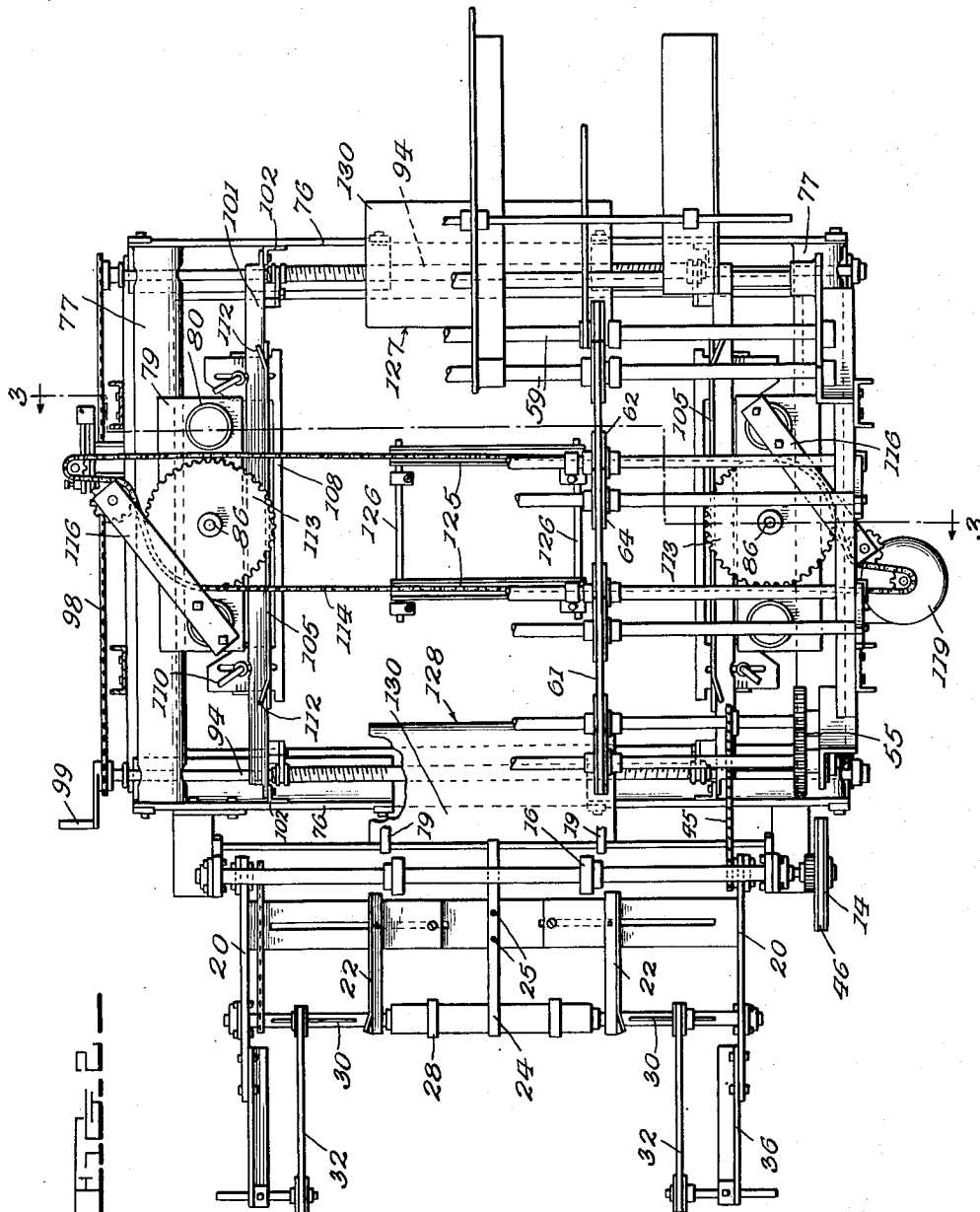
S. R. JOHNSON ET AL

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METAL SHEET STACKER

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16 Sheets-Sheet 2



INVENTORS
Scott R. Johnson and
Charles T. Walter
 BY

Thom, Porter, Diller, Stewart
attys.

Aug. 18, 1953

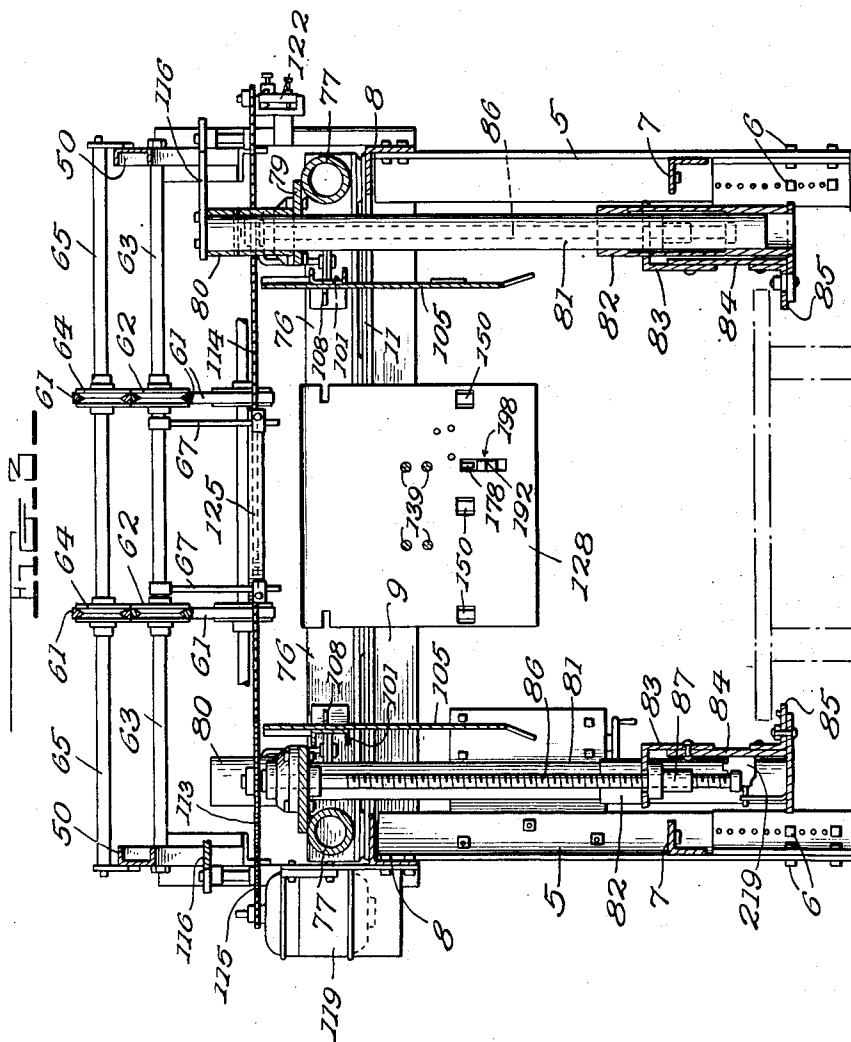
S. R. JOHNSON ET AL

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METAL SHEET STACKER

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16 Sheets-Sheet 3



Mason, Porter, Miller & Stewart
Attys.

Aug. 18, 1953

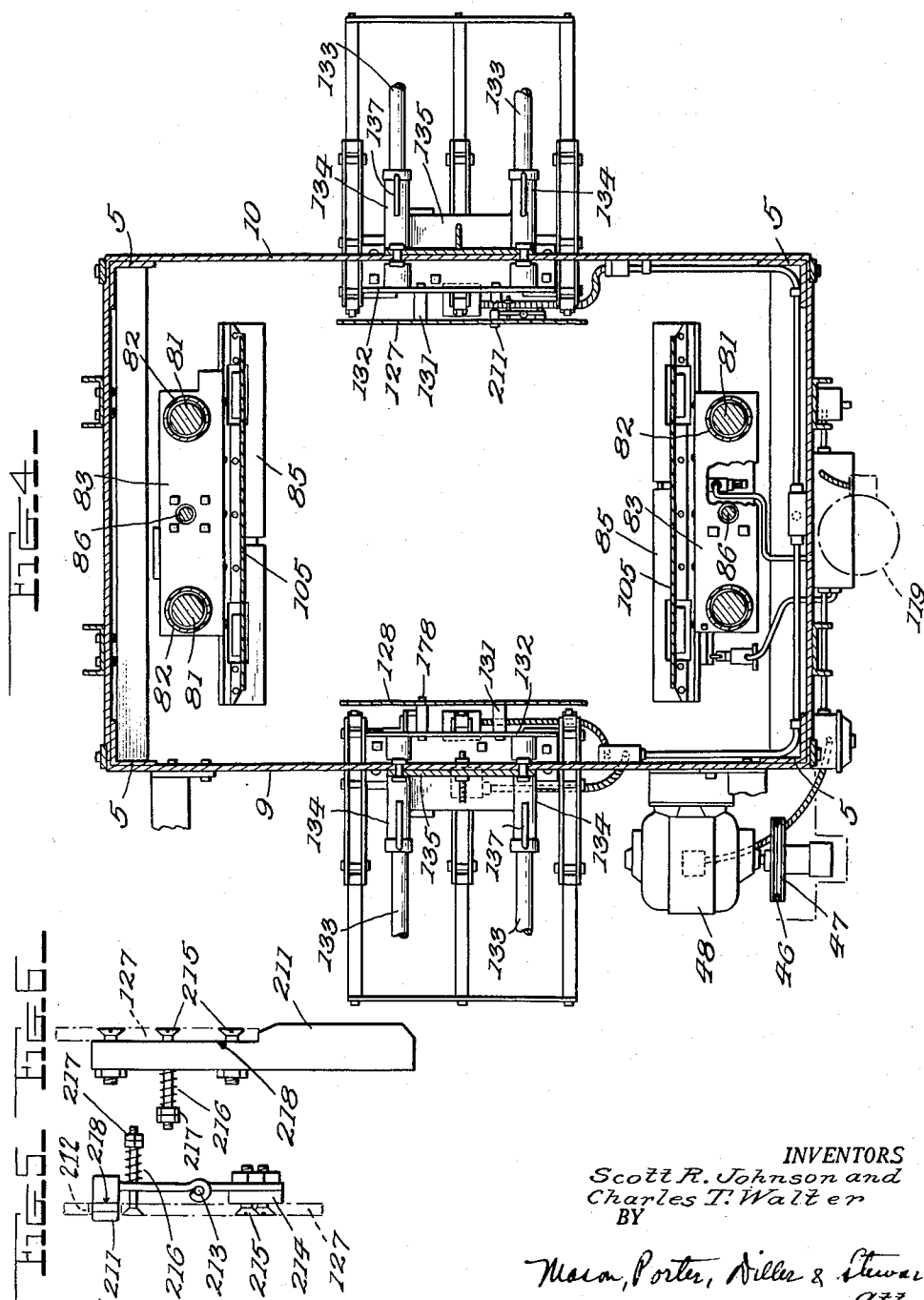
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METAL SHEET STACKER

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16 Sheets-Sheet 4



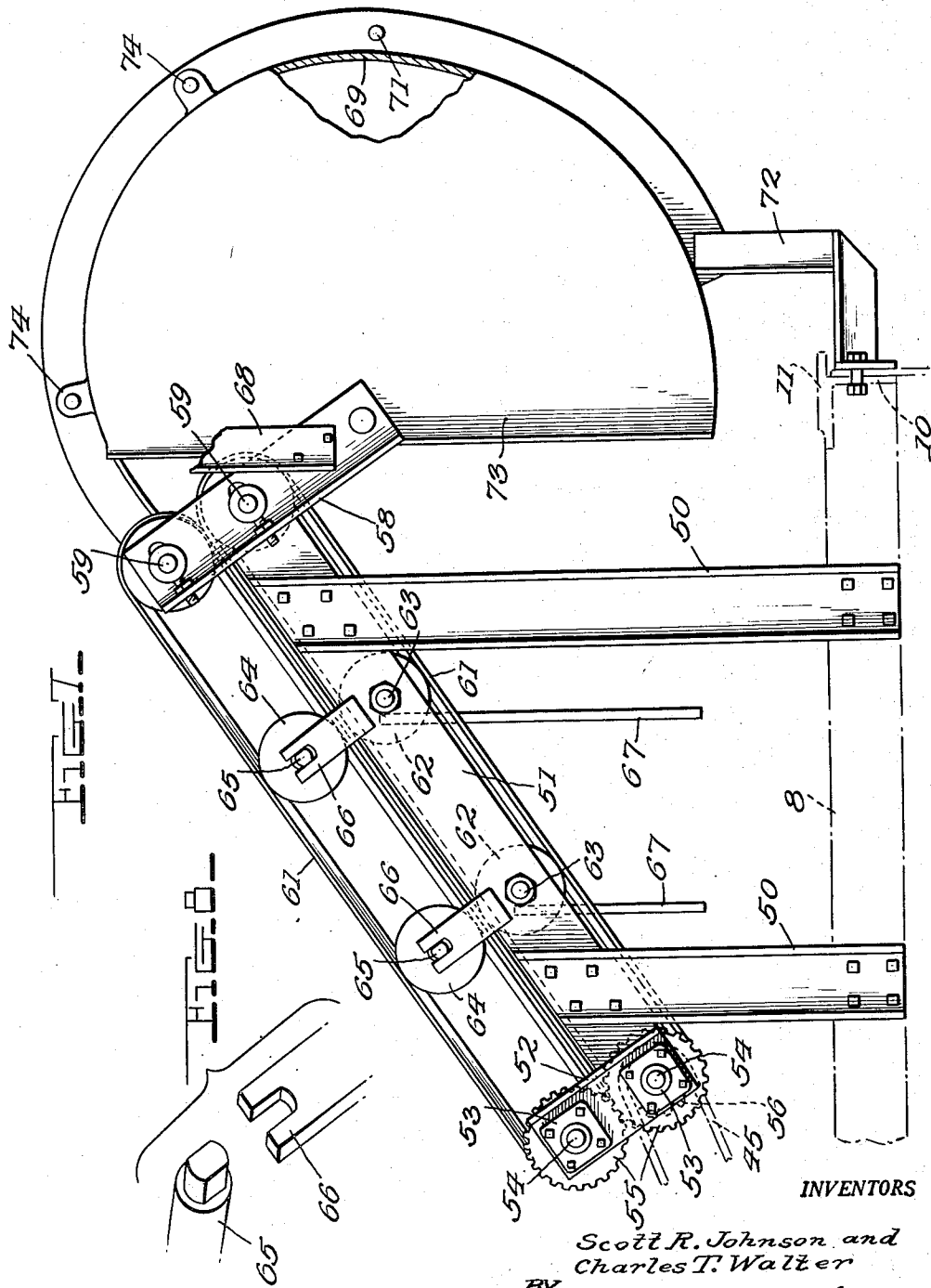
Aug. 18, 1953

S. R. JOHNSON ET AL
METAL SHEET STACKER

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16 Sheets-Sheet 5



INVENTORS

Scott R. Johnson and
Charles T. Walter

BY
Mann, Porter, Miller & Stewart
Attys.

