July 3, 1928. 1,676,156

E. D. RADER

WIRE STITCHING FOLDING MACHINE

Filed Dec. 8, 1922 18 Sheets-Sheet 1

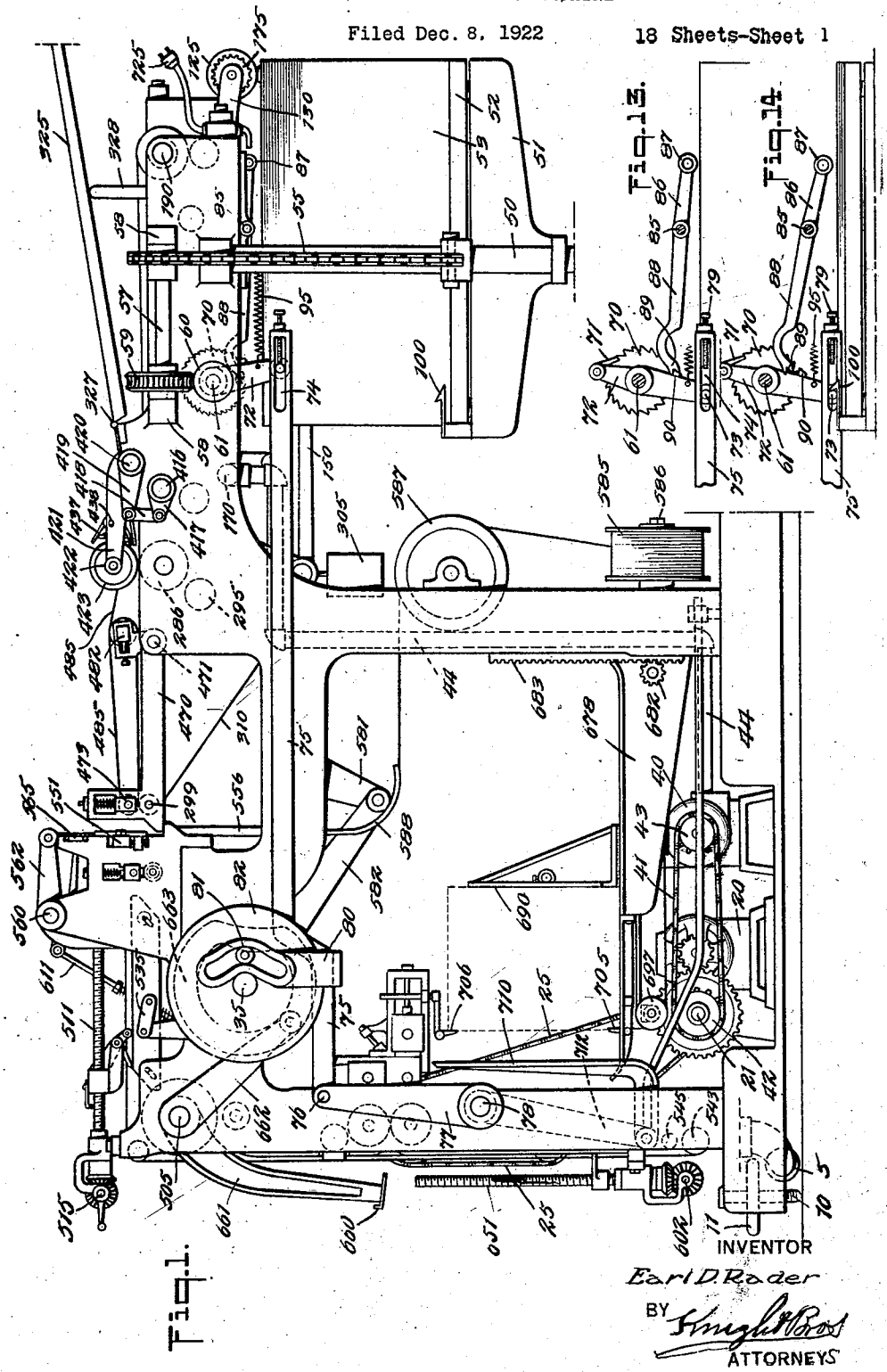


Fig. 1.

Fig. 13.

Fig. 14.

INVENTOR
Earl D. Rader
BY Knight Bros
ATTORNEYS

July 3, 1928. 1,676,156

E. D. RADER

WIRE STITCHING FOLDING MACHINE

Filed Dec. 8, 1922 18 Sheets-Sheet 2

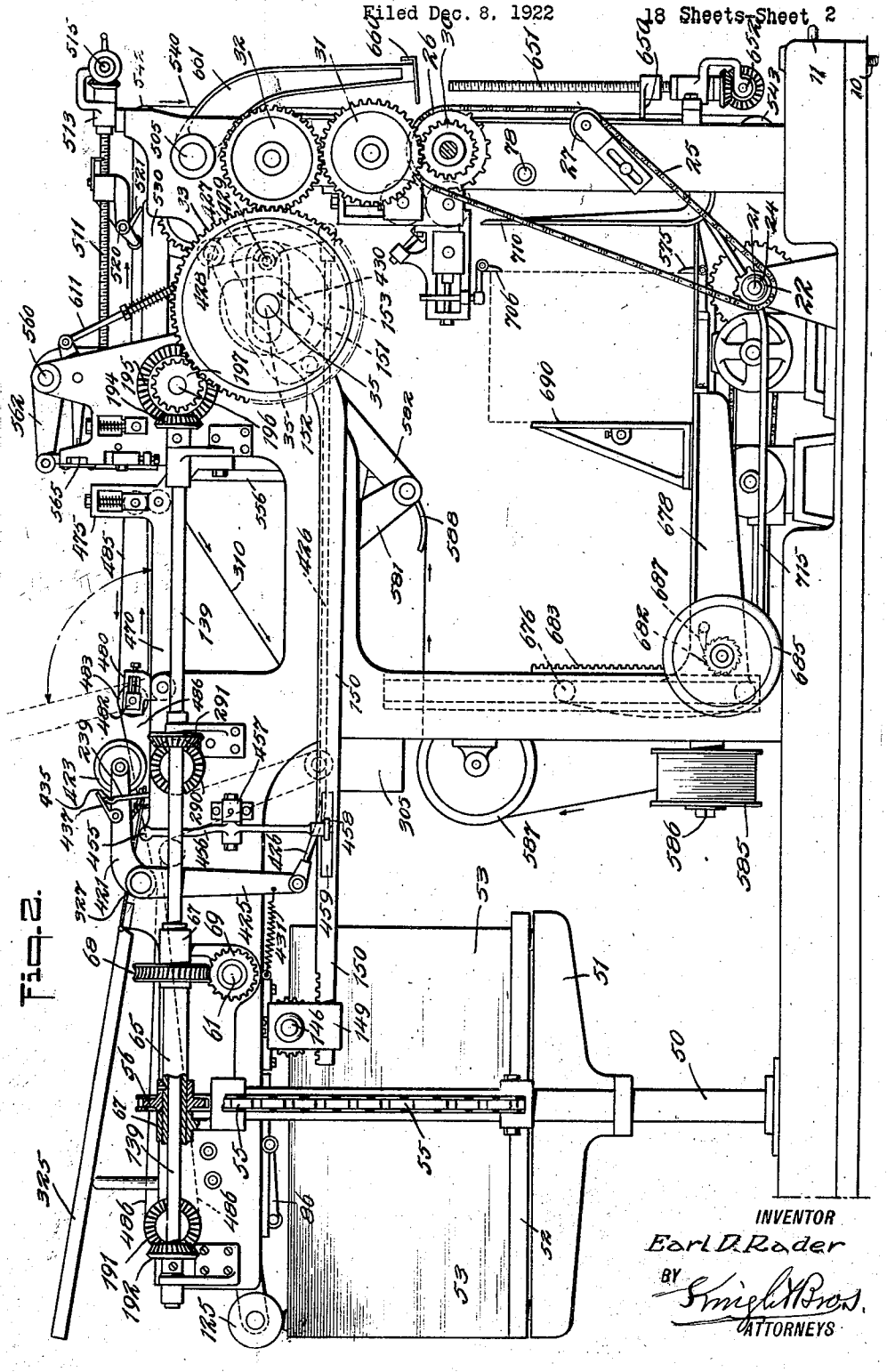


Fig. 2.

INVENTOR
Earl D. Rader
BY Smith Bros.
ATTORNEYS

July 3, 1928. 1,676,156

E. D. RADER

WIRE STITCHING FOLDING MACHINE

Filed Dec. 8, 1922 18 Sheets-Sheet 3

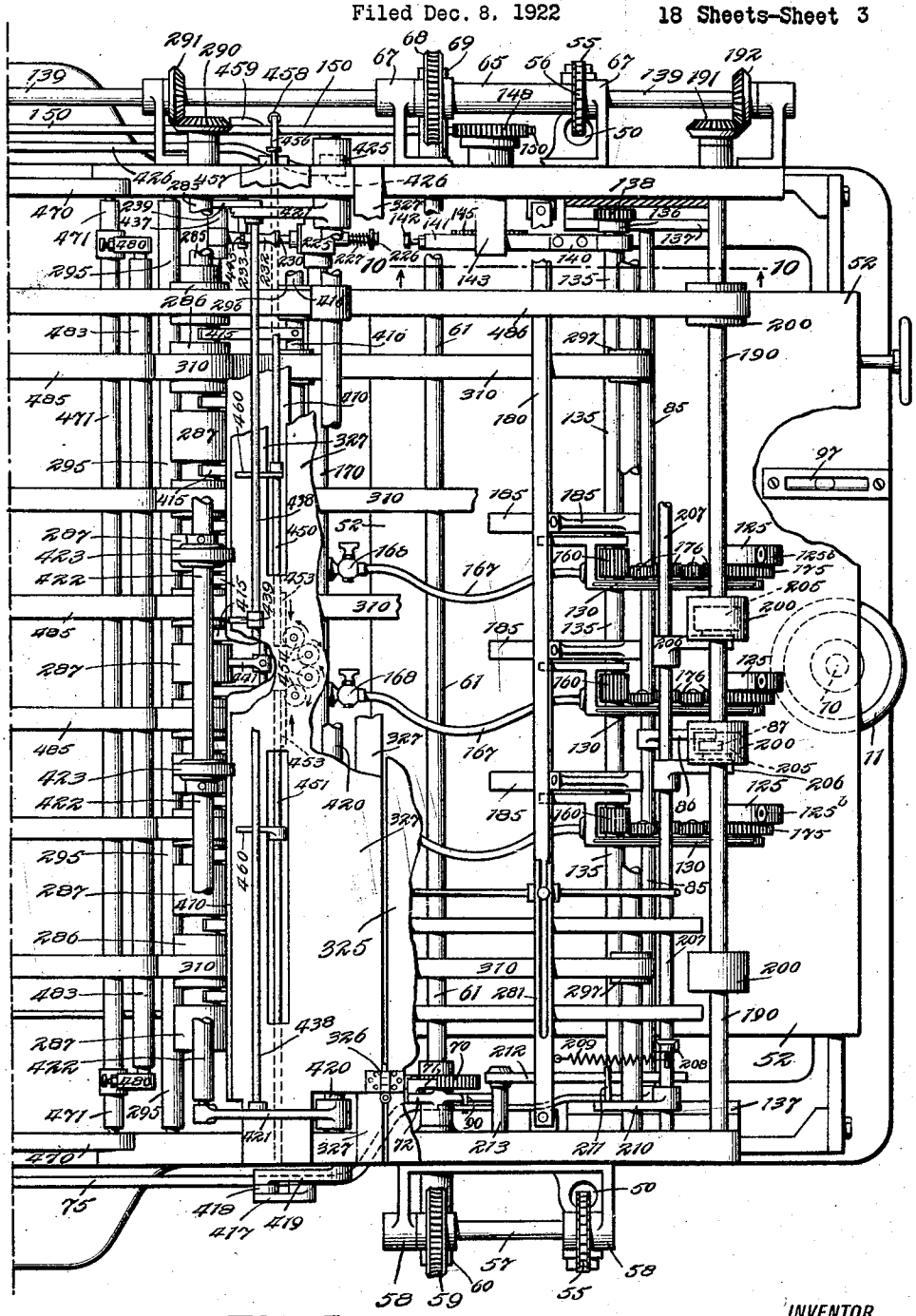


Fig. 3.