Aug. 18, 1953

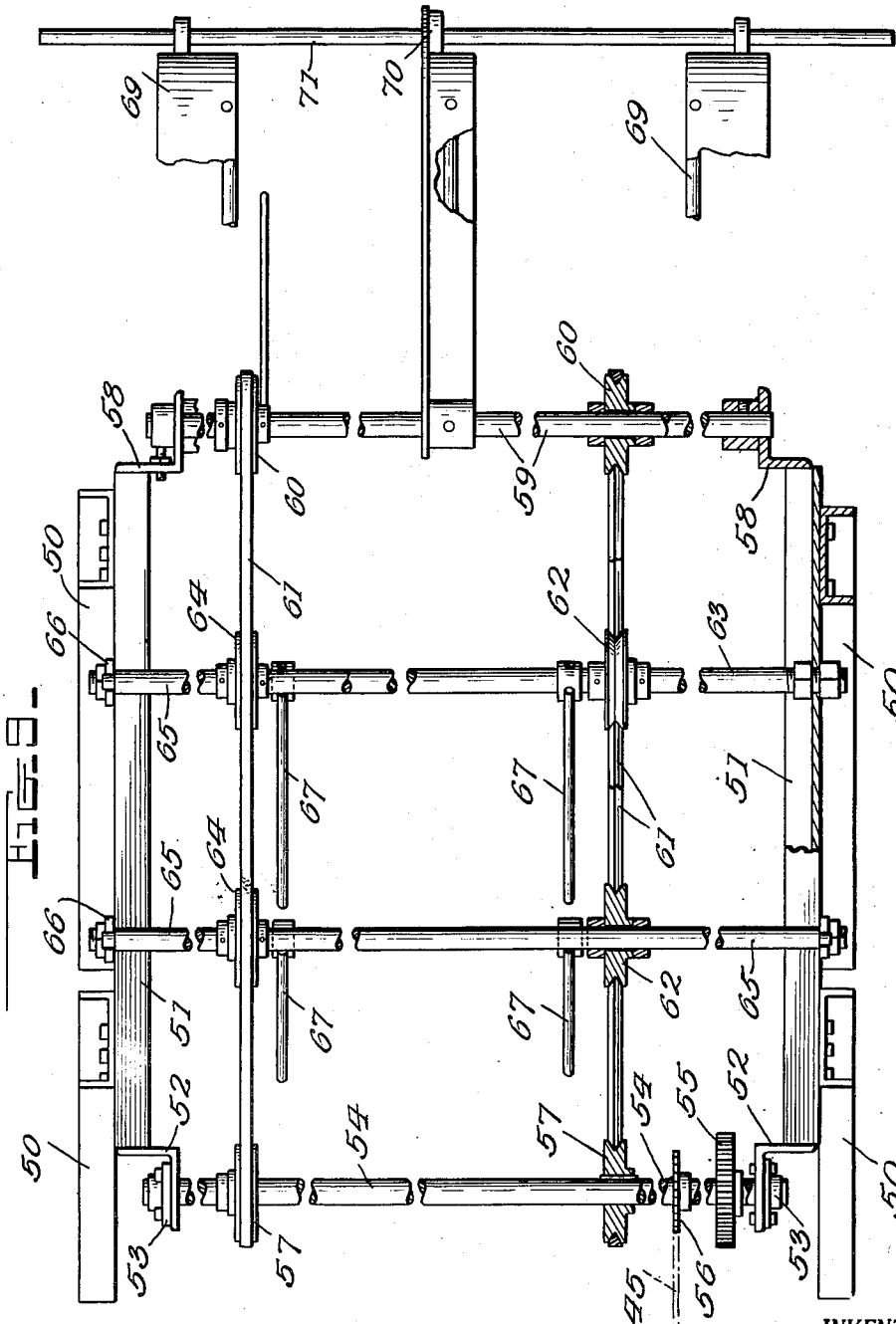
S. R. JOHNSON ET AL

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METAL SHEET STACKER

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16 Sheets-Sheet 6



INVENTORS
Scott R. Johnson and
Charles T. Walter
BY

Maas, Porter, Miller & Stewart
attys.

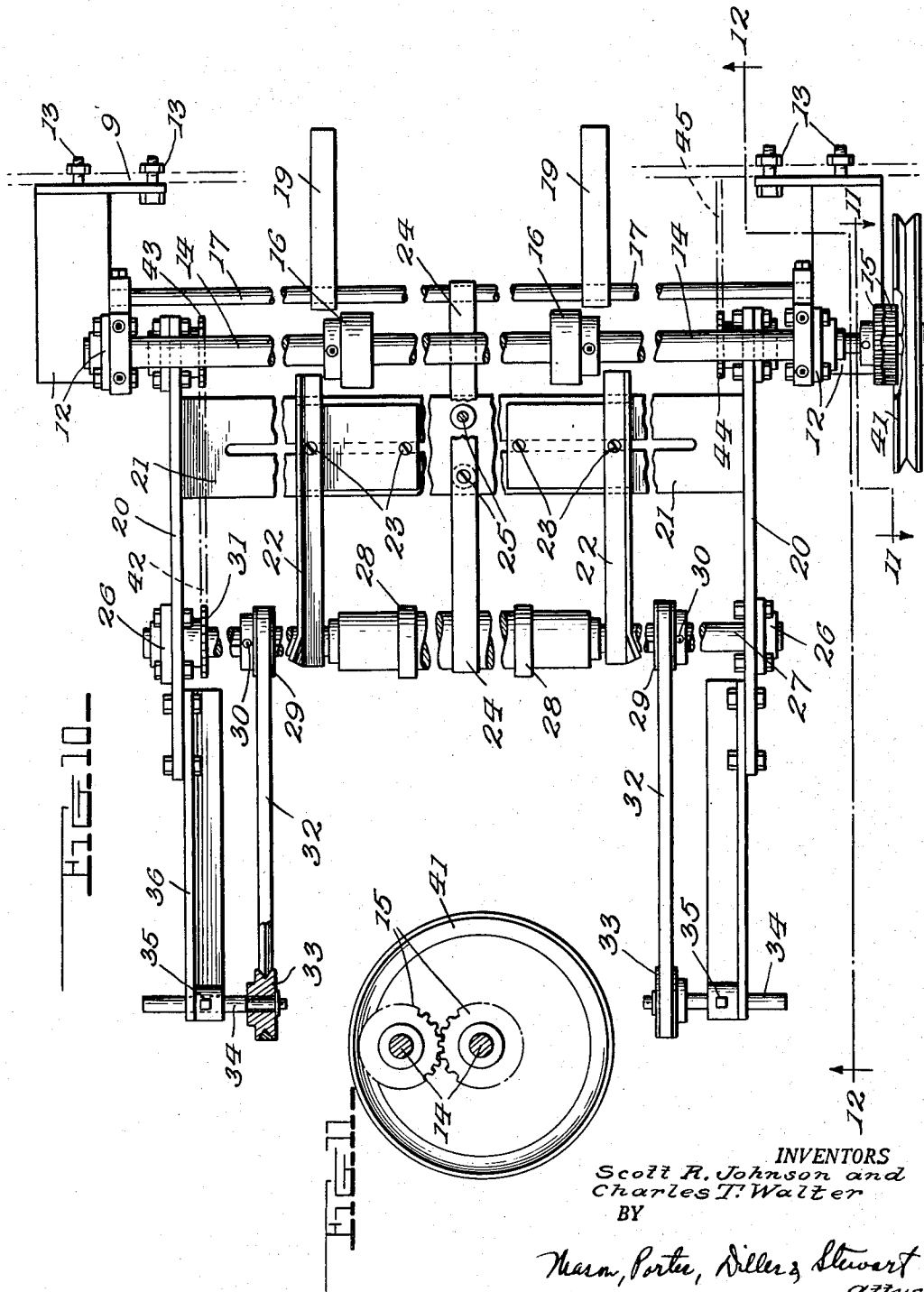
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S. R. JOHNSON ET AL
METAL SHEET STACKER

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16 Sheets-Sheet 7



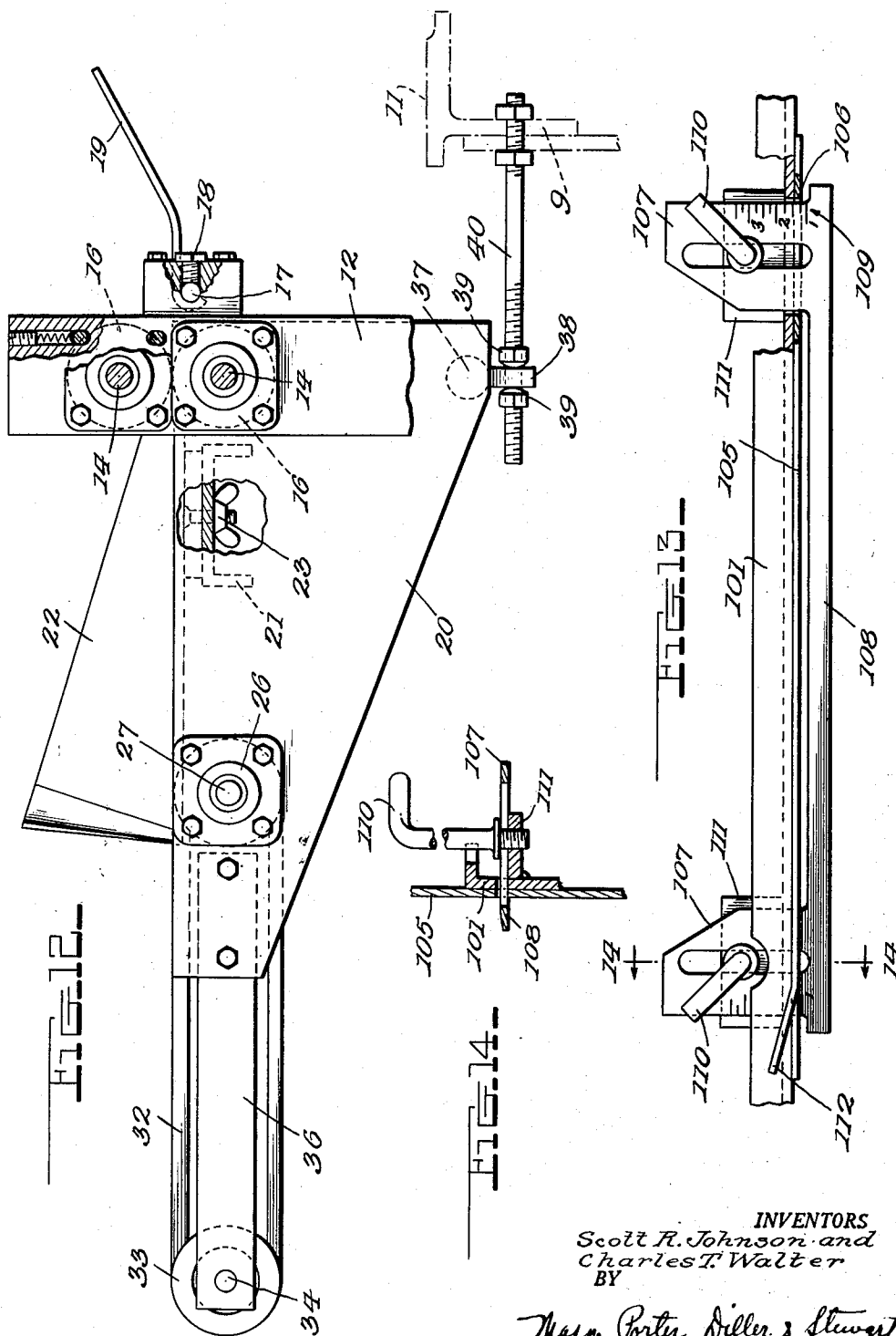
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METAL SHEET STACKER

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16 Sheets-Sheet 8



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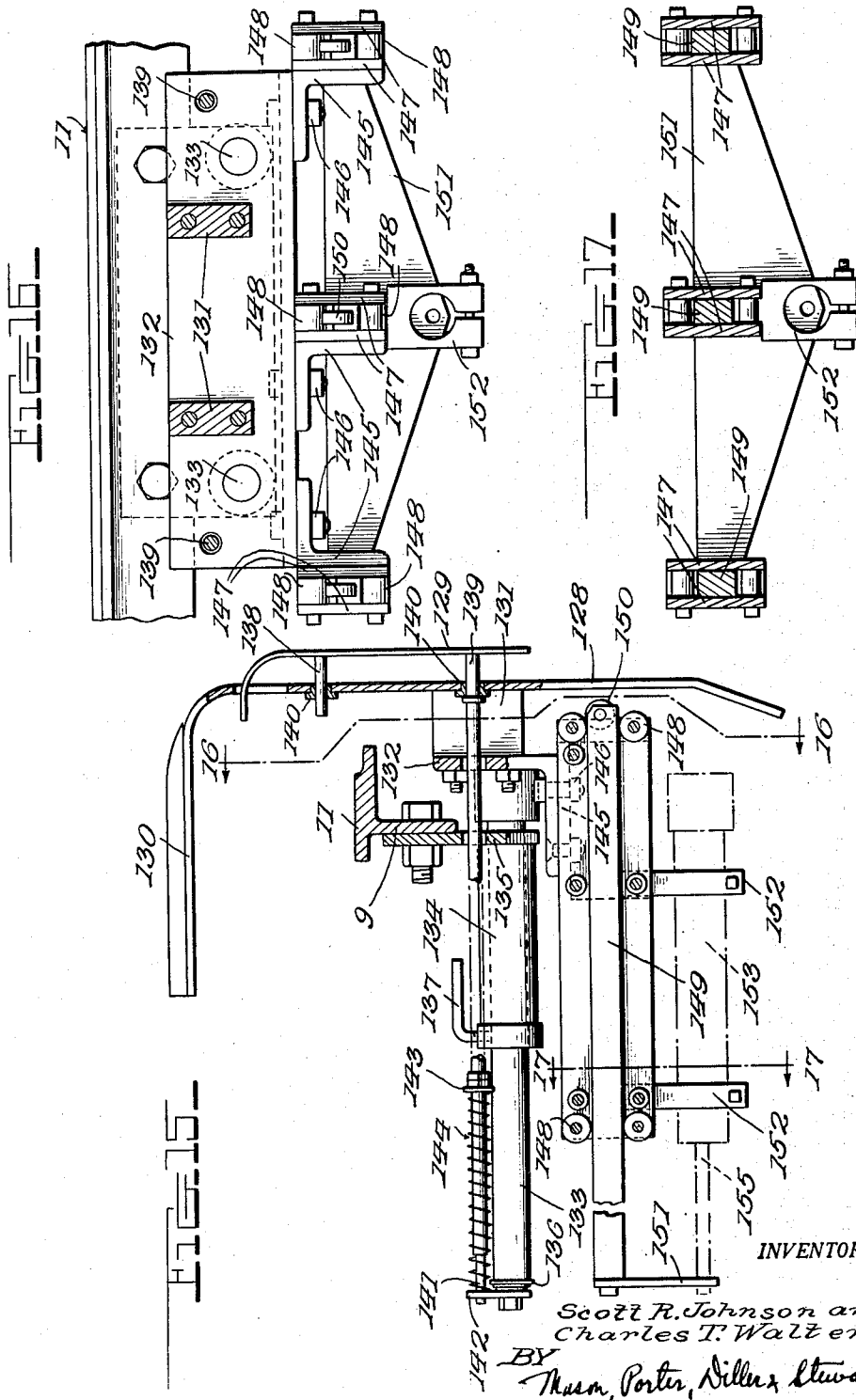
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METAL SHEET STACKER

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16 Sheets-Sheet 9



Aug. 18, 1953

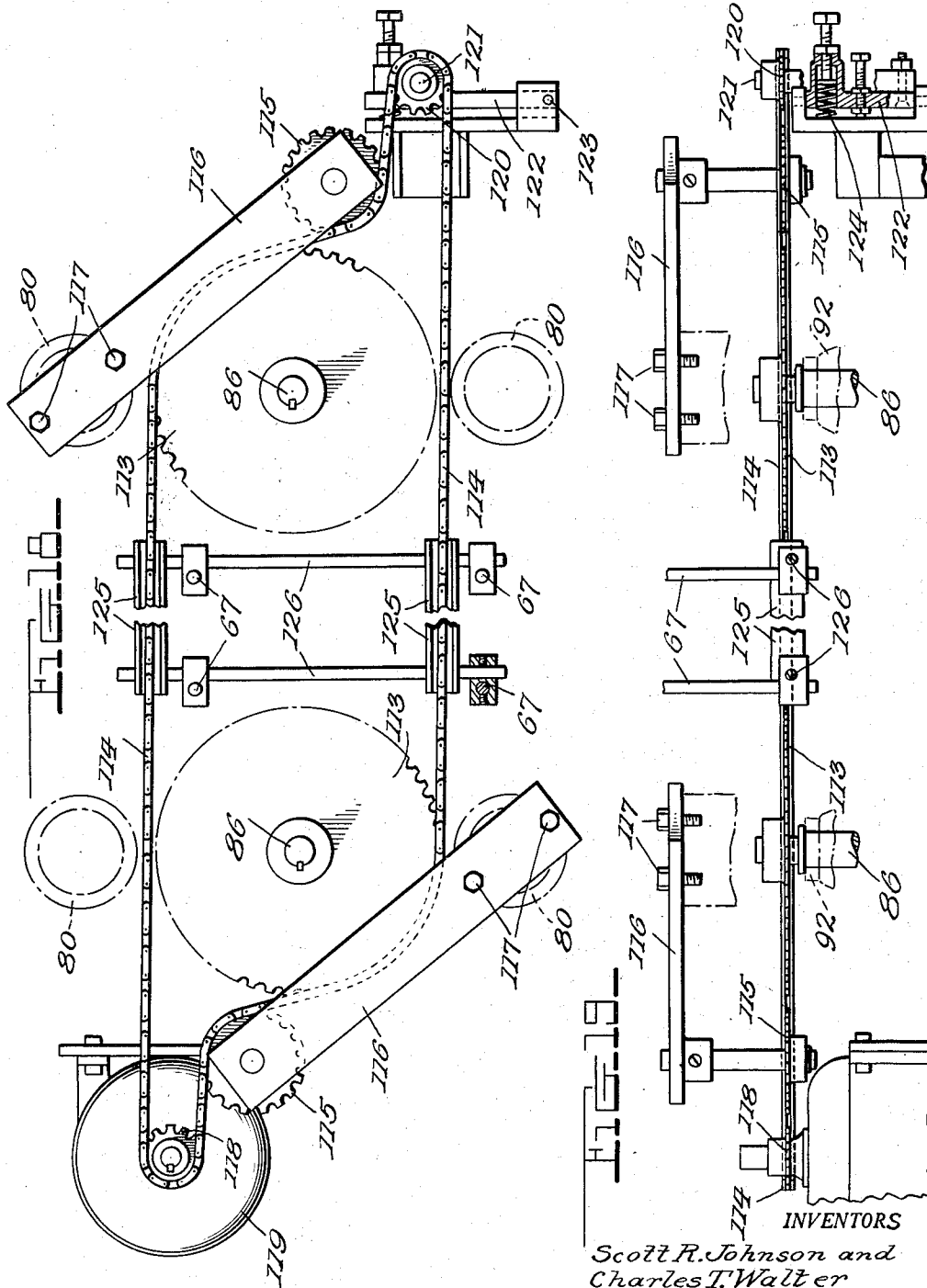
S. R. JOHNSON ET AL

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METAL SHEET STACKER

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16 Sheets-Sheet 10



H1619

INVENTORS

Scott R. Johnson and
Charles T. Walter

BY

Mason, Porter, Miller & Stewart

Aug. 18, 1953

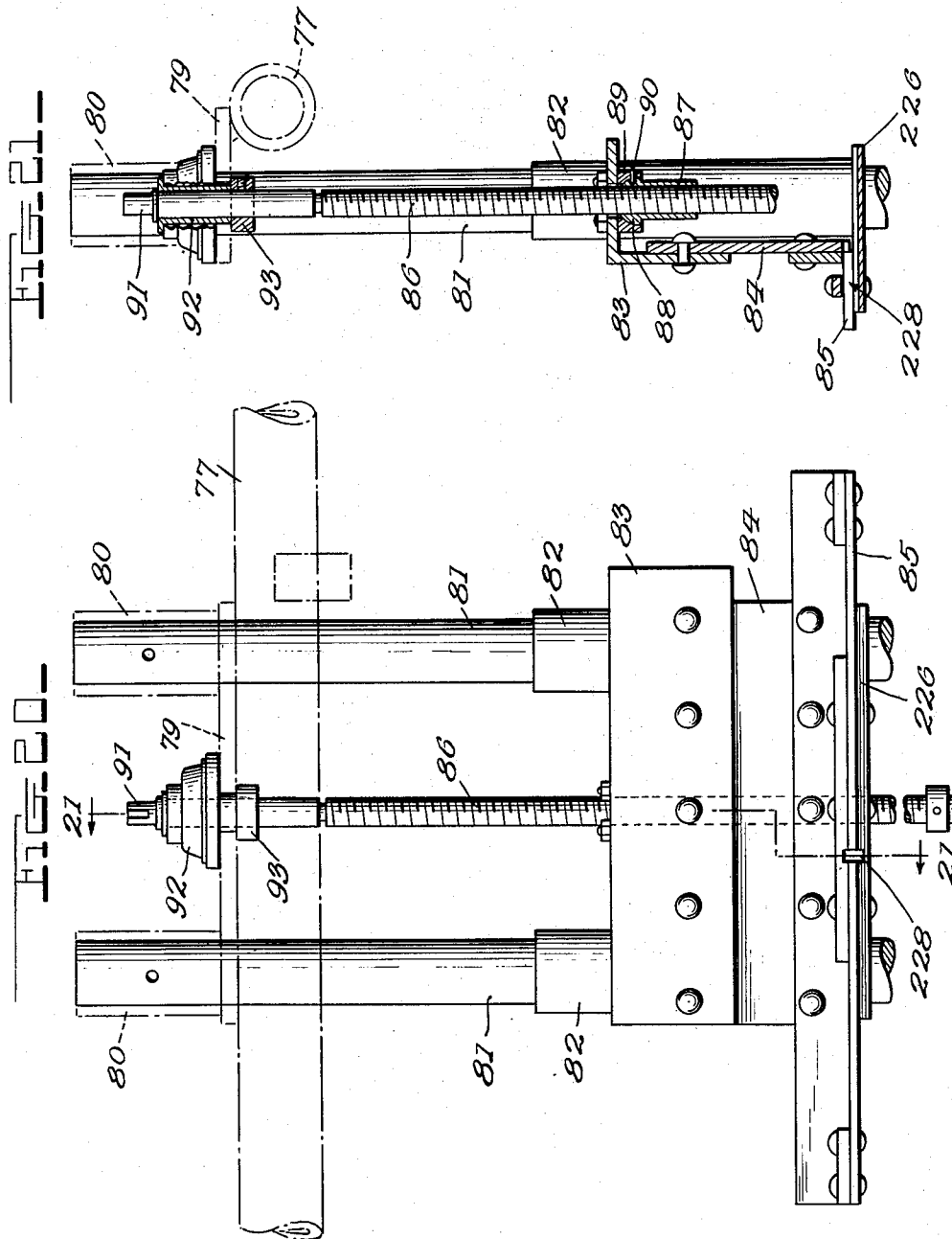
S. R. JOHNSON ET AL

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METAL SHEET STACKER

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16 Sheets-Sheet 11



INVENTORS
Scott R. Johnson and
Charles T. Walter
BY

Thorn, Porter, Diller & Stewart
attys.

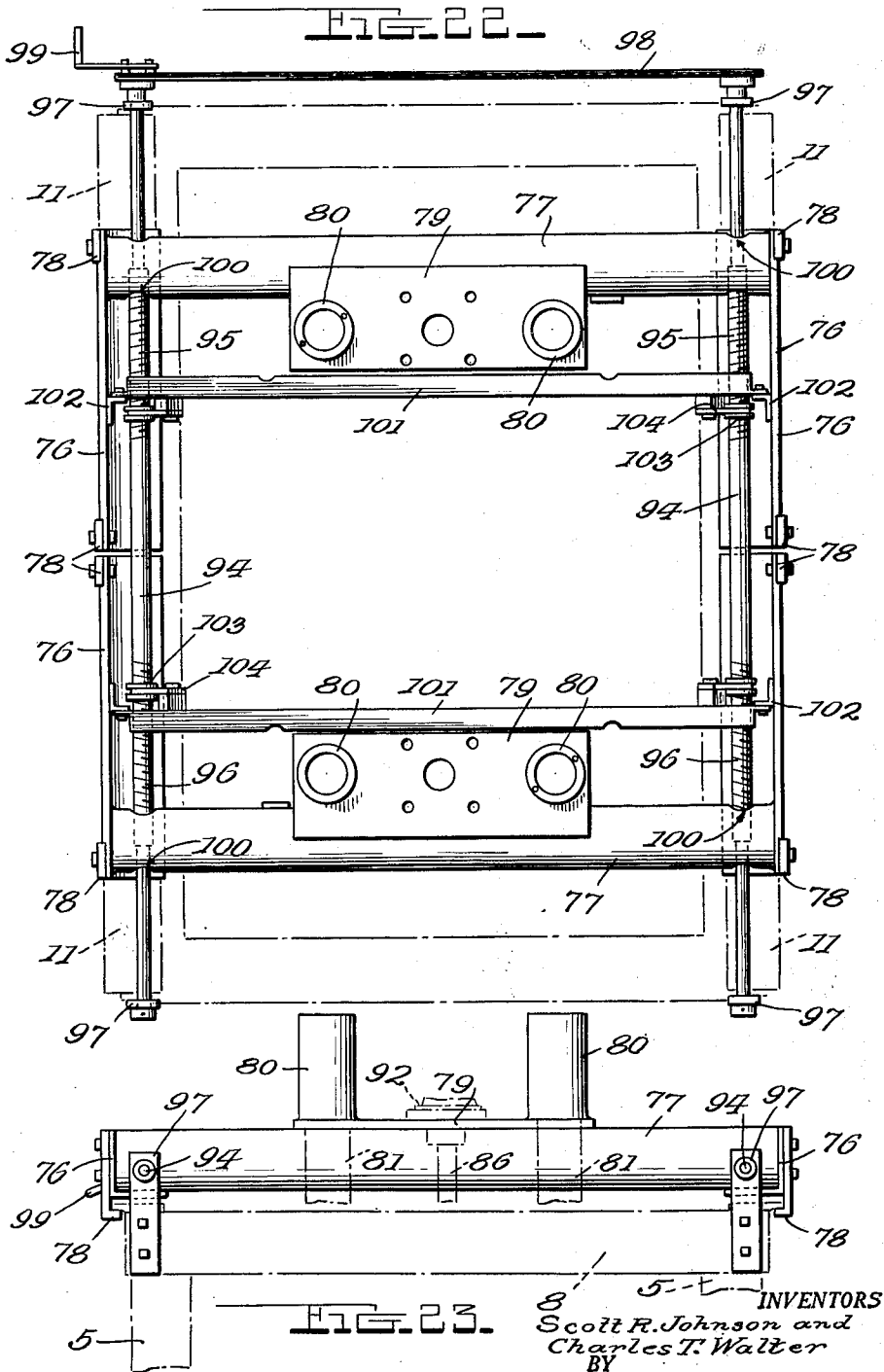
Aug. 18, 1953

S. R. JOHNSON ET AL
METAL SHEET STACKER

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16 Sheets-Sheet 12



Thos. Carter, Diller & Stewart
attys.