INVENTOR
Earl D. Rader
BY Knight Bros
ATTORNEYS

July 3, 1928. 1,676,156

E. D. RADER

WIRE STITCHING FOLDING MACHINE

Filed Dec. 8, 1922 18 Sheets-Sheet 4

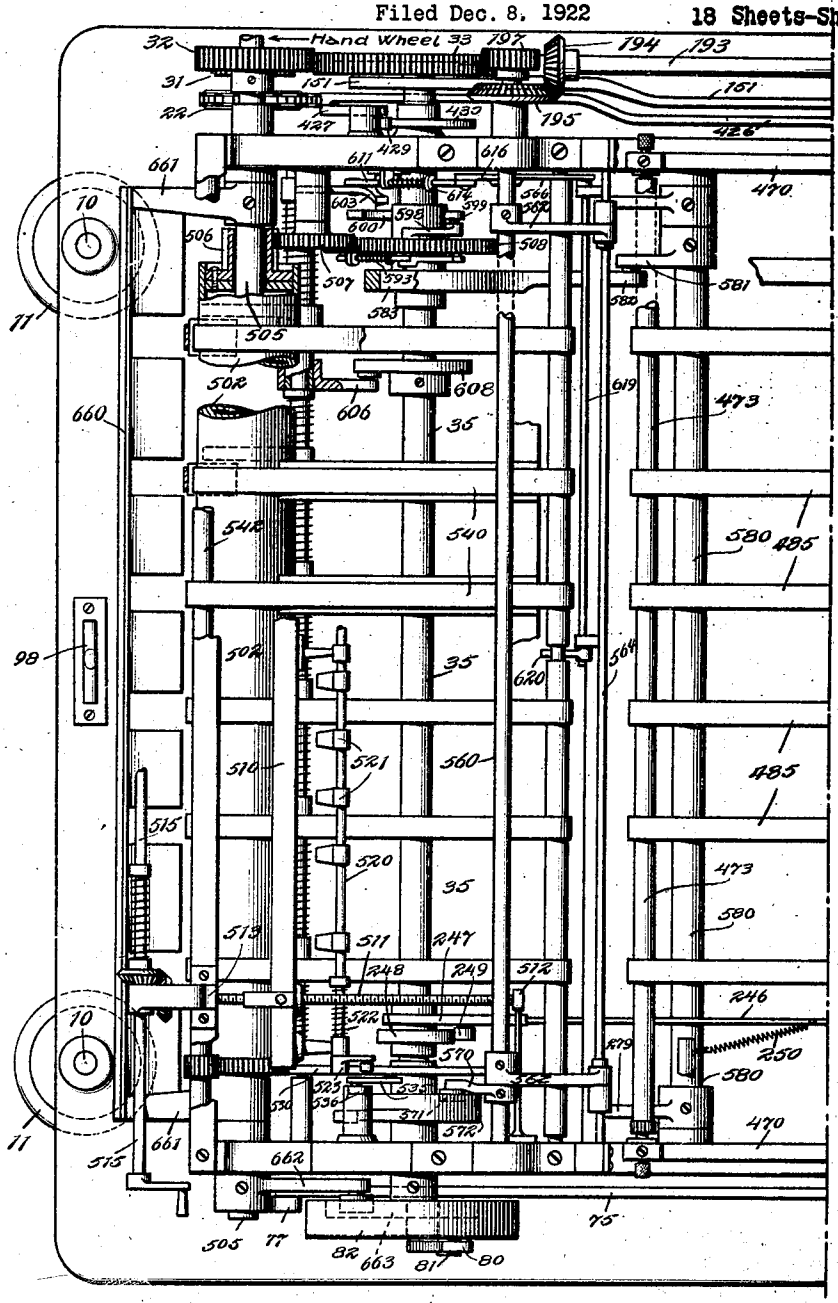


Fig. 4.

INVENTOR
Earl D. Rader
BY Wright Brown
ATTORNEYS

July 3, 1928. 1,676,156

E. D. RADER

WIRE STITCHING FOLDING MACHINE

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Fig. 3.

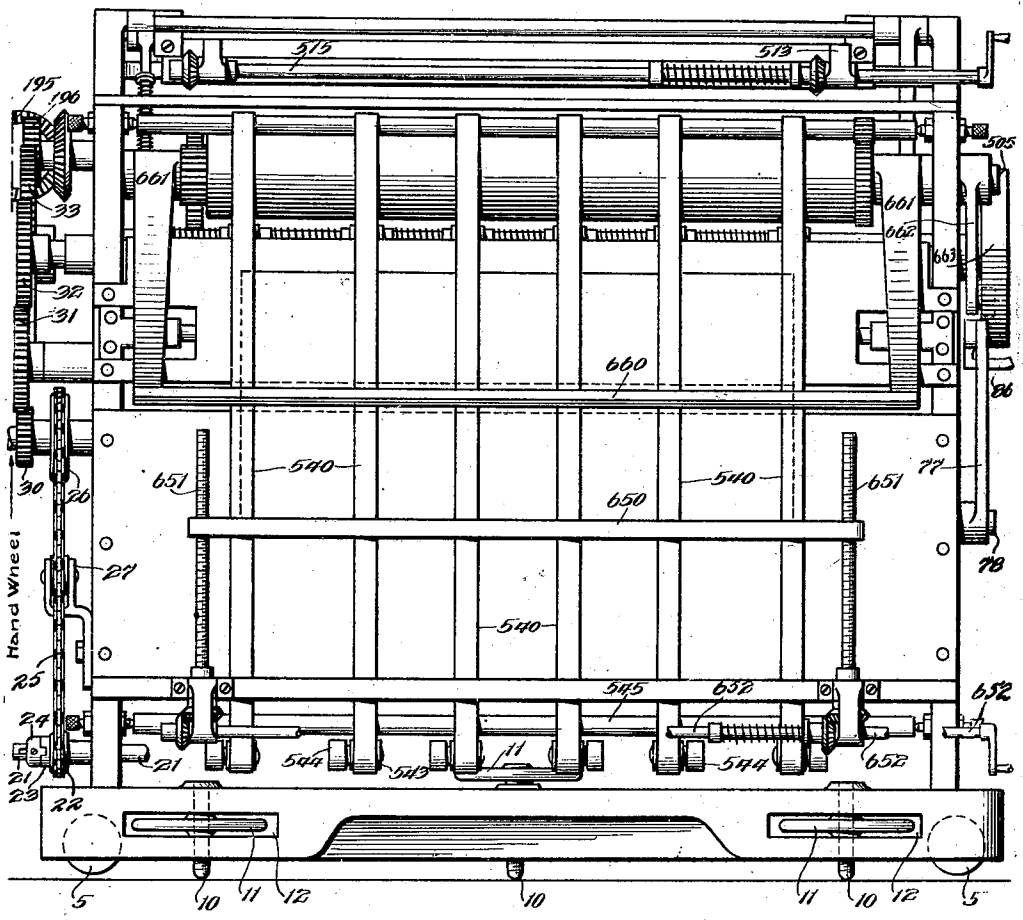


Fig. 8.

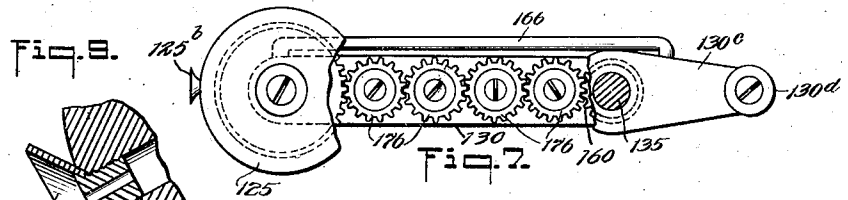


Fig. 7.

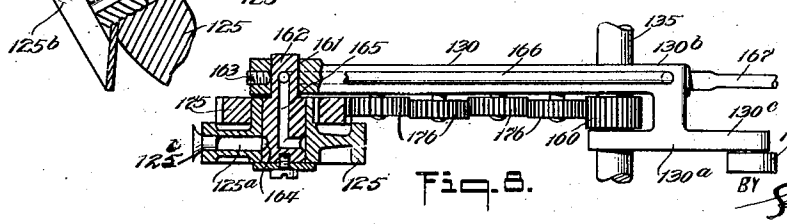


Fig. 8.

INVENTOR
Earl D. Rader
BY
ATTORNEYS

July 3, 1928. 1,676,156

E. D. RADER

WIRE STITCHING FOLDING MACHINE

Filed Dec. 8, 1922 18 Sheets-Sheet 6

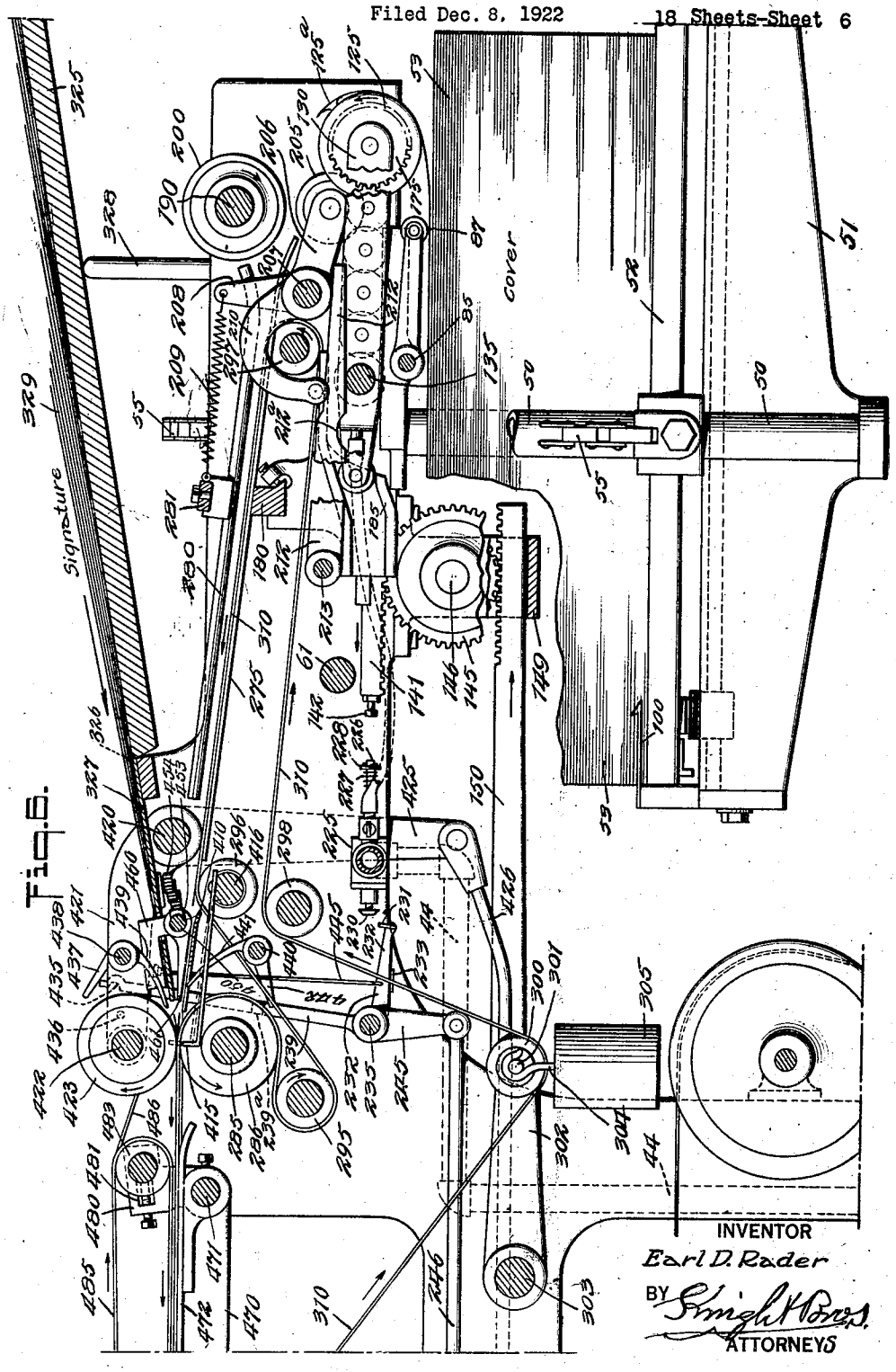


Fig. 6.