Aug. 18, 1953

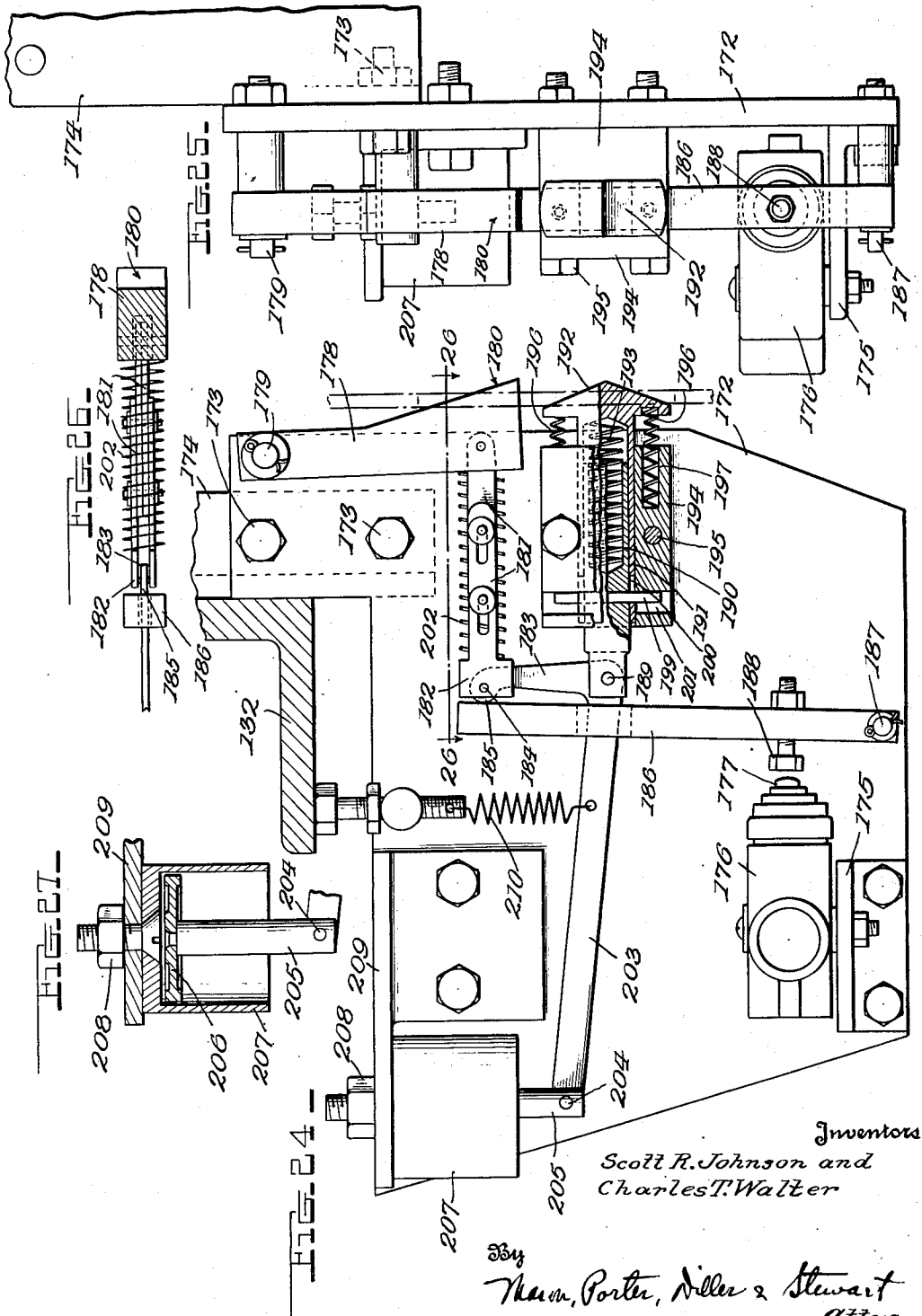
S. R. JOHNSON ET AL

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METAL SHEET STACKER

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16 Sheets-Sheet 13



Aug. 18, 1953

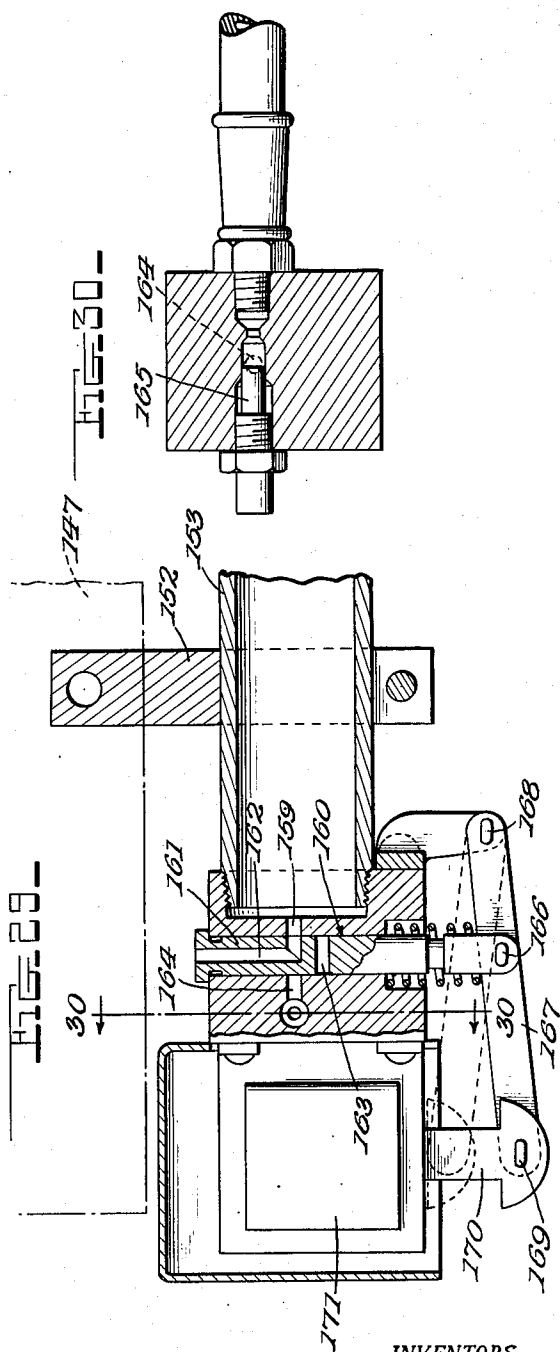
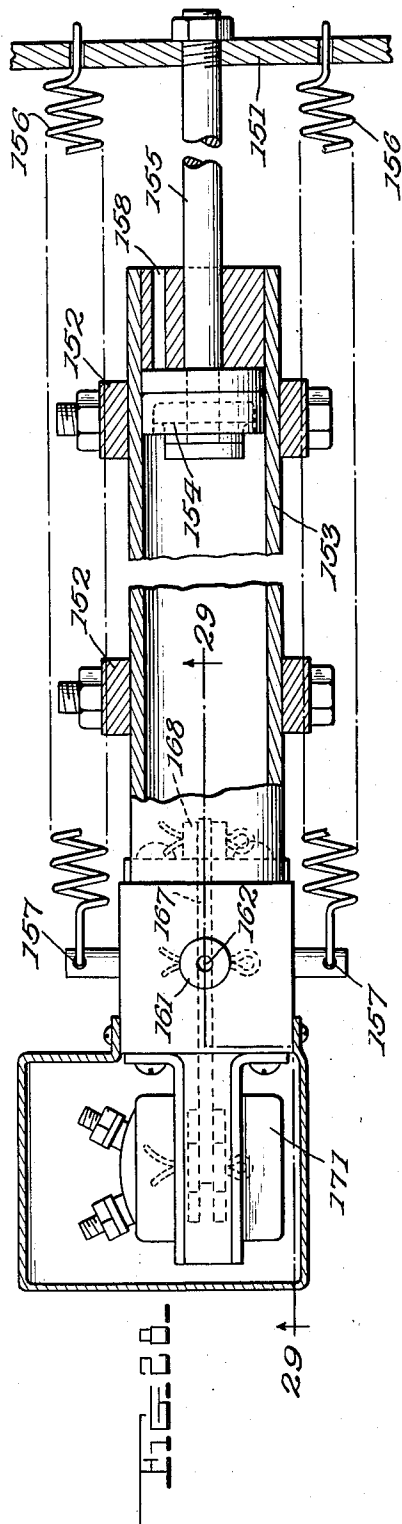
S. R. JOHNSON ET AL

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METAL SHEET STACKER

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16 Sheets-Sheet 14



INVENTORS
Scott R. Johnson and
Charles T. Walter
BY

Mason, Porter, Diller & Stewart
attys.

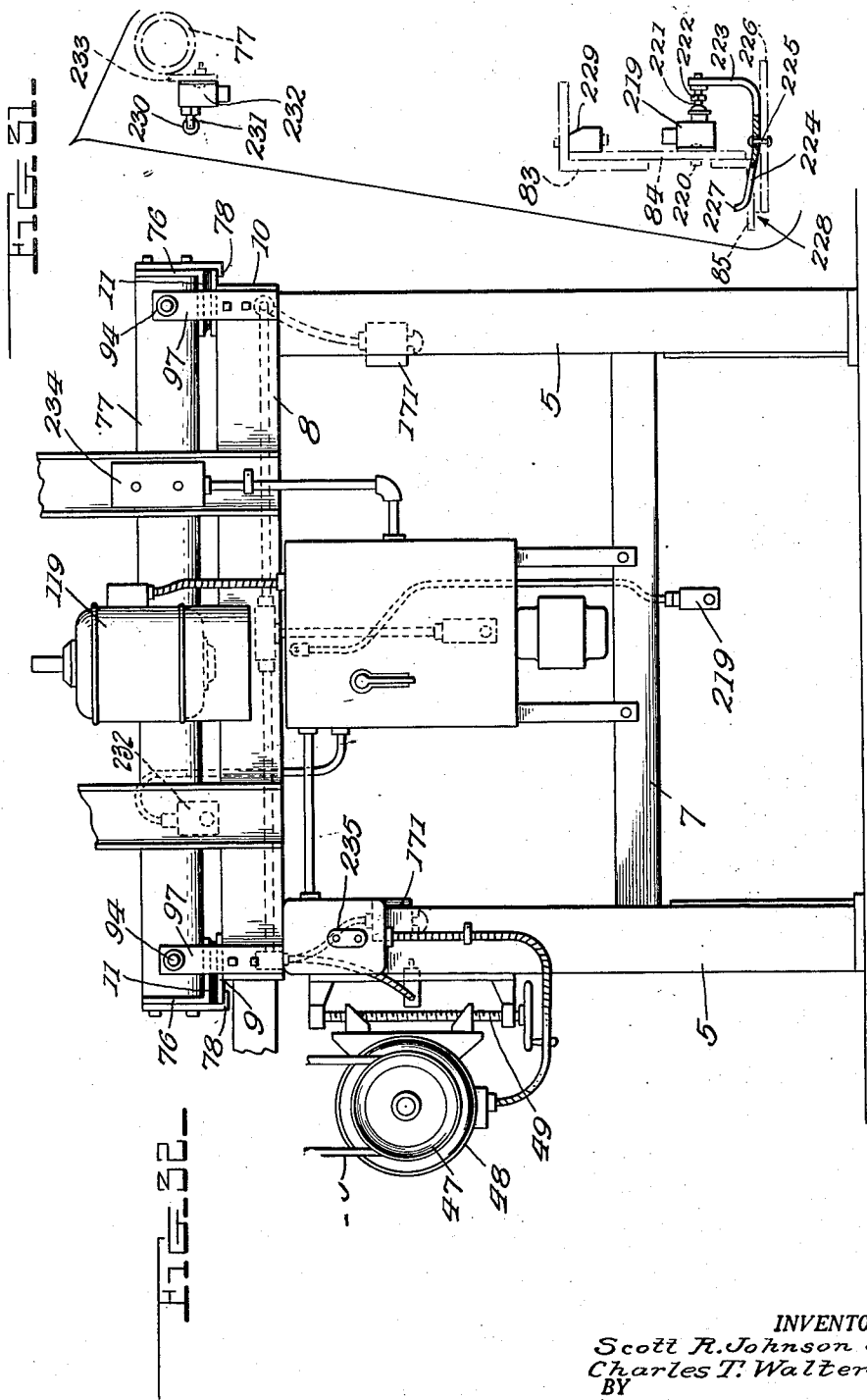
Aug. 18, 1953

S. R. JOHNSON ET AL
METAL SHEET STACKER

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16 Sheets-Sheet 15



INVENTORS
Scott R. Johnson and
Charles T. Walter
BY

Mason, Porter, Miller & Stewart
Attys.

Aug. 18, 1953

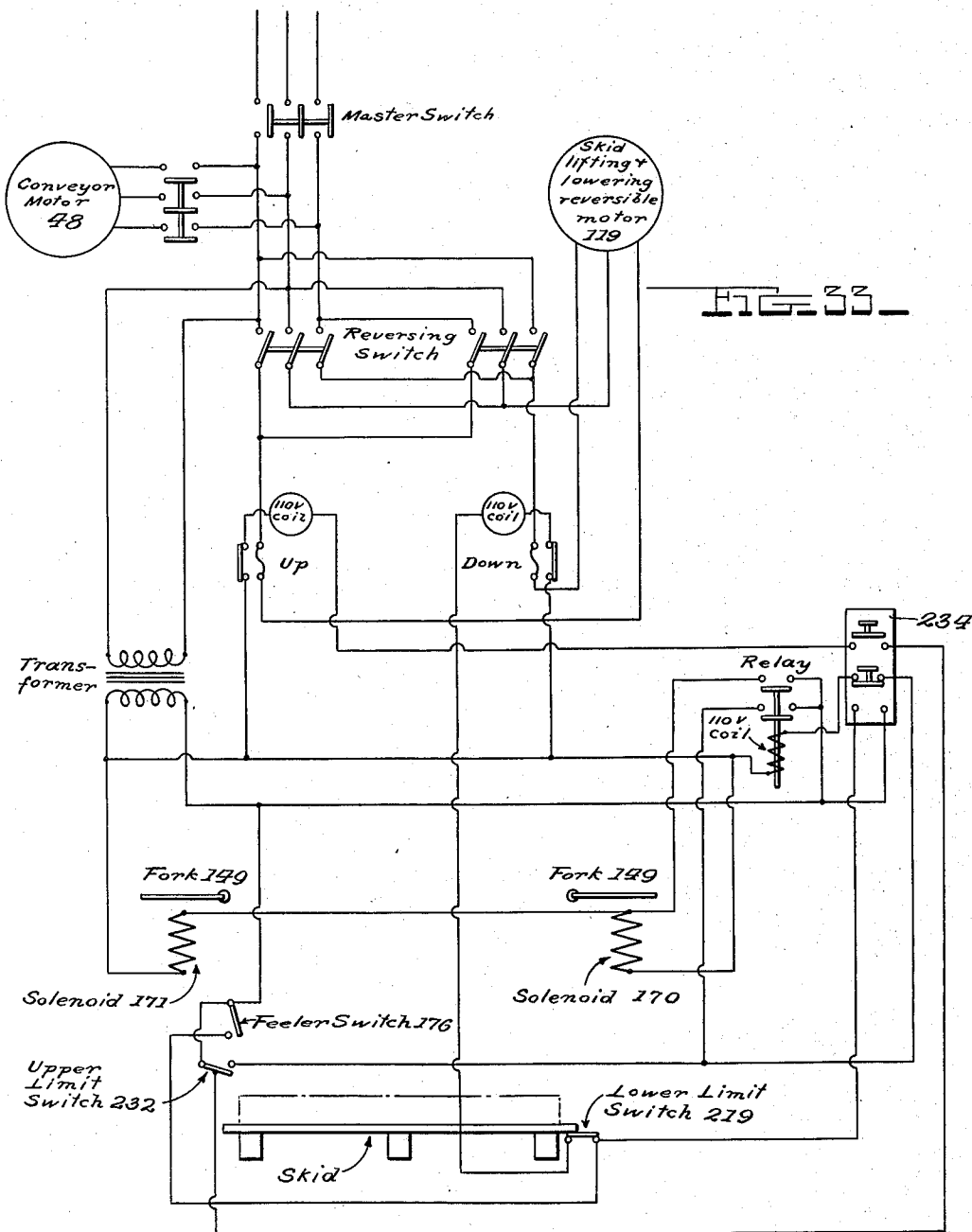
S. R. JOHNSON ET AL

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METAL SHEET STACKER

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16 Sheets-Sheet 16



INVENTORS
Scott R. Johnson and
Charles T. Walter
BY

Tham, Porter, Diller & Stewart
attys.

UNITED STATES PATENT OFFICE

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METAL SHEET STACKER

Scott R. Johnson, River Forest, and Charles Taylor Walter, Markham, Ill., assignors to Continental Can Company, Inc., New York, N. Y., a corporation of New York

Application October 31, 1949, Serial No. 124,632

33 Claims. (Cl. 271-65)

1

The invention relates generally to the art of handling metal sheets and primarily seeks to provide a novel apparatus for receiving such sheets, one-by-one, as from the conveyor wickets of an oven, and stacking them on a skid in a compact pile so that they can be quickly and conveniently stored.