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E. D. RADER

WIRE STITCHING FOLDING MACHINE

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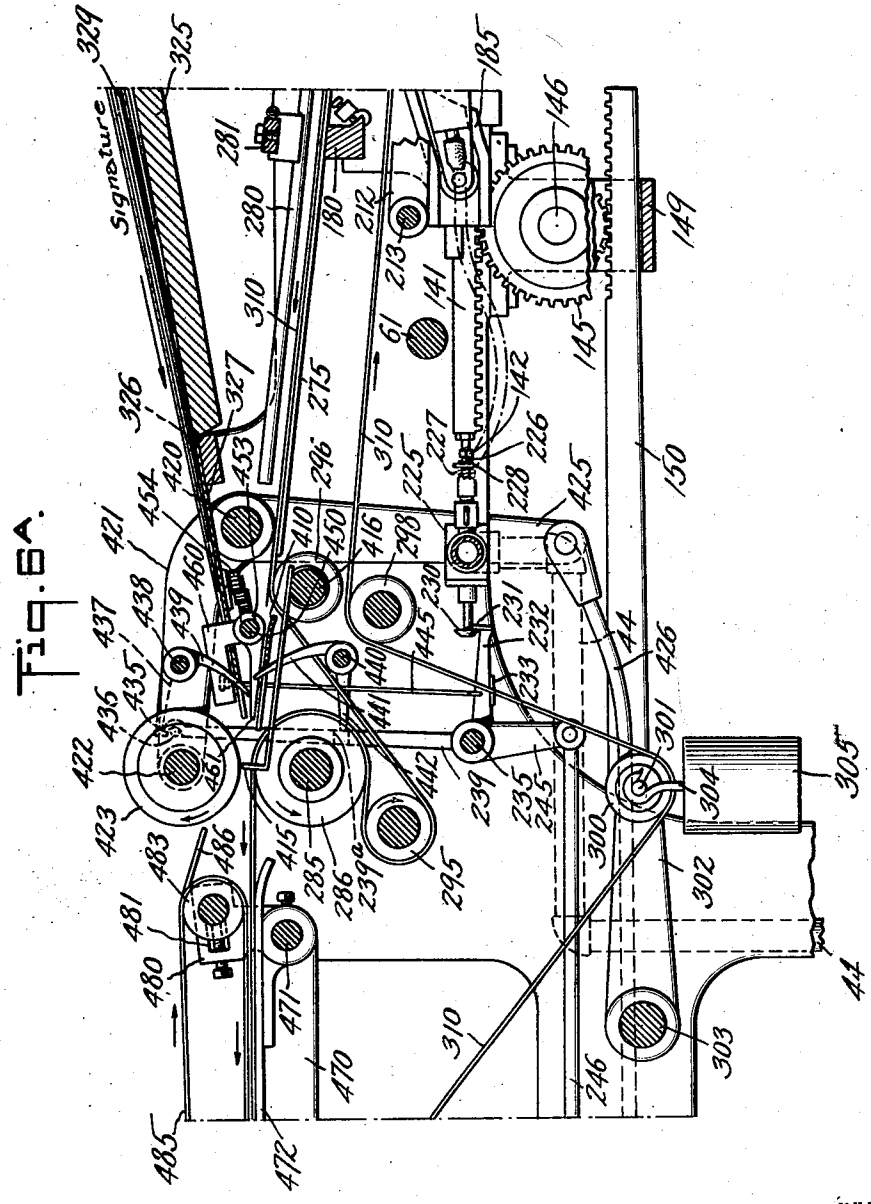


Fig. 6A.

INVENTOR
Earl D. Rader
BY Smith Bros.
ATTORNEYS

July 3, 1928. 1,676,156

E. D. RADER

WIRE STITCHING FOLDING MACHINE

Filed Dec. 8, 1922 18 Sheets-Sheet 8

Fig. 10.

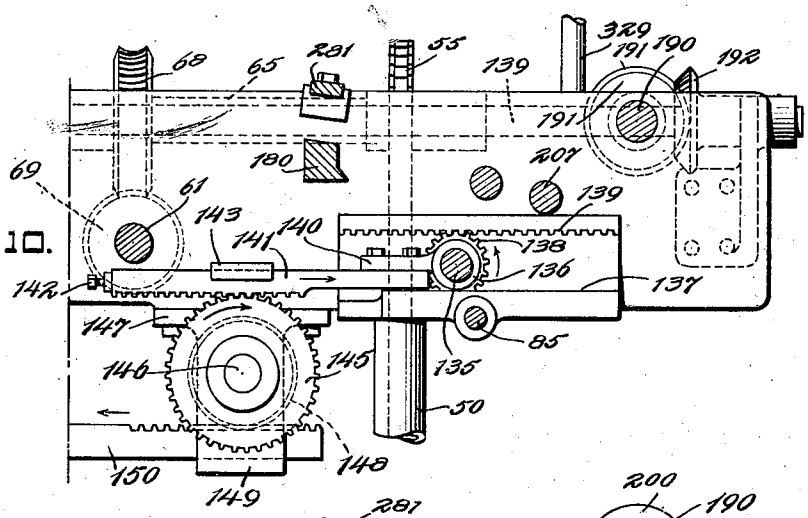


Fig. 11.

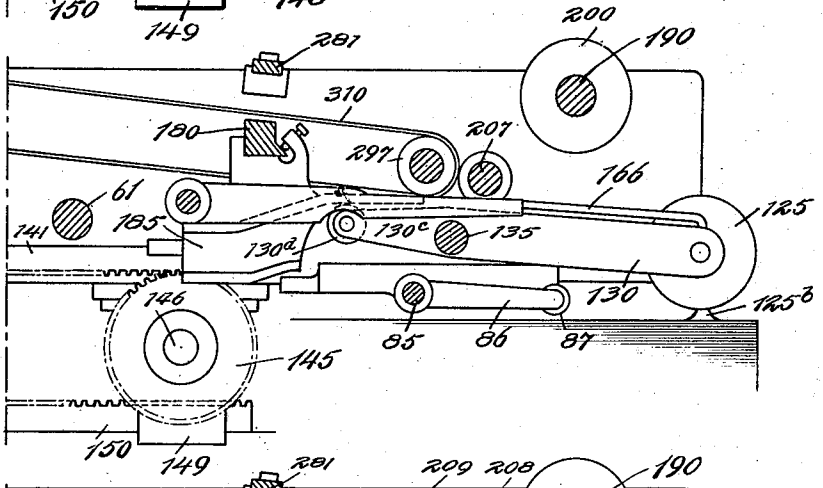
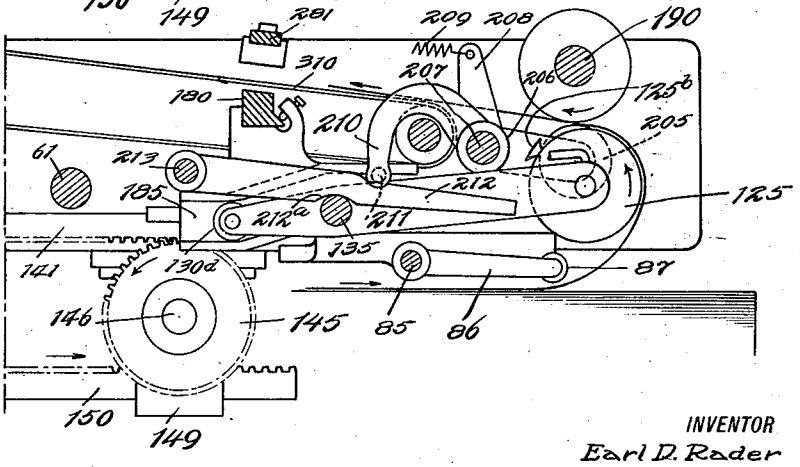


Fig. 12.