In the preparation of metal sheets for the manufacture of cans and can ends, the sheets are lacquered, or lithographed, or otherwise coated, and then are conveyed uprightly on a conveyor and against supporting wickets through suitable oven structures wherein the coatings are baked. Obviously, the handling of the hot, coated sheets at the discharge end of the oven presents difficulties, and considerable speed and accuracy is required in properly taking the sheets from the wickets and arranging them in the desired compact stack formation. Apparatus designed for properly accomplishing this purpose must be capable of operating rapidly and accurately, without marring the freshly coated sheet surfaces, and it must be capable also of inverting each sheet received therein before it is stacked when the positions the sheets are to assume in the stack demand such inversion. It is a purpose of the present invention to provide a sheet stacking apparatus capable of accomplishing the stated purposes with great efficiency and dispatch.

An object of the invention is to provide a sheet stacking apparatus of the character stated in which there are included means for receiving the sheets one by one from the oven wickets and dropping them in accurate position on a skid, either directly or after inversion, and automatically lowering the skid, step-by-step as the sheets accumulate thereon.

Another object of the invention is to provide a sheet stacking apparatus of the character stated wherein the means for receiving the sheets from the oven wickets includes a magnetic roll engaged by that portion of each sheet extending radially beyond a wicket, auxiliary belts disposed to engage portions of each sheet which might project laterally of a wicket, other conveying belts and a pair of grip rolls, and a diverter gate shiftable to direct sheets from said rolls directly onto the stack, or into the sheet inverting means.

Another object of the invention is to provide a sheet stacking apparatus of the character stated in which the sheet inverting means includes upper and lower upwardly inclined belt sets between which the sheets are fed into curved guides which serve to invert the sheets, the upper belt sets being pressed into sheet feeding con-

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tact with the lower belts, or underlying sheets, by the gravity action of free presser pulleys.

Another object of the invention is to provide a sheet stacking apparatus of the character stated wherein the sheets are stacked between cooperating side, front and rear guides, two such guides being movable manually toward or from each other for varying their spaced relation, and the remaining two guides being so movable by mechanical means.

Another object of the invention is to provide a sheet stacking apparatus of the character stated wherein are included novel projectable and retractable fork devices placeable to support infedding sheets temporarily while a skid and a stack thereon are being removed from the apparatus and an empty skid is placed to receive the temporarily collected sheets from the fork means as it is retracted and take over the supporting of the accumulating stack of sheets.

Another object of the invention is to provide a sheet stacking apparatus of the character stated wherein the sheet supporting fork means are spring projected and fluid pressure retracted and are assembled on and movable with the supports on which certain of the sheet stacking guides are mounted.

Another object of the invention is to provide a sheet stacking apparatus of the character stated wherein there are included novel screw means for supporting, lifting and lowering the stack supporting skids, and novel motor driven means for operating the screw means.

Another object of the invention is to provide a sheet stacking apparatus of the character stated wherein there are included novel stack contact actuated devices for bringing about the skid lowering operation of the screws automatically and by step-by-step movements, said devices being supported upon one of the stack guide adjusting devices so as to partake of movement of adjustment with the associated guide.

Another object of the invention is to provide a sheet stacking apparatus of the character stated wherein the skid lifting and lowering screws are driven by novel sprocket and chain devices so constructed and arranged as to permit adjustment of the spacing of the screws with the associated stack guides without varying the length of the chain.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the ap-

pendent claims and the several views illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a vertical central longitudinal section through the improved sheet stacking apparatus.

Figure 2 is a plan view, and part horizontal section, parts of the sheet reversing devices being broken away.

Figure 3 is a vertical cross section taken on the line 3—3 on Figure 2.

Figure 4 is a horizontal section taken on the line 4—4 of Figure 1.

Figure 5 is an enlarged detail plan view illustrating the sheet fall balancing, spring loaded guide.

Figure 6 is a left side elevation of the guide shown in Figure 5.

Figure 7 is an enlarged right side elevation illustrating the sheet reversing means.

Figure 8 is a fragmentary detail perspective view illustrating one of the upper roller bearings of the sheet reversing means.

Figure 9 is a plan view illustrating the reversing means shown in Figure 7, parts being broken away and in section.

Figure 10 is an enlarged plan view illustrating the means for feeding the sheets into the stacking devices, either directly, or through the sheet reversing means.

Figure 11 is a detail vertical cross section taken on the line 11—11 on Figure 10.

Figure 12 is a detail vertical cross section taken on the line 12—12 on Figure 10.

Figure 13 is a fragmentary plan view illustrating one of the laterally adjustable supporting guides for engaging and aligning the lateral edges of the sheets as they are falling.

Figure 14 is a detail vertical cross section taken on the line 14—14 on Figure 13.

Figure 15 is an enlarged fragmentary vertical cross section illustrating one of the sheet guiding and forking assemblies.

Figure 16 is a detail vertical cross section taken on the line 16—16 on Figure 15.

Figure 17 is a detail vertical cross section taken on the line 17—17 on Figure 15.

Figure 18 is a plan view illustrating the drive for the lifting and lowering screws, parts being broken away.

Figure 19 is a rear edge view of the parts shown in Figure 18.

Figure 20 is an inside face view of one of the skid supports and the cooperating lifting and lowering screw, the guide column supporting slide devices being shown in dot and dash line phantom.

Figure 21 is a vertical cross section taken on the line 21—21 on Figure 20.

Figure 22 is a plan view illustrating the means for adjusting the laterally spaced relation of the skid supports, the supporting frame structure being shown in dot and dash line phantom.

Figure 23 is a right side elevation of the parts shown in Figure 22.

Figure 24 is an enlarged detail elevation illustrating the means for automatically controlling the lowering of the skid step-by-step, parts being broken away and in section.

Figure 25 is an inside edge view of the parts shown in Figure 24.

Figure 26 is a detail horizontal section taken on the line 26—26 on Figure 24.

Figure 27 is a detail vertical cross section illustrating the control dashpot.

Figure 28 is an enlarged detail horizontal section illustrating one of the air and spring actuators for the fork means, and the control therefor.

Figure 29 is a vertical longitudinal section taken on the line 29—29 on Figure 28.

Figure 30 is a detail vertical cross section taken on the line 30—30 on Figure 29.

Figure 31 is a somewhat diagrammatic vertical cross sectional view illustrating the cooperative relation and mounting of the upper and lower limit switches which serve to discontinue operation of the skid lifting and lowering screws at the upper and lower limits of the skid travel.

Figure 32 is a somewhat diagrammatic right side elevation illustrating the arrangement of the several electrical controls embodied in the improved apparatus.

Figure 33 is a wiring diagram illustrating one acceptable manner of electrically connecting the several controls shown in Figure 32.

In the example of embodiment of the invention herein disclosed, there is included a frame structure having corner standards 5 which are adjustable as to height, as at 6, and connected intermediately of their height by side frame pieces 7. At their upper ends the corner standards are connected by side frame pieces 8, by a front end piece 9, and by a rear end piece 10. Each of the end pieces 9 and 10 carries a slide guide 11, the purpose of which will become apparent as the description progresses. See Figures 1, 2, 3 and 32.

Sheet feeding means

The means for receiving the sheets from the wickets of an oven, or from other delivery means is best illustrated in Figures 1, 2, 10 and 12 of the drawings. Mounted in brackets 12 affixed as at 13 to the front end frame piece 9 are a pair of upper and lower shafts 14 which are gear coupled as at 15 and equipped with cooperating gripping rolls 16. A rod 17 is rockably mounted in the brackets 12 in the manner clearly illustrated in Figures 10 and 12, and said rod is rockably adjusted as at 18 and has two diverter bars 19 fixed thereon. As will become apparent hereinafter, when the diverter bars 19 are elevated in the manner illustrated in Figures 1 and 12 they will serve to divert sheets passing through the grip rolls 16 upwardly into inverting means to be described hereinafter, and when the bars 19 are lowered, sheets passing through the grip rolls 16 will pass directly to the stack without being inverted.

Two triangular support frame members 20 are provided and are pivotally supported on the lower shaft 14 and are connected by a slotted channel member 21. Sheet edge guides 22 are laterally-adjustably mounted as at 23 on the transverse channel member 21, and said channel member, also serves as a mounting for a center support bar 24, the same being secured thereon as at 25.

The support frame members 20 have bearings 26 thereon in which a cross shaft 27 is rotatably mounted, and a magnet roll 28 is secured on said cross shaft. Small pulleys 29 are laterally-adjustably mounted as at 30 on the cross shaft 27, and said shaft also is equipped with a driving sprocket 31. Feeder belts 32 take over the pulleys 29 and over pulleys 33 which idle over studs 34, the latter being laterally-adjustably mounted as at 35 in arms 36 extending from the frame members 20.

It will be apparent by reference to Figure 12 that a cross rod 37 connects the frame members

20 at their lower extremities and said rod is equipped with depending lug means 38 which engage between abutments 39 adjustably mounted on stud means 40 secured to the main frame structure. It will be apparent that by altering the positions of the abutments 39, the whole sheet infeeding means can be tilted upwardly or downwardly about its pivotal mounting on the lower cross shaft 14.

A large pulley 41 is secured on the upper cross shaft 14 and rotation is imparted through this pulley to the sheet infeeding means in a manner which will become apparent hereinafter. The sprocket 31 on the magnet roll shaft is driven by a chain 42 trained over the sprocket 43 on the lower cross shaft 14 and said shaft 14 is equipped with a sprocket 44 from which the sheet inverting means to be described hereinafter is driven through a chain 45. As previously stated, the upper and lower cross shafts 14 are gear coupled as at 15, and the pulley 41 on the lower cross shaft may be driven by a belt 46 from a pulley 47 secured on the drive shaft of the infeed driving motor which is adjustably mounted as at 49 on the frame structure in the manner clearly illustrated in Figure 32.

Sheet inverting means

The sheet inverting means is best illustrated in Figures 1, 3, 7 and 9 from which it will be apparent that the frame side members 8 support upright frame members 50 whereon are supported two upwardly inclined frame channels 51 having bearing brackets 52 secured on their lower end portions. The brackets 52 support bearings 53 in which two shafts 54 are rotatably mounted, said shafts being gear coupled as at 55. The lower shaft 54 is equipped with a sprocket 56 to which rotation is imparted by the previously described chain 45 from the sheet infeeding means. The shafts 54 also are equipped with pulleys 57.

The frame channels 51 have brackets 58 secured to their upper end portions, and said brackets support two cross shafts 59 about which pulleys 60 idle. Upper and lower belt sets 61 take over the upper and lower pulley sets 57 and 60, and over pulleys 62 idling over lower cross shafts 63 secured to the frame beams 51 and upper pulleys 64 which idle over upper cross shafts 65 resting in forked bearings 66 affixed to the channel members 51. It will be apparent by reference to Figures 1, 7 and 8 that the trunnions of the shafts 65 rest freely on the forked supporting brackets 66, and the weight of the pulleys 64 will yieldably press the lower flights of the upper belts 61 against the upper flights of the lower belt 61 or any sheet which may be passing between the same.

Hanger rods 67 are suspended from the lower cross shafts 63 and serve a purpose to be described hereinafter.

The upper brackets 58 have supporting angles 68 attached thereto, and these and the upper cross shaft 59 serve to support side and intermediate sheet reversing guides 69 and 70 in the manner clearly illustrated in Figures 1, 2, 8 and 9. All of the side and intermediate guides 69 and 70 are connected by a cross rod 71 and are additionally supported as at 72 on the rear frame piece 10. The side guides 69 may have side closure plates 73 attached thereto, as at 74, and inner guides 75 also may be provided and supported in spaced relation within the guides 69 and 70 in the manner illustrated in Figure 1.

Skid supporting assemblies

At each side of the machine a skid supporting assembly is mounted, said assemblies being laterally-adjustable so as to permit the varying of the spaced relation thereof. These assemblies are best illustrated in Figures 1 to 4, and 20 to 23, and each includes two transverse angle members 76 which are slidable over the frame guides 11 and connected by a rigid longitudinal member 77. Keepers are secured to the angles 76 and engage under the guides 11 serving to prevent upward movement of the assemblies.

A shelf 79 is secured in horizontal position on each longitudinal member 77, as by welding, and each said shelf is equipped with two upstanding guide sleeves 80 from which supporting and guiding columns 81 depend in the manner indicated in Figures 3, 20 and 21. Sleeve members 82 are vertically slidable on each cooperating pair of columns 81, and each cooperating pair of sleeves is connected by an angle member 83 to which a supporting plate 84 is attached in depending relation as shown in Figures 20 and 21. A skid supporting angle 85 is secured to the lower edge portion of each support plate 84 with its horizontal flange portion inwardly directed, and the outwardly directed flange of each angle member 83 is apertured to receive an adjuster screw 86 in the manner clearly illustrated in Figure 21. Each adjuster screw is threaded through a support sleeve 87 beneath the horizontal flange of the respective angle member 83, and each said sleeve has a ball head 88 engaged in a ball socket formed in a socket member 89 secured to said angle member flange. A pin 90 extends through each socket member and engages in a recess in the ball head so as to secure the sleeve against rotation while permitting a limited amount of freedom of the ball to move in the socket. This ball and socket arrangement provides sufficient flexibility to eliminate the necessity of very accurate machining, and it is preferred that the screws be of the double thread type so as to bring about rapid lifting and lowering of the skids. Such threads of one-half inch pitch having a helix angle of about eight degrees have been found practical.

At its upper end each screw has a reduced actuator end portion 91 and is rotatable in a bearing 92 secured on the respective shelf 79, being held against upward movement by a collar 93 secured thereon immediately beneath the shelf 79. The particular means for driving the screws and the operation thereof will be described in detail hereinafter.

Two transverse adjuster screws 94 having reversed threads 95 and 96 at their respective ends are held captive and are rotatably supported in bearings 97 provided therefor on the supporting frame structure in the manner clearly illustrated in Figures 22 and 23. These screws are caused to turn in unison by a sprocket and chain couple 98, and one thereof has a crank 99 secured thereto. The longitudinal members 77 are apertured as at 100 to allow the screws 94 to pass there-through, or in other words to permit said members 77 to partake of lateral movement of adjustment relative to said screws. Longitudinal channel members 101 are secured as at 102 to each pair of angle members 76 and adjuster sleeves 103 through which the screws 94 are threaded, are secured, as at 104, to each channel member 101. Thus it will be apparent that as the crank 99 is manually rotated the screws 94 will be

caused to rotate in unison by reason of the chain and sprocket couple 98. As the crank 99 is rotated in one direction, the skid supporting assemblies, including the lifting and lowering screws 86 will be moved apart, because of the engagement of the reversed threads 95, 96 in the nuts 103, and when the crank is turned in the opposite direction said assemblies will be moved toward each other.

The longitudinal channel members 101 also serve as supports for side guides 105 which are secured to and depend from said channels in the manner clearly illustrated in Figure 3. Each said guide is horizontally slotted as at 106 to adjustably receive the slotted end extensions 107 of an edge fall guide 108. See Figures 1, 3, 13 and 14. It will be apparent by reference to Figures 2 and 3 that as each sheet is fed longitudinally between the side guides 105 it will fall onto the guides 108 while it is moving longitudinally, and said guides will cause it to bow downwardly and control the falling thereof between the side guides 105 and onto the receiving stack. It will be apparent by reference to Figure 13 that the guide end extensions 107 are provided with scales 109 so that the degree of projection inwardly of the guides 108 can be accurately adjusted and secured through the medium of the adjuster screws 110 which pass through the transverse slots in said end extensions and are threaded into brackets 111 which are secured, as by welding, to the channel members 101. The side guides 105 may be flared as at 112 at their receiving ends in the manner clearly illustrated in Figures 2 and 13.

Lowering and lifting screw driving means

The lowering and lifting screw driving means is best illustrated in Figures 2, 3, 18 and 19. A large sprocket 113 is secured on the upper end of each of the lowering and lifting screws 96, and these sprockets are driven by a chain 114 which is caused to engage about a considerable portion of the periphery of each said sprocket at one side only as illustrated in Figure 18 by the peculiar positioning of a guide sprocket 115. One such guide sprocket 115 is associated with each of the large sprockets 113 and is mounted at the free end of a carrier 116 having its other end fixed as at 117 atop one of the sleeves 80 with which the particular adjuster screw 86 is mounted in assembly. The chain 114 also passes over a driver sprocket 118 secured on the uprightly disposed driver shaft of a reversible motor 119 which preferably is of the brake equipped type so that it will stop quickly when the motor power circuit is broken. At the opposite side of the apparatus the chain passes over an idler sprocket 120 mounted on a shaft 121 which is rotatable in a bearing carried by a supporting plate 122. The plate 122 is pivoted as at 123 on the frame structure, and a compression spring 124 interposed between said plate and the opposing portion of the frame structure serves to constantly urge the plate and the supported sprocket 120 in a direction for tightening the chain. It will be noted that the large driven sprockets 113 engage at one side only with opposite flights of the chain 114. The driver sprocket 118, the adjacent guide sprocket 115, and the large driver sprocket 113 at one side of the apparatus bear identical but reversed relation to the arrangement of the idler sprocket 120, the guide sprocket 115 and the large driven sprocket 113 at the other side of the apparatus. The driver sprocket 118 is fixedly sup-

ported on the frame structure, and so is the idler sprocket 120, except for the limited amount of yield permitted by the tightening spring 124, but the unit assemblies, each comprising the two sleeves 80, the support 116, guide sprocket 115 and driven sprocket 113 as shown at the right and left hand side respectively in Figure 18, are capable of being moved apart or brought together by manipulation of the screws 94 so as to vary the spacing of the sheet guides 105. During such movement of adjustment, the sprockets 115 and 113 of each unit assembly will merely move along the respective flight of the chain 114 without any necessity of varying the length of the chain, and while maintaining the driving relation between the chain flights and the sprockets 113 and the desired chain arranging function of the guide sprockets 115. It will also be apparent that the adjuster screws 86 are driven in unison and in like direction regardless of the direction of rotation of the driver sprocket 118.

The longitudinal flights of the chain intermediately of the large driven sprockets 113 are supported in U-shaped guides 125 which are mounted on rods 126 supported on the lower ends of the previously described angle rods 67 which depend from the lower pulley shaft 63 in the manner clearly illustrated in Figures 1, 3, 13 and 19 of the drawings.

Front and rear sheet guides and sheet supporting fork assemblies

The apparatus also is provided with front and rear sheet guides which are mechanically adjustable as to spacing in unison with projectable and retractable sheet supporting forks designed to temporarily support sheets while a skid and a collected stack of sheets are being removed and replaced by an empty skid. The arrangement of these parts is best illustrated in Figures 1, 4 and 15 to 17. The rear sheet guide is generally designated 127 and the front guide is generally designated 128. One or both of said guides may include a yieldably mounted buffer plate 129 as in Figure 15, and each includes a horizontal shelf portion 130 in the manner clearly illustrated in Figure 1.

Each of the guides 127 and 128 is secured at 131 on an angle member 132 having a pair of support rods 133 projecting therefrom and slide guided in long cylindrical guides 134 provided on a support casting 135 which is secured to the respective frame member 9 or 10. See Figures 1 and 4. Each pair of support rods 133 is connected as at 136 and may be manually shifted to impart movement of adjustment to the guides 127 and 128, thereby to vary the spaced relation of said guides. A hand screw 137 mounted on each of the rod guides 134 may be utilized to secure the particular adjustment of the guides 127 and 128.

When a yieldable buffer 129 is to be employed it is supported on upper short guide rods 138 and lower long guide rods 139, all said rods being slide guided as at 140 in the respective main guide plate 127 or 128, and the lower long rods 139 being extended and having reduced end extremities 141 slide guided as at 142 at the ends of the respective rods 133. The rods 139 are provided with abutments 143, and cushion springs 144 interposed between the abutments 143 and the guides 142 serve to yieldably project the buffer 129 in the manner clearly illustrated in Figure 15.

Each of the angle members 132 also serves as a fork support, having three angle members 145

secured at 146 to depend therefrom, and to each of the members 146 a pair of spaced guides 147 equipped with vertically spaced antifriction rollers 148 is attached. See Figures 15 and 16. Each guide 147 serves to shiftably support a fork member 149, and each fork member is equipped at its inner end extremity with a roller 150, the periphery of which extends slightly above the fork and beyond the end extremity thereof. The three forks of each set are connected by a cross head 151, and the central guides 147 of each set of fork guides support a pair of depending brackets 152 in which an air cylinder 153 is securely clamped in the manner clearly illustrated in Figures 15, 28 and 29 of the drawings. A piston 154 is slidable in the cylinder 153 and is connected by a rod 155 with the particular cross head 151. Retractable springs 156 connected to the cross head 151 and anchored at 157 on the respective cylinder constantly tend to project the forks into position for intercepting sheets falling between the guides 125, 105 and 127, 128 or in other words to move the piston 154 to the left as viewed in Figure 28. A vent 158 is provided in the outer end of each cylinder 153, and the other end of the cylinder opens through a duct 159 into a cross bore 160 wherein a valve 161 is slidably mounted. It will be apparent by reference to Figure 29 that each valve is equipped with an L-shaped exhaust duct 162, and with an inlet duct 163 extending transversely therethrough. In one position of the valve, the exhaust duct 162 will register with the cylinder port 159, and in the other position of the valve the inlet duct 163 will communicate with the inlet port of the cylinder and open communication with the inlet port 164 which communicates with a source of air or other fluid pressure (not shown). The effective size of the inlet port 164 may be varied by adjustment of the threadably mounted plug 165.

Each valve 161 is connected as at 166 with an actuator lever 167, the latter being pivoted as at 168 at one end on the respective cylinder, and connected at 169 at its other end with the core 170 of a solenoid 171. It is to be understood that the solenoids 171 are suitably connected in a control circuit so that they may be controlled, manually or automatically. When the solenoids are energized the valves 161 will be placed in position for directing fluid pressure into the cylinders and causing the pistons to move outwardly and retract the forks from their sheet intercepting positions, and whenever the solenoid energizing circuits are broken the lever 167 will be spring shifted to the cylinder exhausting position illustrated in Figure 29 whereupon the springs 156 will be effective to project the forks into position for intercepting and temporarily collecting sheets being fed into position between the guide members 105, 105 and 127, 128.

Automatic skid increment lowering control.

The angle member 132 on which the front guide plate 128 and the associated forks are shiftably mounted also serves as a support for devices effective to automatically control the step-by-step lowering of the skid supports. See Figures 1, 4 and 24 through 27. A supporting plate 172 is secured at 173 to a bracket 174 which is affixed to the particular angle 132. On the plate 172 is mounted a bracket 175 whereon is supported a switch 176 which is normally open and which when closed completes a circuit

through the motor 119 effective to rotate the screws 86 in a direction for lowering the skid supports. The switch 176 includes the usual actuator plunger 177.

A control lever 178 is pivotally suspended at 179 on the plate 172 and includes a downwardly and inwardly inclined edge portion 180 presented toward the falling sheets for contact therewith. The lower or free end of the lever 178 is connected by a multiple of pivotally connected and slotted links 181 with a head 182 to which a short uprightly disposed leg 183 of a bell crank lever is pivoted as at 184. The end extremity 185 of said lever leg is presented for contact with the upper free end of an upright switch actuator lever 186 which is pivotally supported as at 187 at its lower end on the plate 172. Intermediately of the ends thereof the actuator lever 186 carries an adjustably mounted switch actuator lug 188 in position for engaging at times with the switch plunger 177 for closing the screw driving motor circuit through said switch in the manner before stated.

The bell crank lever is pivoted at 189 to a hollow plunger 190 which is telescoped and slidable in a sleeve 191 equipped with an actuator head 192 having a downwardly and inwardly inclined upper portion and a downwardly and outwardly inclined lower portion presented in position for being engaged by falling sheets and sheets accumulating on the skid directly beneath the previously mentioned lever 178. A compression spring 193 is interposed between the telescoped plunger 190 and sleeve 191, and constantly tends to separate them. The plunger and sleeve assembly 190, 191 is slidably mounted in a bearing block 194 which is secured as at 195 on the plate 172, and compression springs 196 interposed between the head 192 and the bearing block and mounted in sockets 197 in said block constantly tend to move the head 192 inwardly, or to the right as viewed in Figure 24. It will be noted that the lever 178 and the head 192 project into the space in which the stack of sheets is collected through a slotway 198 formed in the guide plate 128.

A pin 199 fixed to the plunger 190 projects through a longitudinal slot 200 in the sleeve 191 and into a longitudinal slot 201 formed in the block 194. This pin and slot arrangement permits limited movement of the sleeve independently of and over the plunger 190, and also movement of both the plunger and sleeve in the receiving bore formed in the block 194.

A light compression spring 202 surrounds the links 181 between the lever 178 and the link head 182 and serves to yieldably hold the links extended, and to yieldably project the sheet engaging portion of the lever 178 into the sheet contacting position through the guide slot 198.

The long, generally horizontally disposed leg 203 of the bell crank lever is pivoted as at 204 to the lower end of the plunger 205 depending from the dash piston 206 which has a loose dash fit in the inverted dash pot 207 which is attached as at 208 to the plate supported bracket 209. An adjustably anchored retractile spring 210 is connected with the long leg 203 of the bell crank lever and serves to yieldably hold said lever and the dash piston in the position illustrated in Figures 24 and 27.

It is to be understood that when the sheet stack receiving skid is mounted on the supporting angles 85 and elevated to the position in which it starts normal receiving of sheets in the accumulation

of the desired stack will have its upper or sheet supporting surface approximately at the level of the lower edge extremity of the yieldably projected control head 192. The control devices are such that each time an increment of sheets extends high enough above the supporting level of the skid to constantly engage with and displace lever 178, said controls will act to automatically close the power circuit connected with the motor 119 to drive the screws in a direction for lowering the skid supports, and thus the screws will be so rotated and will bring about a lowering of the skid a distance sufficient to move the accumulation of sheets down out of displacing contact with the control lever 178 and the control head 192. This step-by-step lowering of the skid is repeated during the normal accumulation of sheets on the skid. The light spring 202 and the slotted link connections 180 permit momentary deflections of the lever 178 incidental to the dropping of a sheet therepast, and the light spring equipment 193 and the pin and slot arrangement 199, 200 similarly permits free displacement of the head 192 incidental to the dropping of individual sheets without such displacement of the actuator lever 186 as will shift the switch plunger and close the skid lowering power circuit through the motor 110. The action of the dash piston 206 in the dash pot 207 and the adjusted tension of the spring 210 resists such sustained movement of the bell crank lever 183, 203 as would be necessary to bring about a switch actuating movement of the lever 186, and thus the contact of the individually dropping sheets with the lever 178 and head 192 will not bring about a closing of the switch. Such movement of the switch actuating lever can be accomplished only by sustained displacements of the lever 178 and head 192 which will result in a movement of the bell crank fulcrum 189 and the upright leg 183 of the bell crank a considerable distance to the left as viewed in Figure 24. This will be accomplished by the accumulation of sheets on the skid sufficient to displace the head to the left the distance permitted by the pin and slot arrangement 199, 201 and the similar holding of the lever 178 to the left. This displacement of the lever extremity to the left with the bell crank fulcrum 189 moved to the left, and the sustaining of the displacement of the lever 178 and the head 192 will permit the necessary downward movement of the dash piston 206 in the dash pot 209 and result in a shifting of the actuator lever 186 sufficient to displace the switch plunger 177 and close the skid lowering circuit through the switch 176 and the motor 119.

If desired, the offcenter contact of the sheets with the control lever 178 may be counteracted by the provision of a yieldable sheet fall retarder 211, the relation of the lever 178 and said retarder 211 being illustrated in Figure 4, and the retarder and the mounting thereof being illustrated in detail in Figures 5 and 6. The retarder 211 is projected through a slot 212 in the rear guide plate 127, and is hingedly connected as at 213 to a bracket 214 which is secured at 215 on said plate. A compression spring 216 acting against the retarder and an abutment member 217 serves to yieldably hold the retarder 212 in place with its limiting shoulder 218 in contact with the guide plate 127 in the manner illustrated in Figure 5.

In Figures 31 and 32 of the drawings the general arrangement of the electrical control devices is somewhat diagrammatically illustrated. A low-

er limit switch 219 may be provided for automatically stopping the downward movement of the skid supporting devices when the skid reaches the desired lower lever at which it may be removed by the usual truck with the accumulated stack thereon. The switch 219 is suitably connected at the skid lowering circuit of the motor 119 and is supported at 220 on one of the skid supporting plates 84 with its plunger 221 presented for actuation by the adjustable lug 222 carried by the upright lug 223 of the skid tripped lever 224 which is intermediately fulcrumed as at 225 on a support plate 226 attached to the pin support angle 85 and has its free end turned upwardly as at 227 and presented through a clearance 228 in position for having the skid rest thereon. It will be apparent by reference to the lower portion of Figure 31 that so long as the skid is resting on the control lever end 227 and displacing the same downwardly, the lug 222 will be pressed into circuit closing contact with the switch button 221. Whenever the skid supports have been lowered sufficiently to cause the skid to rest on the ground and thus relieve the lever end 227 of its weight, the switch button 221 will be free to move outwardly and break the skid lowering circuit through the motor 119.

The upper angle 83 on the particular skid supporting unit has a cam 229 attached thereto in position for engaging with a roller 230 mounted on the actuating plunger 231 of an upper limit switch 232 which is supported as at 233 on the longitudinal member 77 of the particular slide skid supporting assembly. The switch 232 is of the normally closed type and contact of the cam 229 with the roller 230 will actuate the switch plunger 231 to open the skid lifting circuit through the motor 119 and discontinue the rotation of the screws 86 effective to lift the skid supporting devices.