INVENTOR
Earl D. Rader
BY Knight Bros
ATTORNEYS

July 3, 1928. 1,676,156

E. D. RADER

WIRE STITCHING FOLDING MACHINE

Filed Dec. 8, 1922 18 Sheets-Sheet 9

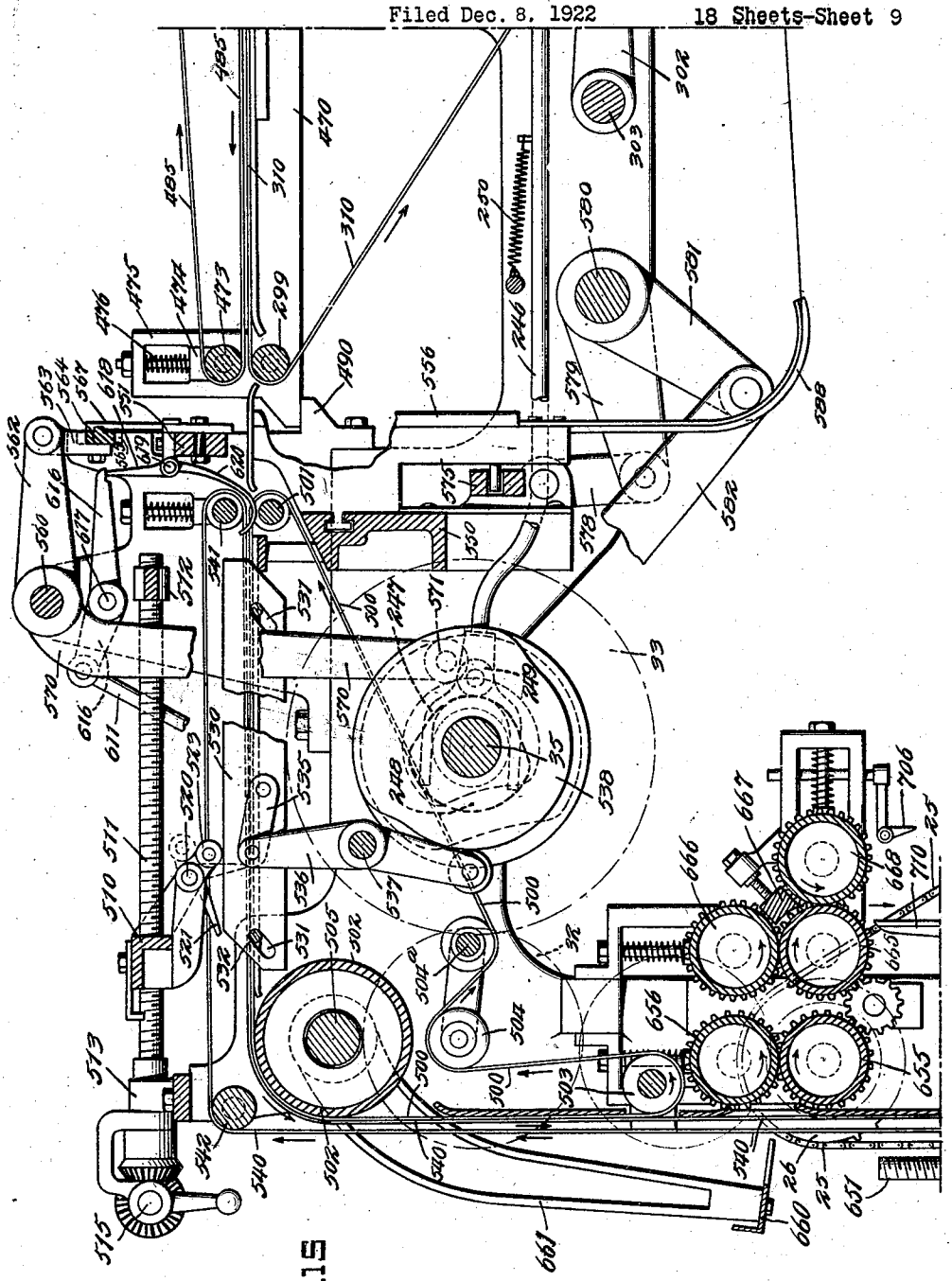


Fig. 15

INVENTOR
Earl D. Rader
BY Knight Bros
ATTORNEYS

July 3, 1928. 1,676,156

E. D. RADER

WIRE STITCHING FOLDING MACHINE

Filed Dec. 8, 1922 18 Sheets-Sheet 10

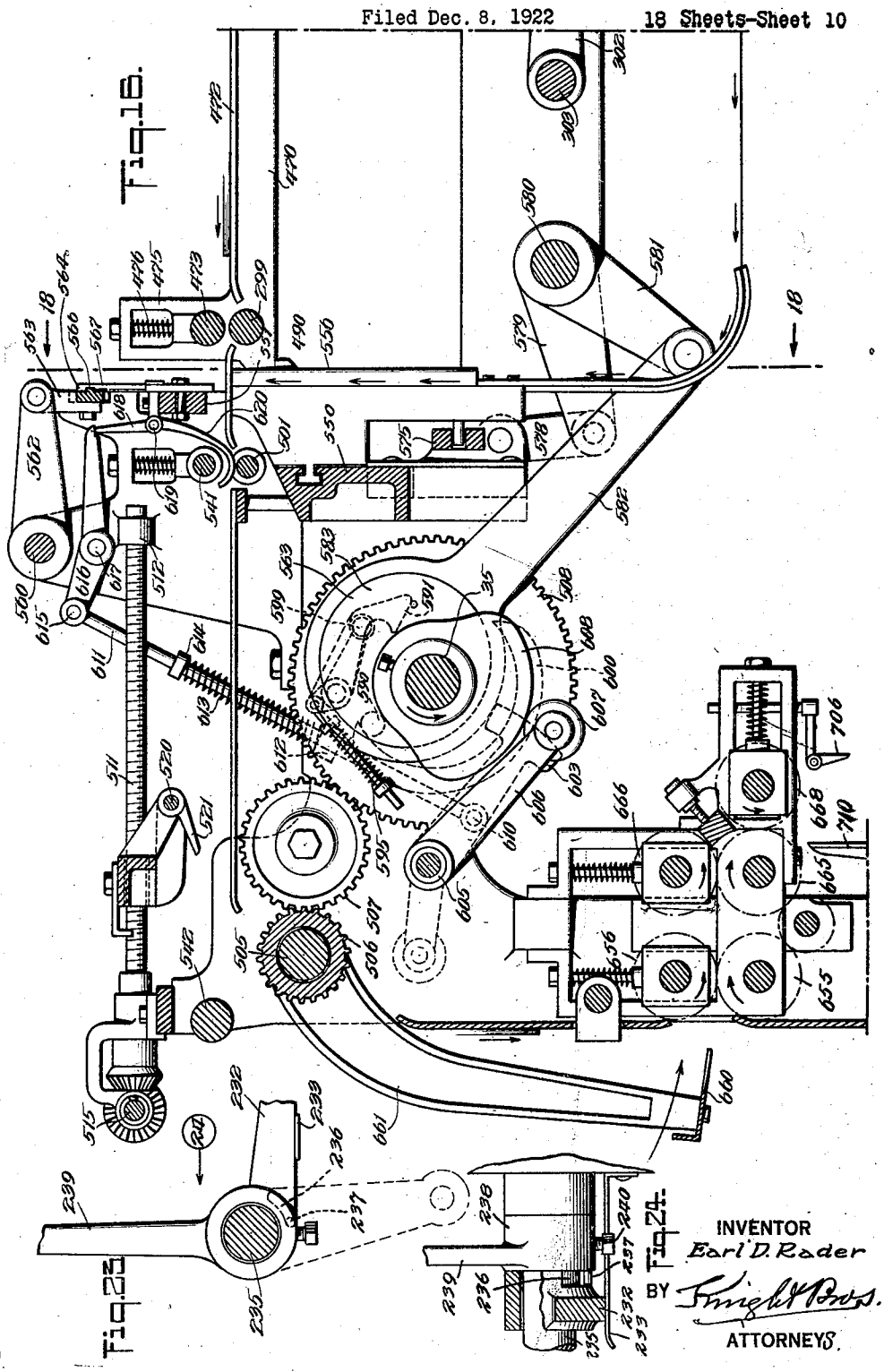


Fig. 16.

Fig. 23.

Fig. 24.

INVENTOR
Earl D. Rader
BY Knight Bros.
ATTORNEYS.

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E. D. RADER

WIRE STITCHING FOLDING MACHINE

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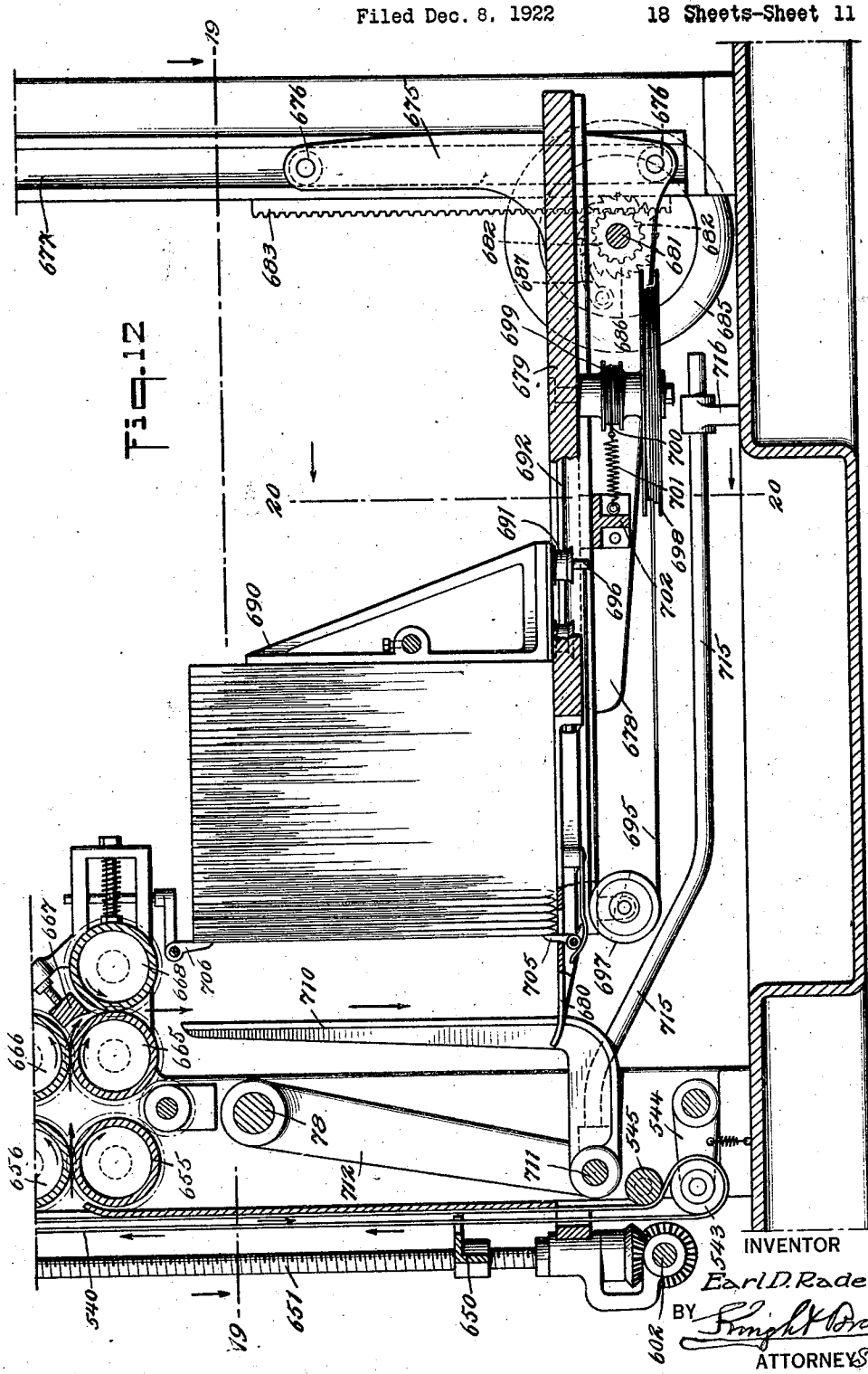


Fig. 12

INVENTOR
Earl D. Rader
BY Knight Bros.
ATTORNEYS

July 3, 1928. 1,676,156

E. D. RADER

WIRE STITCHING FOLDING MACHINE

Filed Dec. 8, 1922 18 Sheets-Sheet 12

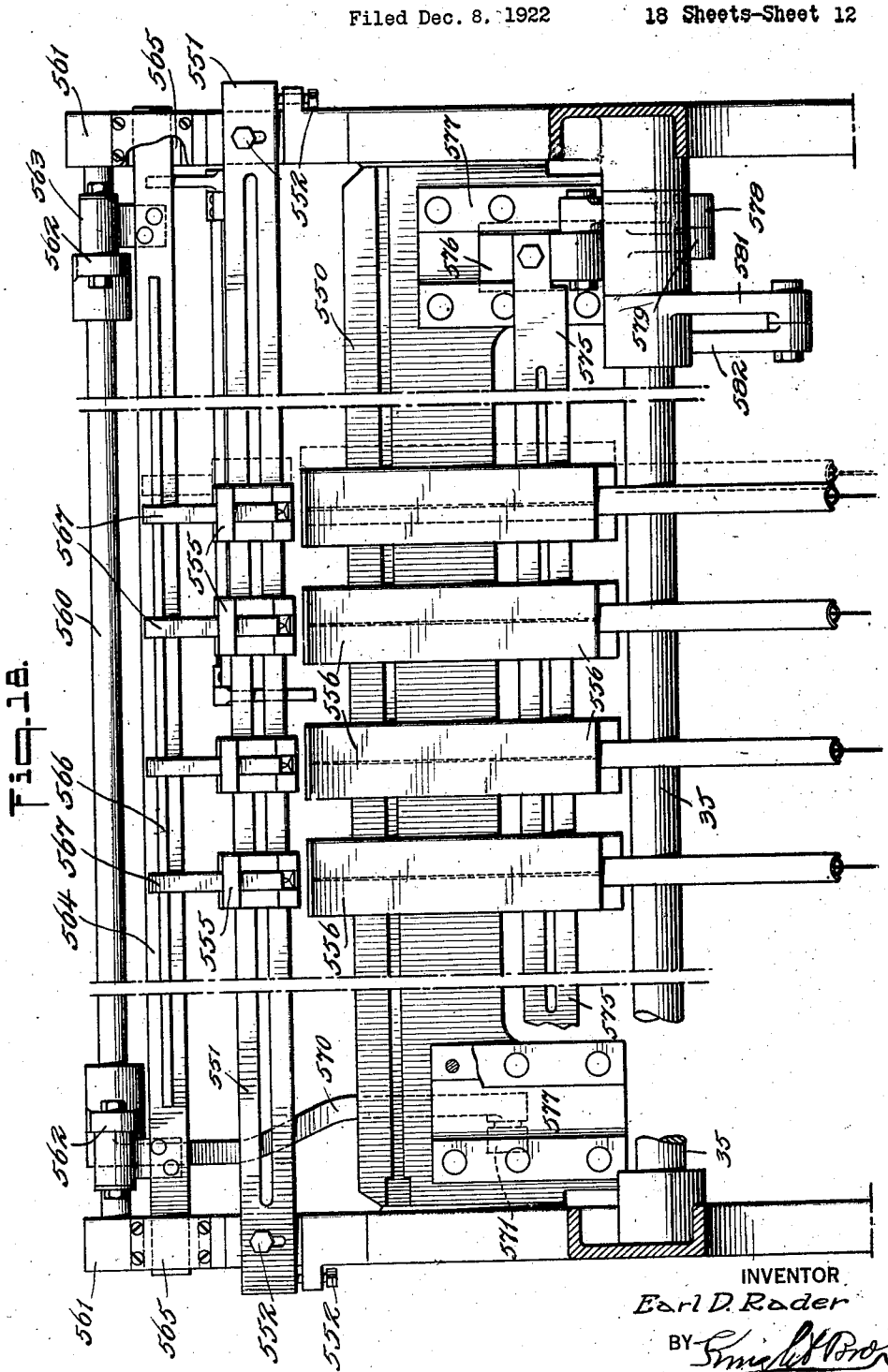


Fig. 18.