In the diagrammatic illustration in Figure 32 there is illustrated a manual control 234 for operating the motor 119 and the screws 86 for lifting or lowering the skid supports, and a manual control for the feed-in motor 48 is indicated at 235.

Operation

When the invention is used in the stacking of sheets being conveyed through a baking oven, the sheets will be understood as being conveyed toward the right as viewed in Figure 1, and as the conveyor chains pass about the supporting sprockets the sheets will gradually be turned from the erect position in which they are supported by the wickets into a horizontal position in which they will be deposited on the feed-in devices shown at the left in Figure 1. The sheet portion projecting radially beyond the outer edges of the wicket will come down upon the magnetic roll 28, and if portions of said sheet are projecting laterally beyond the sides of the wicket they will come down upon the auxiliary belts 32. The magnetic roll 28 alone, or said roll in combination with the auxiliary side belts 32 will rapidly feed the sheet away from the wicket and over the guide means 24 and the guide ledges between the side guides 22 and present the advance edge thereof between the grip rolls 16 which will feed the sheet into the stacking apparatus.

If the sheet is to be inverted, the rod 17 is adjusted as to position so as to place the diverters 19 in the position illustrated in Figures 1 and 12. This will serve to direct the sheet upwardly between the opposing belt sets 61, and into the curved guides 75, 70 which will invert the sheet

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and direct the same into the receiving space between the side guide plates 105, 105 and the front and rear guide plates 128, 127. If the sheets are not to be inverted the rod 17 is adjusted so that the diverters 19 will rest upon the shelf portion 130 of the front guide 128, and the sheets will thus be delivered directly into the receiving space between the side and end guide plates without moving through the inverting devices.

Regardless of whether the sheets are fed directly into the receiving space, or indirectly through the inverting means, they are received while travelling longitudinally between the side guide plates 105 and on the receiving ledges 108 supported thereon in the manner illustrated in detail in Figures 1, 3 and 13 of the drawings. While thus travelling over and falling through between the ledges 108 the sheets are bowed slightly before they fall completely beneath said ledges, and in this manner a measure of rigidity is imparted to the travelling sheets and they are caused to fall evenly and flatwise onto the stack which is accumulating on the skid supported by the elements 85. It is to be understood that during the accumulation of a stack of sheets the skid is initially supported by the members 85 approximately at the lower extremities of the guide plates 105, 105, 128, 127, or in other words just beneath the control elements 178 and 192 illustrated in detail in Figure 24.

As each sheet falls onto the stack it will momentarily deflect the control devices 178 and 192 without tripping the lever 186 so as to close the switch 176 and start the motor 119 and the rotation of the lowering screws 86. As previously described this free deflection of the control elements 178 and 192 is made possible by the yieldable mounting of these elements, the initial placement of the bell crank lever pivot 189 out of effective position, and the resistance which the dash-piston offers to sudden movements of the control devices 178 and connected parts. However, as the stack starts to accumulate on the skid, the accumulated sheets will engage and hold the head 192 displaced whereas the lost motion provided by the slot 200 will be taken up and the sleeve and plunger assembly will be shifted to the left the distance permitted by the slot 201 so as to place the lever fulcrum 189 in effective position. Continued accumulation of sheets will engage and hold the control member 178 in displaced position, and the sustained pressure through the spring 202 will gradually overcome the resistance of the dash-piston 206 and shift the switch lever 186 to the left as viewed in Figure 24 a distance sufficient to close the switch 176 and start the motor 119. The resulting rotation of the supporting screws 86 will lower the supports 85 and the skid and accumulated sheets thereon, and with the sheets removed from displacing contact with the head 192 and the control member 178 said head and member will return to their normal control position, the switch 176 will again open and the rotation of the screws will be discontinued. This step-by-step lowering of the skid will be repeated until finally the skid will come into contact with the floor. With the supports 85 thus relieved of the weight of the skid and the accumulated sheets, the depression of the switch control lever end 227 (Figure 31) will be discontinued and the control switch 219 will be opened so as to break the control circuit through the screw driving motor 119 and discontinue the lowering of the skid supporting devices 85.

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At this time it becomes necessary to remove the loaded skid and replace the same with an empty skid. In order to accomplish this the fork devices shown at 149, 150 in Figures 1, 4 and 15 to 17 are projected into the sheet receiving space so as to intercept and support the feeding sheets temporarily while an empty skid is being placed upon the supporting devices 85 and moved into sheet receiving position. This projection of the forks can be accomplished by automatic or manual control. As before described, by energizing the solenoids 171 the valves 161 associated with the fork control cylinders 153 will be positioned as shown in Figure 29 and air will now be permitted to exhaust from the cylinders so that the projection of the forks will be effected by the retractile springs 156.

When an empty skid has been placed upon the skid supports 85 and the motor 119 has been operated to drive the screws 86 in a direction for lifting the skid supports to place the skid in the previously described initial, sheet receiving position, the fork devices 149, 150 will again be retracted so that the limited number of sheets collected thereon will be deposited on said skid and the skid will take over the normal collection or stacking of sheets. This retraction of the fork devices also may be either manually or automatically controlled and is accomplished by again energizing the solenoids 171 to bring about a shifting of the valves 161 to bring the duct 153 into communication with the fluid pressure ducts 164, 159. With the valves thus positioned, pressure fluid entering the cylinders 153 will drive the pistons 154 to the outer ends of the cylinders as shown in Figure 28, and this will serve to retract the fork devices.

As previously described, the lifting and lowering screw driving motor 119 is of the reversible type, and the manual control devices 234 shown in Figure 31 may be utilized to operate the motor to bring about a lowering or lifting of the skid. As previously described the contact of the skid support carried cam 229 with the switch control devices 230, 231 of the upper limit switch 232, shown in Figure 32, may serve to automatically break the power circuit to the screw driving motor 119 so as to discontinue movement of the skid supporting devices when the skid has reached the upper limit of its travel.

In Figure 33 there is shown a wiring diagram illustrating one manner of electrically connecting the several control devices. In this example illustration the power input lines and the conductor lines connecting the several control devices are clearly shown, a master switch being connected in said power input lines. Briefly summing up the operation in light of this diagram it can be stated that when the switch 235 is closed, power will be supplied to the motor 48 for driving the same and bringing about the feeding of sheets into the apparatus, assuming, of course, that the main switch in the power input lines has been closed. At this time a skid will be supported in position for receiving sheets a short distance below the level of the control devices 178 and 192 associated with the control switch 176. When the predetermined, limited number of sheets have accumulated on the skid and the devices 178 and 192 have been sheet actuated to bring about a closing of the switch 176, the motor 119 will be operated to bring about a limited step lowering of the skid, the amount of this lowering being de-

terminated by the time interval necessary for the return of the control devices 178 and 192 to normal and the reopening of the switch 176. This step-by-step lowering of the skid will be continued until the desired bundle or stack of sheets has been accumulated on the skid.

At this time the operator pushes the "down" button of the control switch 234 to energize the motor 119 and bring about the desired lowering of the skid to the floor for removal and replacement, and at the same time the solenoids 170 and 171 are de-energized by action of the relay to allow the springs 156 to project the forks 149 into sheet intercepting and temporary supporting position in the manner previously described. These forks 149 will support the in-feeding sheets while the skid with the sheet stack thereon is removed and replaced by an empty skid. When the skid with the stack thereon reaches the floor the lowering supports will be relieved of its weight as previously described and the lower limit switch 219 will open and break the circuit through the motor 119 to discontinue the lowering of said supports.

After the skid and the stack thereon have been removed and replaced by an empty skid, the operator pushes the "up" button of the control switch 234 and the motor 119 will again be energized, this time being driven in a direction for lifting the supports and the empty skid thereon. When the skid has been lifted to the first described, upper limit position, the upper limit switch 232 will be actuated in the manner previously described and operation of the motor 119 will be discontinued and the relay will function to bring about an energizing of the solenoids 170 and 171. This will result in air being directed into the cylinders 153 to retract the forks 149 and allow the sheets temporarily accumulated thereon, and also the subsequently fed sheets, to fall onto the skid now in fully elevated position to receive them. The described operation cycle will then be repeated.

When it is desired to alter the spacing of the front and rear sheet guide plates 128 and 127 it is only necessary to release the securing screws 137 and shift the plate support plungers 133. When it is desired to alter the spacing of the guide plates 105, this can be accomplished by merely turning the crank 89 which serves to rotate the transverse adjuster screws 94 and impart movement of adjustment to said plates. It will be apparent that since the plates are mounted in rigid assembly with the skid supporting devices 77, 79, 81 and 76, said parts and also the lifting and lowering screws 86 will partake of the movement of adjustment of the said side plates 105.

While one form of the invention has been shown for purposes of illustration, it is to be clearly understood that various changes in the details of construction and arrangement of parts may be made without departing from the spirit and scope of the invention as defined in the appended claims.

We claim:

1. In apparatus of the character described, means for supporting a skid in position for receiving sheets thereon, means for guiding falling sheets to arrange them in a stack on a supported skid, means for receiving sheets and feeding them at a predetermined level to the guiding and supporting means, sheet inverting means disposed and constructed to deliver sheets directed therethrough in inverted condition at said level, means

controlled by the accumulation of sheets on said skid for automatically lowering the supporting means so as to maintain the top of the stack always approximately the same distance below said level and means placeable to bring about passage of sheets directly to the guiding and supporting means or indirectly through the inverting means.

2. In apparatus of the character described, means for supporting a skid in position for receiving sheets thereon, means for guiding falling sheets to arrange them in a stack on a supported skid, means for receiving sheets and feeding them at a predetermined level to the guiding and supporting means, sheet inverting means disposed and constructed to deliver sheets directed therethrough in inverted condition at said level, means controlled by the accumulation of sheets on said skid for automatically lowering the supporting means so as to maintain the top of the stack always approximately the same distance below said level means placeable to bring about passage of sheets directly to the guiding and supporting means or indirectly through the inverting means, and means for adjusting the position of the sheet receiving and feeding means to vary the elevation at which sheets will be received thereon.

3. In apparatus of the character described, means for supporting a skid in position for receiving sheets thereon, means for guiding falling sheets to arrange them in a stack on a supported skid, means for receiving sheets and feeding them at a predetermined level to the guiding and supporting means, sheet inverting means disposed and constructed to deliver sheets directed therethrough in inverted condition at said level, means controlled by the accumulation of sheets on said skid for automatically lowering the supporting means so as to maintain the top of the stack always approximately the same distance below said level, means placeable to bring about passage of sheets directly to the guiding and supporting means or indirectly through the inverting means, and means for adjusting the position of the sheet receiving and feeding means to vary the elevation at which sheets will be received thereon and the angle at which sheets will be fed thereby into the apparatus.

4. In apparatus of the character described, means for supporting a skid in position for receiving sheets thereon, means for guiding falling sheets to arrange them in a stack on a supported skid, and means for receiving sheets as from the wickets of an oven conveyor and feeding them at a predetermined level to the guiding and supporting means, said last named means including sheet guiding and supporting ledges, opposing grip rolls for receiving sheets moving over said ledges and feeding them to the guiding and supporting means, and magnetic roll means engageable by sheet portions extending radially beyond oven conveyor wickets and effective to move the sheets over said ledges and to said rolls, and means controlled by the accumulation of sheets on said skid for automatically lowering the supporting means so as to maintain the top of the stack always approximately the same distance below said level.

5. In apparatus of the character described, means for supporting a skid in position for receiving sheets thereon, means for guiding falling sheets to arrange them in a stack on a supported skid, and means for receiving sheets as from the wickets of an oven conveyor and feeding them

to the guiding and supporting means, said last named means including sheet guiding and supporting ledges, opposing grip rolls for receiving sheets moving over said ledges and feeding them at a predetermined level to the guiding and supporting means, magnetic roll means engageable by sheet portions extending radially beyond oven conveyor wickets and effective to move the sheets over said ledges and to said rolls, means controlled by the accumulation of sheets on said skid for automatically lowering the supporting means so as to maintain the top of the stack always approximately the same distance below said level, and a driven belt disposed longitudinally and beyond each end of the magnetic roll means in position to be engaged by and impart feeding movement to portions of sheets extending endwise beyond oven conveyor wicket ends.

6. Apparatus as defined in claim 5 in which there are provided frame sides on which the belts and the magnetic roll means are supported and which are pivotally supported at the axis of one of the grip rolls, a lug being attached to said frame sides, and there being included a distance piece rigidly mounted and having thereon spaced and adjustably mounted abutments for engaging at opposite sides of said lug so that by adjustment of the abutments along the distance piece the angle of projection of the frame sides and the parts supported thereon can be varied.

7. Apparatus as defined in claim 1 in which the sheet inverting means includes upwardly inclined conveyor belt means and arcuate guides for receiving the sheets from the conveyor belt means inverting them and directing them to the sheet guiding and supporting means.

8. Apparatus as defined in claim 1 in which the sheet inverting means includes upper and lower sets of upwardly inclined belts between which sheets are fed upwardly to arcuate guides effective to receive the sheets, invert them and direct them to the sheet guiding and supporting means, freely supported pulleys being engageable over the effective flights of the upper belts of the sets for the purpose of pressing said flights against underlying cooperating conveyor belt flights or sheets moving therewith.

9. Apparatus as defined in claim 1 in which there are included motor driven screws for lifting and lowering the skid supporting means, and sheet stack engaged control devices for controlling the motor to lower said supporting means a limited distance each time an accumulation of sheets of a predetermined amount is received on a supported skid.

10. Apparatus as defined in claim 1 in which there are included motor driven screws for lifting and lowering the skid supporting means, and sheet stack engaged control devices for controlling the motor to lower said supporting means a limited distance each time an accumulation of sheets of a predetermined amount is received on a supported skid, means for automatically discontinuing supporting means lowering operation of the screws when the supporting means reaches a predetermined low point, and means for automatically discontinuing supporting means lifting operation of the screws when the supporting means reaches a predetermined high point.

11. Apparatus as defined in claim 1 in which there are included means for lowering the skid supporting means a limited distance each time an accumulation of sheets of a predetermined amount is received on a supported skid, said last named means including a control switch held

closed during lowering of the skid supporting means by the weight of the skid and which automatically opens when the supporting means is lowered far enough to deposit the skid onto another support such as a floor so as to relieve said supporting means of the weight of said skid.

12. Apparatus as defined in claim 1 in which there are included motor driven screws for lifting and lowering the skid supporting means, and sheet stack engaged control devices for controlling the motor to lower said supporting means a limited distance each time an accumulation of sheets of a predetermined amount is received on a supported skid, and in which there are also included projectable and retractable fork devices effective when projected to support sheets temporarily while a skid and a sheet stack accumulated thereon are being unloaded and replaced by an empty skid.

13. Apparatus as defined in claim 1 in which there are included motor driven screws for lifting and lowering the skid supporting means, and sheet stack engaged control devices for controlling the motor to lower said supporting means a limited distance each time an accumulation of sheets of a predetermined amount is received on a supported skid, and in which there are also included projectable and retractable fork devices effective when projected to support sheets temporarily while a skid and a sheet stack accumulated thereon are being unloaded and replaced by an empty skid, and fluid pressure operated means for moving the fork devices in one direction and spring means for moving said fork devices in the opposite direction.

14. Apparatus as defined in claim 1 in which there are included motor driven screws for lifting and lowering the skid supporting means, and sheet stack engaged control devices for controlling the motor to lower said supporting means a limited distance each time an accumulation of sheets of a predetermined amount is received on a supported skid, and in which there are also included projectable and retractable fork devices effective when projected to support sheets temporarily while a skid and a sheet stack accumulated thereon are being unloaded and replaced by an empty skid, and spring means for projecting the fork means to their sheet supporting position and fluid pressure operated means for retracting said fork means.

15. Apparatus as defined in claim 1 in which the sheet guiding means includes a pair of side guide plates and a pair of front and rear guide plates, said side guide plates having horizontal longitudinal slots therein, and longitudinally disposed sheet guide ledges mounted for lateral adjustment in said slots in position for intercepting and bowing sheets as they are being fed and falling between said side guide plates.

16. Apparatus as defined in claim 1 in which the sheet guiding means includes a pair of side guide plates and a pair of front and rear guide plates, and in which there are also included projectable and retractable fork devices effective when projected to support sheets temporarily while a skid and a sheet stack accumulated thereon are being unloaded and replaced by an empty skid, said fork devices being mounted on and movable with one said pair of guide plates, and said one pair of guide plates being shiftable to vary the spacing thereof.

17. In apparatus of the character described, means for supporting a skid in position for receiving sheets thereon, means for guiding falling

sheets to arrange them in a stack on a supported skid, means for receiving sheets and feeding them to the guiding and supporting means, said sheet guiding means including a pair of side guide plates and a pair of front and rear guide plates, a pair of captive screws reversely threaded at their opposite ends and traversing the plates of one said guide plate pair in parallel spaced relation, nuts threaded on said screws and connected with the plates of said one pair, chain and sprocket means drive coupling said screws, and a crank on one screw for imparting rotation to the screws and movement of adjustment to the plates of said one pair to vary the spacing thereof.

18. In apparatus of the character described, means for supporting a skid in position for receiving sheets thereon, means for guiding falling sheets to arrange them in a stack on a supported skid, means for receiving sheets and feeding them to the guiding and supporting means, said sheet guiding means including a pair of side guide plates and a pair of front and rear guide plates, and said plates of each pair being shiftable relatively for varying the spacing thereof, and projectable and retractable fork devices effective when projected to support sheets temporarily while a skid and a sheet stack accumulated thereon are being unloaded and replaced by an empty skid, said fork devices being mounted on and movable with the plates of one said guide plate pair.

19. In apparatus of the character described, means for supporting a skid in position for receiving sheets thereon, means for guiding falling sheets to arrange them in a stack on a supported skid, means for receiving sheets and feeding them to the guiding and supporting means, said sheet guiding means including a pair of side guide plates and a pair of front and rear guide plates, said skid supporting means including a pair of laterally spaced support members each having a longitudinal ledge rest engageable under one side of a skid, a pair of support columns at each side and means slide guiding each said support member on one pair of the columns, and an upright captive screw threadably connected with each said support member and rotatable in a bearing having fixed relation to the respective pair of columns.

20. Apparatus as defined in claim 19 in which the support column, screw, bearing and support member assembly at each side is adjustably mounted so that the spacing of the support members and their lifting and lowering screws can be varied at will.

21. Apparatus as defined in claim 19 in which the support column, screw, bearing and support member assembly at each side is adjustably mounted so that the spacing of the support members and their lifting and lowering screws can be varied at will, and the guide plates of one pair being mounted on said assemblies to be laterally adjustable therewith.

22. Apparatus as defined in claim 19 in which the support column, screw, bearing and support member assembly at each side is adjustably mounted so that the spacing of the support members and their lifting and lowering screws can be varied at will, and the guide plates of one pair being mounted on said assemblies to be laterally adjustable therewith, said last mentioned guide plates having horizontal longitudinal slots therein, and longitudinally disposed sheet guide ledges mounted for lateral adjustment in said slots in position for intercepting and bowing sheets as

they are being fed and falling between said side guide plates.

23. Apparatus as defined in claim 19 in which the support column, screw, bearing and support member assembly at each side is adjustably mounted so that the spacing of the support members and their lifting and lowering screws can be varied at will, and the guide plates of one pair being mounted on said assemblies to be laterally adjustable therewith, and there being included means for imparting movement of adjustment to said assemblies and the guide plate mounted thereon and including a pair of captive screws reversely threaded at their opposite ends and traversing said assembly mounted plates, nuts threaded on said traversing screws and fixed to the assemblies, chain and sprocket means drive coupling said screws, and a crank on one screw for imparting rotation to the screws and movement of adjustment to the assemblies and the plate mounted thereon to vary the spacing thereof.

24. Apparatus as defined in claim 18 in which each guide plate and fork device assembly and its mounting includes a frame supported bracket having two horizontal cylindrical guides, a bracket upon which the guide plate is mounted and having plungers projecting therefrom and slidable in the cylindrical guides, means for securing the plungers at adjusted positions in the cylindrical guides, multiple guides supported by the bracket and having anti-friction slide bearings therein in which multiple fork members are slidably mounted for movement in a horizontal plane, said fork members being connected for movement in unison, and each said fork member having a roller at its advance end projecting beyond and above said advance end for anti-friction engagement with sheets.

25. Apparatus as defined in claim 19 in which the support column, screw, bearing and support member assembly at each side is adjustably mounted so that the spacing of the support members and their lifting and lowering screws can be varied at will, each said screw having a sprocket thereon, and there being included a screw driving motor mounted with its shaft upright and equipped with a driver sprocket at one side of the apparatus, an idler sprocket mounted at the other side of the apparatus, a driver chain passing about the driver and idler sprockets and about portions of the screw sprockets so as to present two flights thereof extending in generally parallel relation and in the direction of adjustment of said assemblies with one flight engaging one side only of one screw sprocket and the other flight engaging the opposite side only of the other screw sprocket, whereby as the spacing of the assemblies is varied the driver and idler sprockets retain their positions and the screw sprockets can move along the respective contacted flights without disturbing the driving contacts of the chain or varying the length thereof.

26. Apparatus as defined in claim 19 in which the support column, screw, bearing and support member assembly at each side is adjustably mounted so that the spacing of the support members and their lifting and lowering screws can be varied at will, each said screw having a sprocket thereon, and there being included a screw driving motor mounted with its shaft upright and equipped with a driver sprocket at one side of the apparatus, an idler sprocket mounted at the other side of the apparatus, a driver chain

passing about the driver and idler sprockets and about portions of the screw sprockets so as to present two flights thereof extending in generally parallel relation and in the direction of adjustment of said assemblies with one flight engaging one side only of one screw sprocket and the other flight engaging the opposite side only of the other screw sprocket, whereby as the spacing of the assemblies is varied the driver and idler sprockets retain their positions and the screw sprockets can move along the respective contacted flights without disturbing the driving contacts of the chain or varying the length thereof, and there also being included a guide sprocket mounted intermediate each screw sprocket and the adjacent driver or idler sprocket and bearing fixed relation to the adjacent screw sprocket and so positioned as to place the chain in driving contact about an extended arc of the respective screw sprocket circumference.

27. Apparatus as defined in claim 19 in which the support column, screw, bearing and support member assembly at each side is adjustably mounted so that the spacing of the support members and their lifting and lowering screws can be varied at will, each said screw having a sprocket thereon, and there being included a screw driving motor mounted with its shaft upright and equipped with a driver sprocket at one side of the apparatus, an idler sprocket mounted at the other side of the apparatus, a driver chain passing about the driver and idler sprockets and about portions of the screw sprockets so as to present two flights thereof extending in generally parallel relation and in the direction of adjustment of said assemblies with one flight engaging one side only of one screw sprocket and the other flight engaging the opposite side only of the other screw sprocket, whereby as the spacing of the assemblies is varied the driver and idler sprockets retain their positions and the screw sprockets can move along the respective contacted flights without disturbing the driving contacts of the chain or varying the length thereof, and there also being included a guide sprocket mounted intermediate each screw sprocket and the adjacent driver or idler sprocket and bearing fixed relation to the adjacent screw sprocket and so positioned as to place the chain in driving contact about an extended arc of the respective screw sprocket circumference, each said intermediately mounted idler sprocket being movable with the respective adjacent screw sprocket as the spacing of the assemblies is varied.

28. Apparatus as defined in claim 19 in which the support column, screw, bearing and support member assembly at each side is adjustably mounted so that the spacing of the support members and their lifting and lowering screws can be varied at will, each said screw having a sprocket thereon, and there being included a screw driving motor mounted with its shaft upright and equipped with a driver sprocket at one side of the apparatus, an idler sprocket mounted at the other side of the apparatus, a driver chain passing about the driver and idler sprockets and about portions of the screw sprockets so as to present two flights thereof extending in generally parallel relation and in the direction of adjustment of said assemblies with one flight engaging one side only of one screw sprocket and the other flight engaging the opposite side only of the other screw sprocket, whereby as the spacing of the assemblies is varied the driver and idler sprockets retain their positions and the screw sprockets can move

along the respective contacted flights without disturbing the driving contacts of the chain or varying the length thereof, and there also being included a guide sprocket mounted intermediate each screw sprocket and the adjacent driver or idler sprocket and bearing fixed relation to the adjacent screw sprocket and so positioned as to place the chain in driving contact about an extended arc of the respective screw sprocket circumference, and said first mentioned idler being mounted on a spring projected support effective to tension the chain.

29. Apparatus as defined in claim 19 in which the support column, screw, bearing and support member assembly at each side is adjustably mounted so that the spacing of the support members and their lifting and lowering screws can be varied at will, each said screw having a sprocket thereon, and there being included a screw driving motor mounted with its shaft upright and equipped with a driver sprocket at one side of the apparatus, an idler sprocket mounted at the other side of the apparatus, a driver chain passing about the driver and idler sprockets and about portions of the screw sprockets so as to present two flights thereof extending in generally parallel relation and in the direction of adjustment of said assemblies with one flight engaging one side only of one screw sprocket and the other flight engaging the opposite side only of the other screw sprocket, whereby as the spacing of the assemblies is varied the driver and idler sprockets retain their positions and the screw sprockets can move along the respective contacted flights without disturbing the driving contacts of the chain or varying the length thereof, there being included also sheet inverting means including supporting framing and upwardly inclined conveyor belt means and arcuate guides for receiving the sheets from the conveyor belt means inverting them and directing them to the sheet guiding and supporting means, means placeable to bring about passage of sheets directly to the guiding and supporting means or indirectly through the inverting means, horizontal guides for the parallel screw driving chain flights, and hangers suspended from the inverting means supporting framing for supporting said chain guides.

30. In apparatus of the character described, means for supporting a skid in position for receiving sheets thereon, means for guiding falling sheets to arrange them in a stack on a supported skid, means for receiving sheets and feeding them to the guiding and supporting means, motor driven means for lifting and lowering the skid supporting means, and sheet stack engaged control devices for controlling the motor to lower said supporting means a limited distance each time an accumulation of sheets of a predetermined amount is received on a supported skid, said control devices including a motor control switch, a switch actuator lever, an actuator element yieldably projected into the path of sheets falling onto a supported skid and momentarily displaceable by each falling sheet and adapted to be displaced and held displaced by contact therewith of sheets having accumulated on said skid up to the level of said actuator element, yielding connector means affording yielding contact between the actuator element and the switch actuator lever and serving to yieldably project said actuator element, and dash-pot means resisting sudden movement of the switch actuator lever but permitting movement thereof by force applied through said yielding connector to effect closing

of the motor control switch upon application of sustained pressure through said yielding connector means.

31. Apparatus as defined in claim 30 in which the yieldable connector means includes a pivoted bell crank lever having an upright leg contacting the switch actuator lever and connected by a yielding spring link interponent with the actuator element, said bell crank lever also having a generally horizontal leg connected with the dash-pot, and the bell crank pivot being supported normally in a position for placing the bell crank ineffectually and on a reciprocable plunger yieldably telescoped and projecting into the path of sheets falling onto and accumulating on the stack so as to be momentarily displaceable by falling sheets without effect on said pivot placement and held displaced by a predetermined accumulation of sheets to so place said pivot as to render the bell crank lever effective to transmit switch closing movement to the switch actuating lever.

32. In apparatus of the character described, means for supporting a skid in position for receiving sheets thereon, means for guiding falling sheets to arrange them in a stack on a supported skid, means for receiving sheets and feeding them to the guiding and supporting means, motor driven means for lifting and lowering the skid supporting means, and sheet stack engaged control devices for controlling the motor to lower said supporting means a limited distance each time an accumulation of sheets of a predetermined amount is received on a supported skid, said sheet guiding and arranging means including four upright guide plates arranged in opposed pairs, at least one of said plates being adjustable to vary the spacing of the plates, and said control devices being mounted on said adjustable plate for movement of adjustment therewith.

33. In apparatus of the character described, means for supporting a skid in position for receiving sheets thereon, means for guiding falling sheets to arrange them in a stack on a supported skid, means for receiving sheets and feeding them to the guiding and supporting means, motor driven means for lifting and lowering the skid supporting means, and sheet stack engaged control devices for controlling the motor to lower said supporting means a limited distance each time an accumulation of sheets of a predetermined amount is received on a supported skid, said control devices including a motor control switch having an actuator plunger, a switch actuator lever pivoted uprightly in position for

being swung against the switch plunger to actuate the same, an actuator head carried on a telescoped sleeve and plunger element assembly slide guided in a bearing block and spring projected into position for being contacted and displaced by sheets falling onto and accumulating on a skid, means permitting limited telescoping of the head bearing element over the other element of the assembly and for permitting limited movement of the assembly elements in unison away from the sheet intercepting position, a bell crank lever pivotally mounted on said assembly and including a generally horizontal leg and an upright leg; the free end of said horizontal leg being connected with a movement retarding dash-pot piston, an actuator element pivoted uprightly in position for being contacted and displaced by sheets falling onto and accumulating on said skid, pin and slot connected links connecting said actuator element with the free end of the upright bell crank lever leg, and spring means holding the links extended and the actuator element in sheet intercepting position and said free end of the bell crank lever leg in contact with the switch actuator lever, the falling of individual sheets past said actuator element and head serving to but momentarily displace them as their respective spring devices yield without swinging the bell crank lever because of the dash-pot resistance, whereas sustained displacement of said head and actuator element by sheets accumulated on the skid will first place the pivot effectively to permit the bell crank lever to swing the switch actuator lever and actuate the switch and then swing the bell crank lever against dash-pot resistance and so actuate the switch actuator lever.

SCOTT R. JOHNSON.

CHARLES TAYLOR WALTER.

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