INVENTOR
Earl D. Rader
BY Smith & Bros.
ATTORNEYS

July 3, 1928. 1,676,156

E. D. RADER

WIRE STITCHING FOLDING MACHINE

Filed Dec. 8, 1922 18 Sheets-Sheet 13

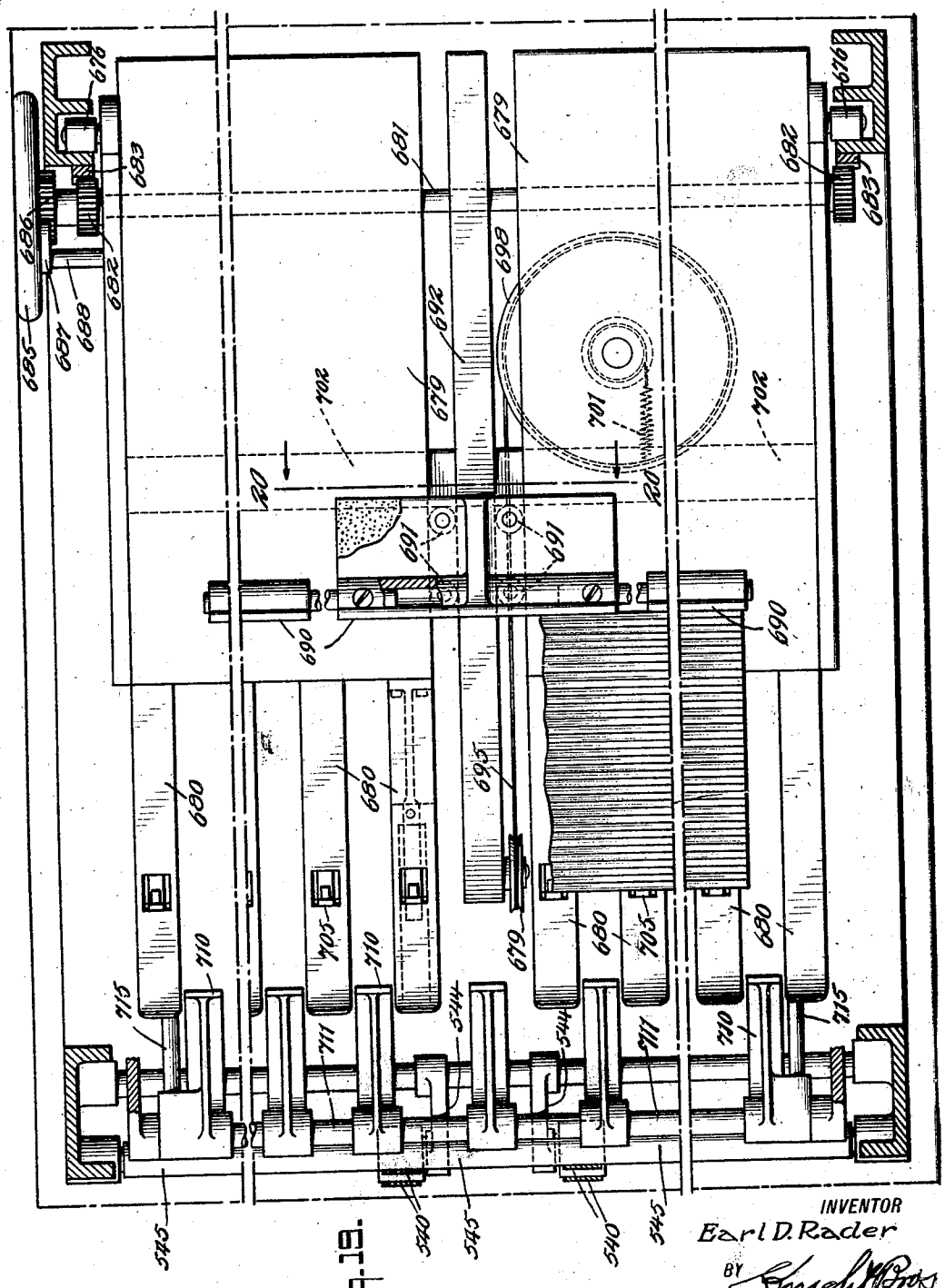


Fig-19.

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E. D. RADER

WIRE STITCHING FOLDING MACHINE

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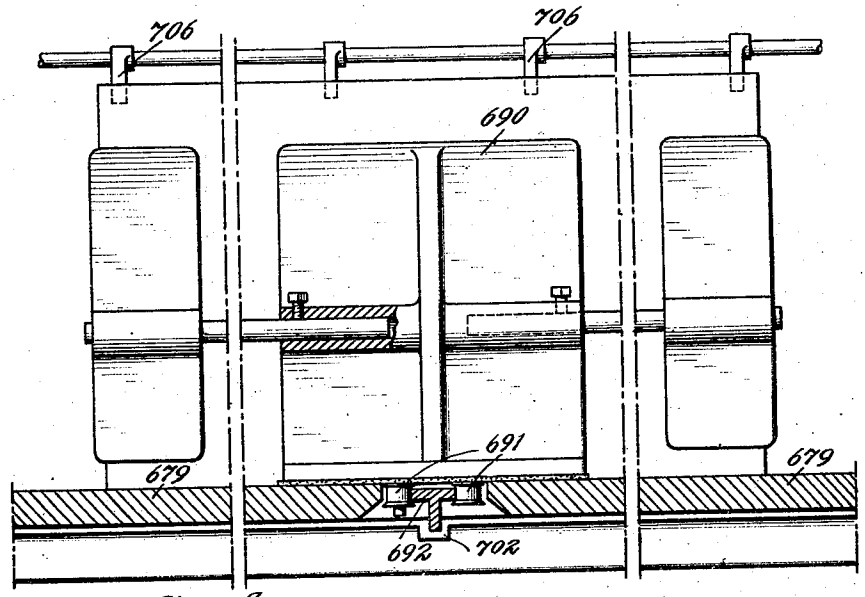


Fig. 20.

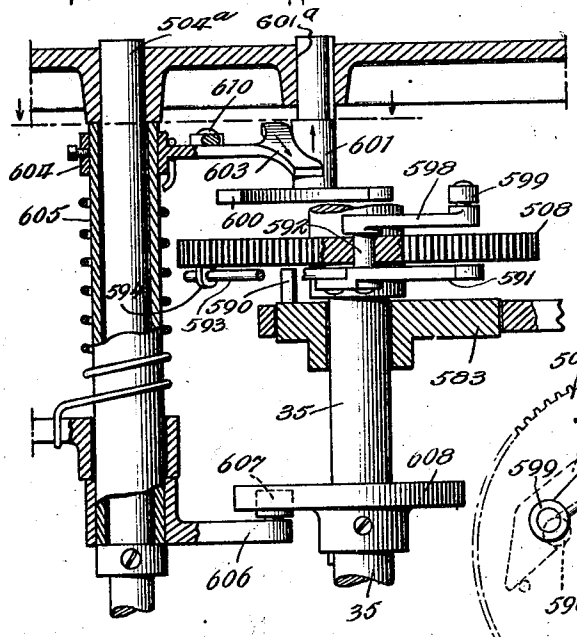


Fig. 21.

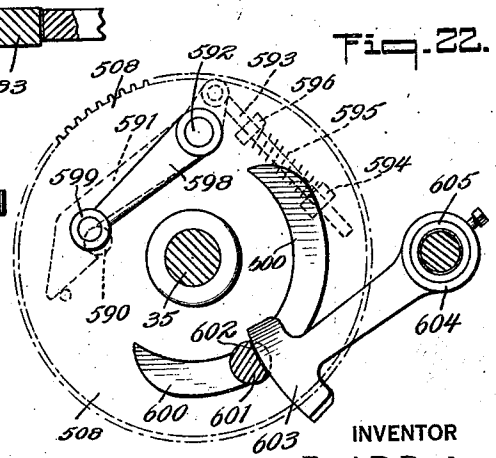


Fig. 22.

INVENTOR
Earl D. Rader
BY Knight Bros
ATTORNEYS

July 3, 1928. 1,676,156

E. D. RADER

WIRE STITCHING FOLDING MACHINE

Filed Dec. 8, 1922 18 Sheets-Sheet 15

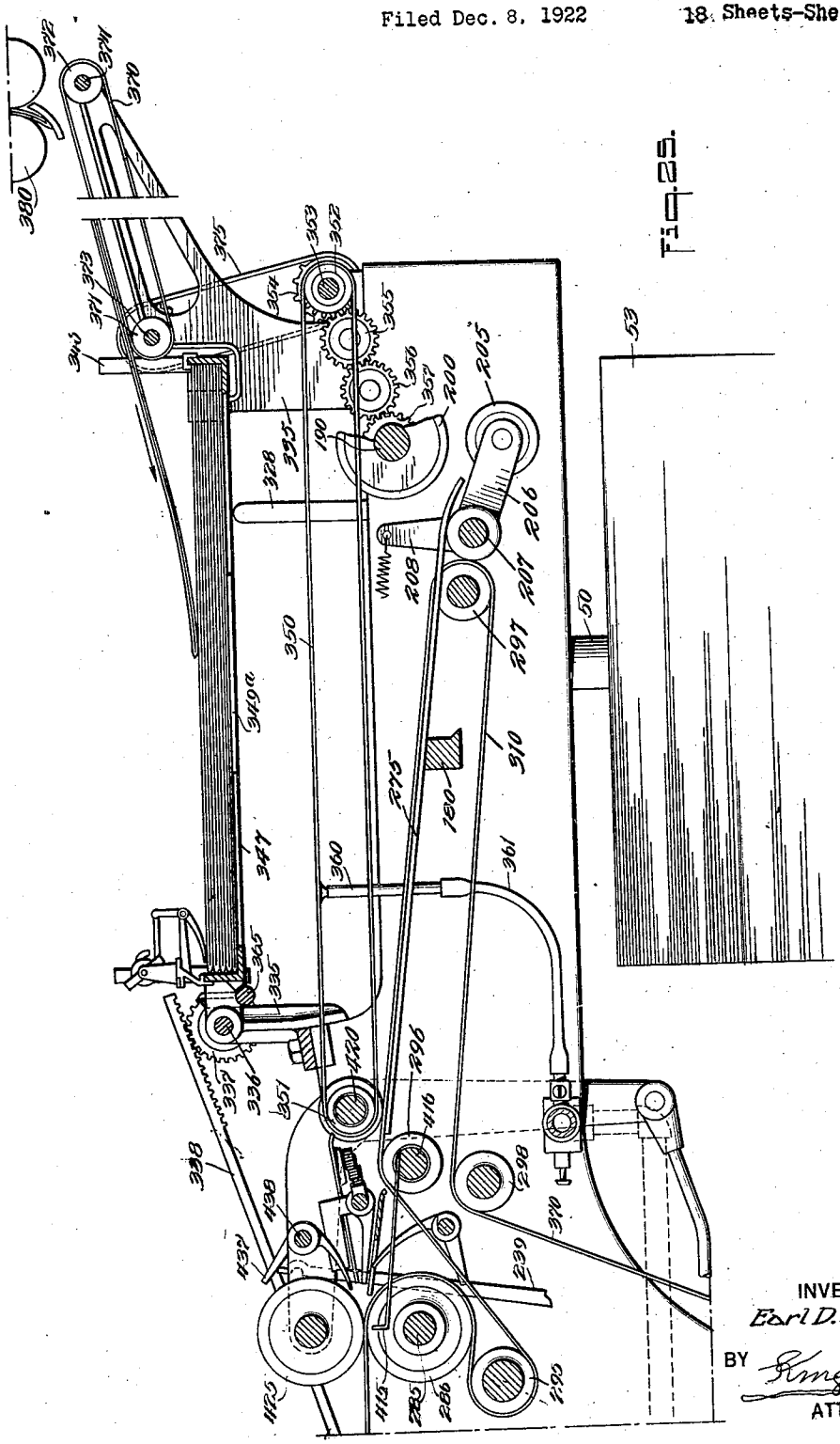


Fig. 25.

INVENTOR
Earl D. Rader
BY Knight Bros
ATTORNEYS

July 3, 1928. 1,676,156

E. D. RADER

WIRE STITCHING FOLDING MACHINE

Filed Dec. 8, 1922 18 Sheets-Sheet 16

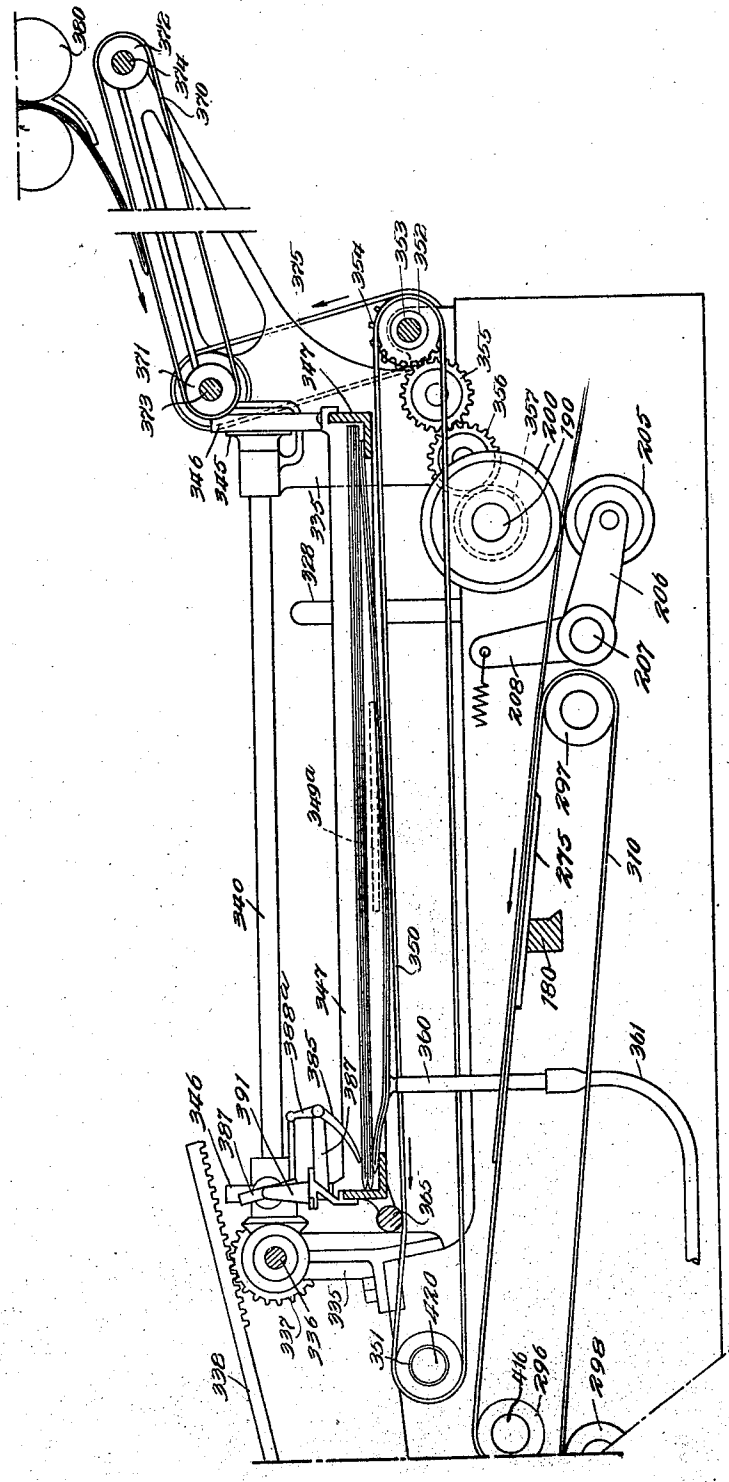


Fig. 26.

INVENTOR
Earl D. Rader
BY Strauch Bros
ATTORNEYS

July 3, 1928. 1,676,156

E. D. RADER

WIRE STITCHING FOLDING MACHINE

Filed Dec. 8, 1922 18 Sheets-Sheet 17

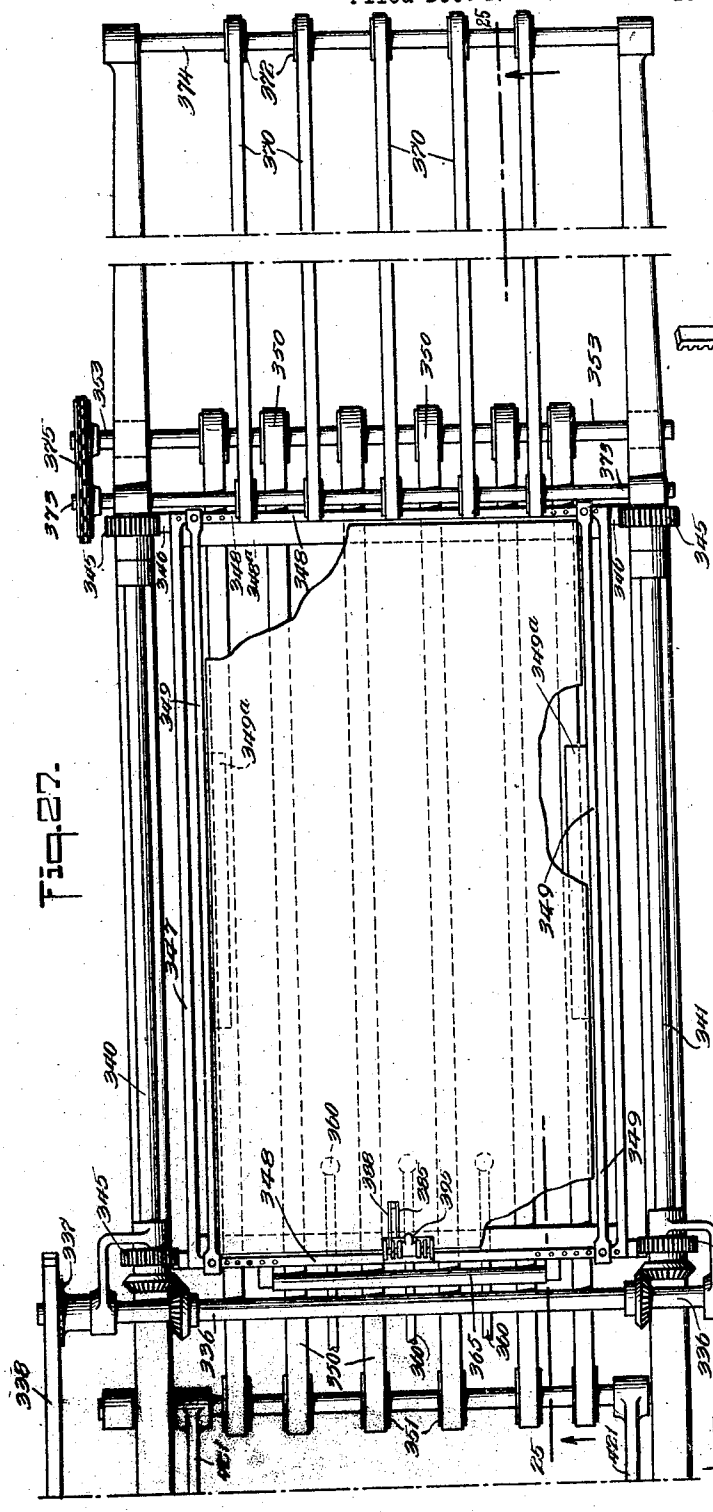


Fig. 27.

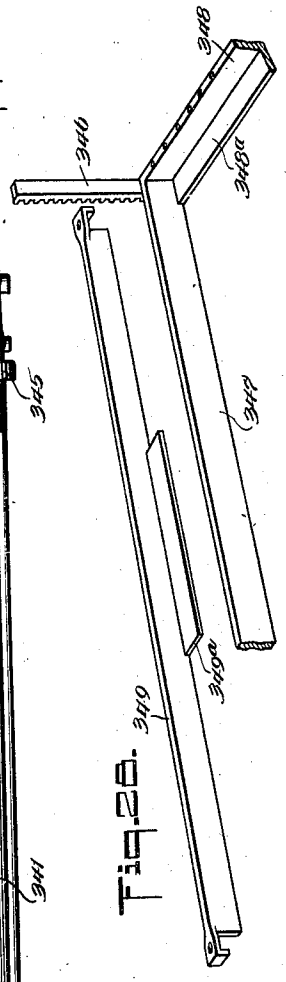


Fig. 28.

INVENTOR
Earl D. Rader
BY Knight Bros
ATTORNEYS

July 3, 1928. 1,676,156

E. D. RADER

WIRE STITCHING FOLDING MACHINE

Filed Dec. 8, 1922 18 Sheets-Sheet 18

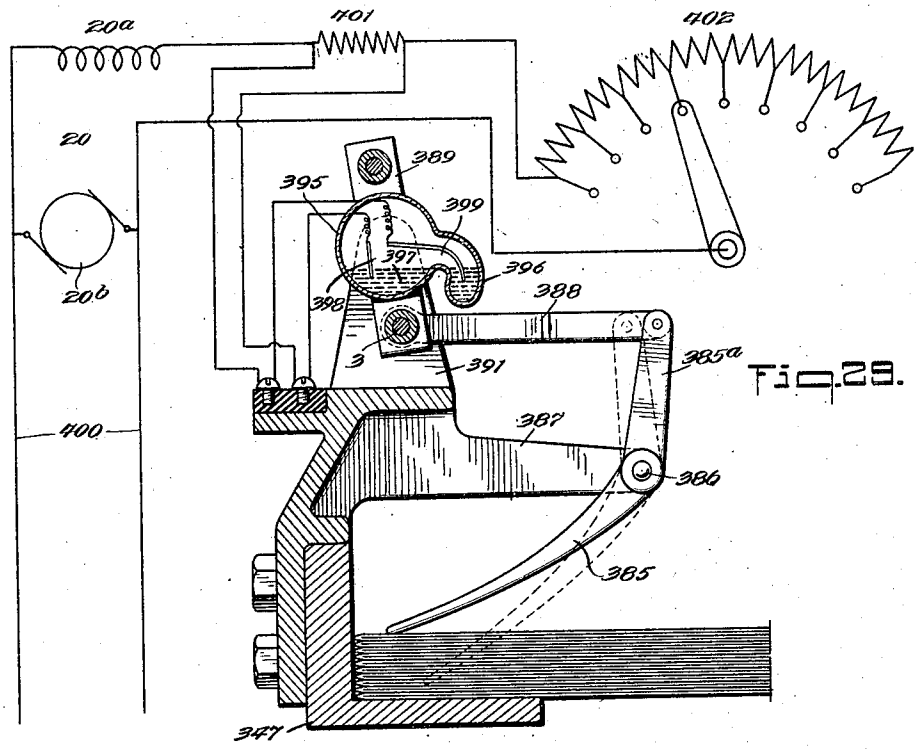


Fig. 29.

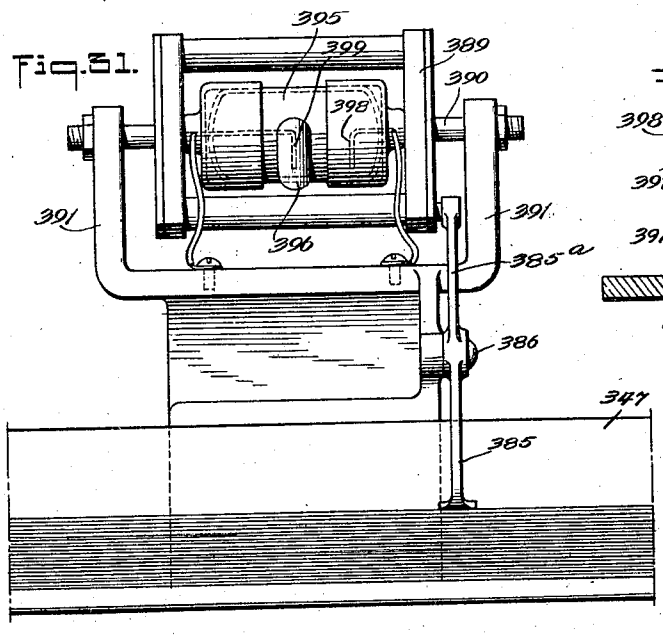


Fig. 31.

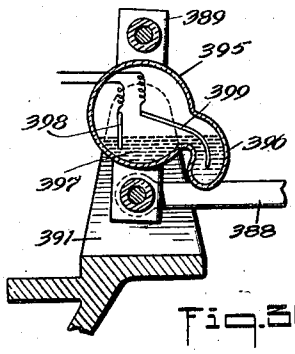


Fig. 30.

INVENTOR
Earl D. Rader
BY Knight Bros
ATTORNEYS.

Patented July 3, 1928. 1,676,156

UNITED STATES PATENT OFFICE.

EARL D. RADER, OF BEDFORD, NEW YORK, ASSIGNOR TO DEXTER FOLDER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

WIRE-STITCHING FOLDING MACHINE.

Application filed December 8, 1922. Serial No. 605,742.

The primary object of the present invention is to produce an improved wire stitching folding machine in the form of a portable self-contained finishing unit for binderies. The improved machine includes feeding and collating devices for sheets or signatures, wire stitching devices for stitching assemblages of sheets or signatures and mechanism for folding the stitched sheets or signatures. The improved machine may be fed either by hand or automatically, and it may be operated as an independent unit for collating, stitching and folding, or it may be moved into operative relation with any standard jobbing, parallel, or double-16 folding machine to receive partially folded signatures directly from the folding machine and assemble them in flat form with cover sheets or additional four page signature sheets as "outsets," and wire stitch and finally fold such assemblages.

To facilitate the convenient placing of the improved machine to receive the partially folded signatures from a standard folding machine, the improved machine is made portable by mounting it upon rollers, and to stabilize and adjust the machine in its desired location it is further provided with feet or lugs in the form of screw pins, whereby the machine can be raised off of its rollers and firmly supported in the desired location upon the screw pins or feet. These screw pins or feet are preferably arranged adjacent to the rear corners and front centre of the bottom frame of the machine, which is further provided with spirit levels extending in transverse and longitudinal horizontal planes, whereby the machine can be leveled in two directions in the desired location.

In the preferred form of the improved wire stitching folding machine or bindery finishing unit, I provide an automatic sheet feeding machine including a pile supporting and elevating table and a suction separating and delivery device. This automatic feeder may be used for feeding cover sheets or for auxiliary signature sheets or "outserts." In addition to the automatic feeder for cover sheets or "outserts," the machine is provided with the removable and interchangeable feed board and signature feeding attachment. When the signature feeding attachment is in place upon the machine it can be arranged to automatically feed signatures from a standard folding machine, or such signatures in flat form may be supplied to said attachment by hand. When the signature feeding attachment is removed and the feed board put in place, the partially folded signatures or sheets may be fed in flat form by hand. The machine is thus equipped for feeding signatures either automatically or by hand with signature feeding attachment or by hand alone with the ordinary feed board.

The improved machine is further provided with an automaticaly controlled collating gauge and side registering joggers, by which cover sheets or "outserts" are assembled with flat form signatures or sheets and then passed to the wire stitching mechanisms. The collating gauge is under the control of trip fingers, which prevent the lifting of the gauge and the action of the roller delivery in the absence of a sheet or signature from either source of supply. This automatic trip control also controls the action of the automatic cover or "outsert" feeder, so that a sheet will not be fed from this automatic feeder when the absence of a sheet or signature has been detected by the tripping devices.

The improved machine also includes a plurality of wire stitching heads with an automatically controlled gauge for positioning assemblages of sheets or signatures to receive the wire stitches or staples, and a final fold mechanism with an adjustable gauge whereby the stitched assemblages of sheets or signatures are given their final fold upon the line of stitching and delivered to a packing box or other suitable suport. The wire stitching devices are operated by a suitable mechanism having an automatic clutch which is under the control of a sheet-actuated trip so that in the absence of an assemblage of sheets or signatures, the stitching heads will not be operated.

The portable stitching folding machine is a self-contained unit having its own motor and its own air pump for the suction feeder, so that when the machine is moved to any desired location in the bindery it is only necessary to connect up to the motor supply wires with a source of electric current.

Aside from the important use of the improved wire stitching folding machine as a single fold stitching folder, its great im-

portance lies in its use for finishing the work of collating, stitching and folding signatures either with or without covers. At the present time this work is usually performed upon standard folding machines by completely folding the signatures of a desired number of pages, then separately folding the cover sheets, and finally inserting signatures in the covers by first opening these folded parts and placing them in inserted relation upon the saddle of a stitching machine. This inserting work is most commonly done by hand, but is in some cases performed by automatic machinery. In using the improved stitching folder in conjunction with the standard folding machine, the signatures are delivered from the folding machine before receiving the final fold and are fed in flat form to the improved machine where they are assembled with the covers, then stitched and finally folded as already explained.

In order that the invention may be fully understood it will first be described with reference to the accompanying drawings and the novelty afterwards pointed out more particularly in the annexed claims.

In said drawings:

Figure 1 is a side elevation of the improved collating stitching folding machine;

Figure 2 is a similar view of the same taken from the opposite side of the machine;

Figure 3 is a plan view of the forward end of said machine, the feed board being broken away to show the suction separator and feeder for cover or "outsert" sheets;

Figure 4 is a similar view of the rear part of the improved machine;

Figures 3 and 4 taken together give a complete plan view of the improved machine;

Figure 5 is a rear end view of the improved machine;

Figure 6 is an enlarged vertical longitudinal sectional view of the forward part of the improved machine;

Figure 6a is a similar view of part of the same mechanism showing the shifted position of the automatic controlling devices;

Figures 7, 8 and 9 are detail views of one of the improved suction separating and feeding devices for cover or "outsert" sheets;

Figure 10 is a longitudinal sectional view taken on the line 10—10 of Figure 3;

Figures 11 and 12 are vertical longitudinal sectional views of the suction separator and feeder for cover or "outsert" sheets, the two views showing parts in shifted position to illustrate the operation of the mechanism;

Figures 13 and 14 are detail sectional elevations of the pile elevating governor mechanism;

Figure 15 is an enlarged vertical longitudinal sectional view of the rear portion of the improved machine taken on the line 15—15 of Figure 4 and showing the stitching and final fold mechanism;

Figure 16 is a similar view taken on the line 16—16 of Figure 4;

Figure 17 is a vertical longitudinal sectional view of the packing box mechanism;

Figure 18 is a vertical transverse sectional view taken on the line 18—18 of Figure 16;

Figure 19 is a horizontal sectional view taken on the line 19—19 of Figure 17;

Figure 20 is a vertical transverse sectional view taken on the line 20—20 of Figure 17;

Figures 21 and 22 are enlarged detail sectional views illustrating the automatic clutch for controlling the operation of the wire stitching mechanisms;

Figures 23 and 24 are detail sectional views of the sheet actuated controller for the collated sheet delivery and the suction cover feeder;

Figure 25 is a vertical longitudinal sectional view of the forward portion of the machine showing the removable automatic signature feed in position in place of the feed board;

Figure 26 is a similar view showing the parts in shifted position;

Figure 27 is a plan view of the automatic signature feeding mechanism;

Figure 28 is a perspective view of parts of the open bottom tray of said automatic mechanism;

Figure 29 is a detail vertical longitudinal sectional view of part of said automatic mechanism illustrating particularly the sheet actuated electric control of the driving motor of the stitching folding machine;

Figures 30 and 31 are detail views of parts of said automatic control devices.

The improved machine including feeding mechanisms, collating or assembling devices, stapling or stitching mechanisms, a final fold mechanism, an air suction pump, various automatic controls and a motor for operating all of the connected mechanisms are suitably mounted in operative relation upon a portable frame, comprising in the form illustrated, a main horizontal base frame 1 supporting the upwardly projecting main side frames 2 and 3, which are suitably braced by the usual tie rods and shafting upon which the operative parts are mounted. The base frame 1 is supported upon a plurality of caster wheels 5 suitably mounted beneath its four corners. The portable machine can be moved upon its supporting rollers to any desired position in the shop in which it is in use. In addition to the supporting rollers, the base frame is provided at a plurality of points, preferably adjacent to two corners at one end of the machine and in the center at the opposite end of the machine, with screw legs or feet indicated

at 10 threaded through suitable vertical openings in the base frame and provided with hand wheels 11 operating in slots 12 of the base frame at one end of the machine and presented above the base frame at the other end of the machine. By rotating hand wheels 11 the screw feet 10 can be adjusted vertically in the base frame to engage the floor and raise the machine frame sufficiently to transfer the support of the machine from rollers 5 to the feet 10. In this way the machine can be securely supported in the desired location for operation.

The base frame is preferably provided with spirit levels 97 and 98 extending respectively longitudinally and transversely of the machine frame, (see Figs. 3 and 4), for the purpose of enabling the operator to accurately adjust the machine by means of the screw feet 10 to place it in the exact horizontal position in the location in which it is to be operated.

Mounted upon the base frame 1 adjacent to the rear end is an electric motor 20 geared to a jack shaft 21 carrying at its outer end a loosely journaled sprocket wheel 22 having a clutch face 23 engaged by an adjustable clutch member 24 splined upon the projecting end of shaft 21, see Fig. 5. This clutch member 24 can be adjusted into and out of engagement with the sprocket wheel 22 and secured in either position. The sprocket wheel 22 drives a sprocket chain 25 which operates sprocket wheel 26 mounted upon the projecting journal of one of the folding rollers hereinafter referred to. An adjustable grooved tightening pulley 27 engages sprocket chain 25. The sprocket wheel 26 operating through a train of gears 30, 31, 32 and 33 continuously rotates the main cam shaft 35, which extends from side to side and is suitably journaled in the side frames 2 and 3. The various operating mechanisms of the improved machine are driven from the cam shaft 35 in a manner which will be hereinafter explained.

40 is an air suction pump mounted upon the base frame 1 adjacent to the motor 20 and 41 is a sprocket chain extending from sprocket wheel 42 upon the jack shaft 21 around a sprocket wheel 43 upon the air pump shaft whereby the air pump is driven by the motor. 44 is the main suction pipe of the air pump to which the suction feeding devices are suitably connected in a manner hereinafter explained.

Projecting up from the base frame 1 near the forward end of the machine are two vertical hollow standards 50, upon which rides the vertically movable pile supporting frame 51 carrying the adjustable platform 52 upon which is a pile of sheets indicated at 53. This pile supporting frame 51 is supported at its opposite ends by sprocket chains 55 which pass over the sprocket wheels 56 with their ends extending down into the hollow standards 50. The sprocket wheel 56 at one side of the machine is mounted upon short shaft 57 journaled in bracket arms 58 and carrying a worm gear 59, meshing with and driven by the worm 60 secured to the end of the shaft 61 journaled in the side frames and extending from side to side of the machine. At the opposite side of the machine the sprocket wheel 56 is keyed to a tubular shaft 65 journaled in brackets 67 and carrying a worm wheel 68 meshing with a worm 69 also keyed to the transverse shaft 61 above referred to.

Transverse shaft 61 has secured to it, adjacent to one end just inside of a side frame, a ratchet wheel 70 which is engaged by an intermittently operated dog 71, pivoted upon a rock arm 72, journaled upon the shaft 61 carrying at its lower end a lateral stud 73, which operates in a longitudinal slot 74 of a reciprocating bar 75. The bar 75 extends to the rear of the machine where it is pivoted at 76 at the upper end of a rock arm 77 projecting upwardly from the rock shaft 78, journaled in the side frames of the machine and carrying the packer arms of the packing box mechanism hereinafter referred to. Rigidly secured to the bar 75 is a slotted bracket arm 80 which is engaged by a crank pin 81 projecting from the outer face of a cam disk 82 keyed to the cam shaft 35 above referred to. The operation of the crank pin upon the bracket arm intermittently reciprocates the bar 75 for actuating the ratchet feed dog 71 under the control of the pile governor which will now be explained.

Suitably journaled in the side frames of the machine above the pile of sheets 53 upon the table 52 is a rock shaft 85 that extends from side to side and supports at or near its center an arm 86, carrying a freely journaled roller 87 that is intermittently lowered into engagement with the top of the piles of sheets for gauging the height of a pile. This rock shaft 85 carries at one end a rearwardly projecting arm 88 formed with a forked end 89, which is adapted under certain conditions to be engaged by an angular lug 90 carried upon the rock arm 72 above referred to. The reciprocating bar 75 carries in its forward slotted end an adjustable screw tappet 79, which is adapted to engage the stud 73 and move the rock arm 72 for more or less of a feeding stroke which is dependent upon the adjusted position of the tappet 79. A spring 95 connects the rock arm 72 with one of the side frames to give the rock arm a normal tendency to move the feed dog 71 rearwardly over the feed ratchet 70, which movement is permitted by the forward movement of bar 75. This return or inactive movement of the feed dog 71 is permitted only when the top of the pile of sheets has fallen below the desired

normal elevation. If at the moment the arm 72 carrying dog 71 is moved by its spring 95, the top of the pile is at the desired level the controller arm 86 gauging the height of the pile will present the forked end 89 of arm 88 in the path of lug 90 and thereby arrest the movement of rock arm 72, while the bar 75 continues to move forwardly to the end of its stroke. The engagement of angular lug 90 with the forked end 89 will slightly raise the controller arm 86 and its roller 87 above the pile as shown in Figure 13 (because of the shape of the lug and fork), said controller arm being held out of engagement with the pile during the feeding operation hereinafter explained. If during the spring induced movement of rock arm 72 the top of the pile is below normal, the controller will support the detecting arm 88 out of the path of the lug 90, so that the arm 72 will be pulled back to its limit determined by the forward position of bar 75 and the adjusted position of tappet 79. This movement of rock arm 72 places the feed dog 71 in position to impart a feeding stroke to the ratchet wheel 70, said stroke being induced by the succeeding rearward movement of bar 75, which actuates rock arm 72 through the tappet 79 and stud 73. The feeding stroke of ratchet 70 partially rotates shaft 61, which through the gearing above described elevates the pile supporting frame 51.

With this automatically controlled pile elevating mechanism the top of the pile of sheets is maintained at the desired level for the effective operation of the suction separating and feeding mechanism which will be presently described. To prevent raising the pile supporting frame too far when the pile of sheets is almost or quite exhausted, the pile supporting frame 51 carries a spring hook 100 which is presented in the same vertical longitudinal plane as stud 73 of rock arm 72, so that when the pile supporting frame reaches the limit of its upward movement this hook 100 will engage the stud 73 and lock the arm 72 against further movement, while at the same time permitting the continued operation of the bar 75. This arrests the feeding operation of the pile supporting frame and prevents injury which would result from the overfeeding of the same. This locked position of the parts is illustrated in Figure 14 of the drawings.

Operating above the adjustably supported pile of sheets 53 are the improved suction separating and sheet delivering mechanisms for feeding sheets singly from the pile and delivering them to the collating or assembling gauges. The suction separator comprises a series of suction wheels mounted upon suitable frames to rotate and reciprocate longitudinally and vertically above the pile of sheets. In the machine as shown three of the suction separating wheels are employed as indicated particularly in Figure 3 of the drawings. The three suction wheels 125 and their driving gears constructed and arranged, as hereinafter more specifically described, are suitably mounted upon arms or frames 130 extending forwardly from and freely journaled upon a traveling shaft 135. This traveling shaft 135 extends from side to side of the machine frame and is provided adjacent to its opposite ends with anti-friction wheels or rollers 136 operating upon track bars 137 secured to the machine side frames. The traveling shaft 135 also has secured to its opposite ends the traveling gears 138 which are in constant mesh with the overhanging rack bars 139 secured to the machine side frames parallel to the track bars 137. Adjacent to the bearing roller 136 at one end of shaft 135 is mounted a bearing member 140 to which is attached the rearwardly projecting rack bar 141 carrying an adjustable tappet screw 142 in its end. This rack bar 141 is guided by a bracket flange 143 projecting from the machine side frame, by which the rack bar 141 is held in constant mesh with a gear wheel 145 keyed to a stud shaft 146 suitably journaled in bearings 147 secured to the machine side frame. This stud shaft 146 carries at its outer end a gear 148 which meshes with a rack bar 150, said rack bar being supported in operative relation to said gear by means of stirrup bracket 149 hung upon the stud shaft 146. The rack bar 150 projects rearwardly parallel with one of the side frames of the machine and is formed at its rear end with a guide loop 151, which guides upon the main cam shaft 35 and is provided with a stud 152 which operates in a groove cam 153 formed in the inner face of the main driving gear 33 above referred to.

As shown particularly in Figures 3, 7, 8 and 9 of the drawings, each of the frames 130 journaled upon the traveling shaft 135 is formed with a divided bearing 130^a and 130^b between the two arms of which is mounted a gear wheel 160 which is keyed to its shaft 135. The forward end of each frame 130 is formed with a socket 161 to receive the reduced end of the hollow trunnion bearing 162 secured in place by means of a set screw 163. Suitably journaled upon the trunnion 162 is the suction wheel 125 which is formed with a suction chamber 125^a, mounted in which is a soft rubber suction cup 125^b projecting a little beyond the periphery of the wheel. The suction chamber 125^a communicates through an annular recess 164 with the axial opening 165 of the trunnion 162. A tube 166 leads from the axial opening 165 to the rear end of frame 130, where it is connected through a flexible rubber hose 167 with one of the valve nipples 168 projecting from the main exhaust trunk or pipe 170 extending transversely of the machine

and in free communication with the suction pipe 44 of the air pump previously referred to.

Keyed to the journaled hub of each of the suction wheels 125 between the wheel and frame 130 is a gear wheel 175, which is driven by the gear 160 through an intermediate idler train of gears 176 journaled upon studs secured to the inner face of the frame 130. The bearing 130^a is projected rearwardly into an arm 130^c upon which is freely journaled an anti-friction roller 130^d.

The transversely extending exhaust pipe 170 is provided at one end with a relief valve indicated at 225. This relief valve has a valve stem 226 extending entirely through the valve casing and projecting forwardly and rearwardly therefrom. The forward portion of the valve stem carries an expansion spring 227 held in place by a washer 228, so that the valve is normally held in closed position. This forward portion of the valve stem 226 is arranged in line with the adjustable tappet 142 projecting rearwardly from the rack bar 141 above refered to, so that at the completion of the rearward stroke of rack bar 141, which is coincident with the completion of the separating action of the suction wheels 125, the relief valve 225 will be opened to release the suction and break the hold of the suction cups upon the separated end of the sheet. This action takes places at the moment that the separated leading edge of the sheet is gripped by the feed rollers in a manner presently to be explained.

The rearwardly projecting end of the valve stem 226 carries a head 230 formed with a rearwardly presented beveled lower edge, which is adapted to be engaged when the relief valve is pressed open by an upwardly presented finger 231 formed on rock arm 232 loosely journaled upon a rock shaft 235 extending transversely of the machine and supported in suitable bearings in the side frames. A leaf spring 233 projects from the side frame and engages the undersurface of rock arm 232 to hold it normally in raised position in the path of the head 230, so as to automatically snap into engagement with said head for holding the relief valve open after the separation of each sheet. Referring to Figures 23 and 24 of the drawings, it will be observed that the rock arm 232 is formed in its hub with a curved groove 236 concentric with shaft 235 to receive a laterally projecting pin 237 projecting from the hub 238 of an upright controlling lever 239, which is mounted upon the shaft 235 along side of the arm 232. Set screw 240 secures the controlling lever 239 in the desired adjusted position upon the shaft 235. This controlling lever 239 cooperates with the sheet actuated tripping devices at the collating or assembling gauges to determine the operation of the drop roller feed mechanism which passes assemblages of sheets to the stitching mechanism. The details of this sheet actuated control will be hereinafter more fully explained in connection with the assemblage of sheets.

The rock shaft 235 is provided with a downwardly extending rock arm 245 fixed to its supporting shaft and pivotally connected to a rearwardly extending pitman 246 which is formed with a guide yoke 247 at its rear end that straddles and guides upon the main cam shaft 35. A cam 248 upon shaft 35 operating upon an anti-friction roller 249 carried by the pitman 246 moves the pitman forwardly once in each revolution of the cam shaft, a heavy spring 250 connecting the yoke of the pitman with a stationary point of the machine to cause roller 249 to follow the cam and impart a yieldingly rocking motion to shaft 235 when the controlling lever 239 is freed from the shaft actuated control. This action of the rock shaft 235 disengages the relief valve 225 to permit it to close and also releases the assembly drop rollers and gauges to permit them to act.

180 is a frame bar extending transversely of the machine above the plane of operation of the traveling shaft 135. Adjustably secured to this bar 180 are a series of channeled track bars 185, one for each of the described suction separating rollers. Each of these track bars 185 is of the general shape indicated in side elevation in Figures 6, 11 and 12 of the drawings, the track bars being arranged closely along side of the frames 130, so that the anti-friction roller 130^d will travel in the guide tracks of said bars to cause the raising and lowering of the suction wheels as they are moved back and forth and rotated by the traveling rotating shaft 135.

190 is a feed shaft suitably journaled in the side frames of the machine above the suction separating wheels 125. This shaft 190 carries at one end a miter gear 191 meshing with a similar gear 192 keyed to a shaft 193, which passes through the hollow shaft 65 and is suitably supported by the necessary bracket bearings mounted upon the side frame. The rear end of this shaft 193 is provided with a miter gear 194 meshing with a similar gear 195 mounted upon a stud shaft 196 journaled in a bracket of the machine side frame and carrying a pinion 197 which meshes with and is driven by the main driving gear 33. By the described means the feed shaft 190 is continuously rotated. The shaft 190 is provided with a series of feed wheels or pulleys 200 with two or more of which cooperate the inverted drop rollers 205 freely journaled upon rock arms 206 projecting forwardly from the rock shaft 207 suitably journaled in the side

frames of the machine. This rock shaft 207 also carries an upwardly projecting rock arm 208, which is connected by a contractile spring 209 with a stationary part of the machine for the purpose of throwing rollers 205 into peripheral contact with feed wheels 200.

Rock shaft 207 also carries at one end a curved rock arm 210 having a laterally projecting finger 211, which normally rests upon the upper edge of a lever 212 freely journaled at its rear end upon stud 213 and resting upon and supported by the traveling shaft 135. This lever 212 is formed in its lower edge with a curved recess 212ª, which receives the shaft 135 upon its rearward active stroke during the operation of separating the sheet, with the result that lever 212 will be lowered sufficiently to permit spring 209 to raise rollers 205 for engaging the leading edge of a partially separated sheet that has been presented by the rotated raised suction wheels above described.

A series of flat bars 275 are mounted upon the transverse frame bar 180 in inclined position leading from the feed delivery rollers 200—205 to a point adjacent to the assembly gauges hereinafter referred to. Supported above and parallel with said flat bars 275 are the rods 280 mounted upon a transverse bar 281, the two series of rods or bars 275—280 forming a passageway for the sheets delivered from the suction feeder.

285 is a transverse pulley shaft journaled in the side frames of the machine and carrying a series of tape pulleys 286 and friction feed pulleys 287. This shaft 285 is provided at one end outside of the side frame with a beveled gear 290 meshing with and driven by a similar gear 291 keyed to the longitudinal shaft 139 above referred to. 295, 296, 297 and 298 are series of idler tape pulleys freely journaled upon transverse shafts mounted in the side frames of the machine. 299 is a feed and tape roller journaled in an auxiliary feed frame hereinafter referred to. 300 are belt tightening pulleys freely journaled upon studs 301 projecting laterally with rock arms 302 pivoted upon a transverse shaft 303. The free ends of studs 301 are formed with annular grooves or recesses to receive the hooks 304 upon which are mounted the weights 305. The described arrangement of belt tightening is important because the hooks and weights constitute the sole means for holding the belt tightening pulleys 300 upon their studs. In mounting the tapes in position upon the several rollers, the weights 305 are removed and the tapes readily put in place around the tightening pulleys 300 since said pulleys are supported at one side only of the rock arms 302.

A series of endless conveyor tapes 310 pass around idler pulleys 297 over pulleys 296, then around deflecting idler pulleys 295 over the main feed pulleys 286 and then around the feed roller 299 down under the tightening pulleys 300 and up over the idler pulleys 298 back to pulleys 297 above referred to. The deflection of the tapes beneath the feeding path by the interposition of the pulleys 295 is to afford proper space for the intermediate supporting plate with which the side registering devices and the sheet actuated controlling devices cooperate in their action upon the successive sheets. The endless conveyor tapes just referred to serve to take the successive sheets from the pneumatic separator and feeder above described to the assembling gauges to meet the signatures or other sheets from another source presently to be explained, and after registry at this intermediate point to convey the assemblage of sheets forward to the next set of gauges which position the sheets for the action of the wire stitching machine.

The automatic suction separator and feeder above described will usually be employed for feeding cover sheets into the machine to be assembled with and stitched to partially folded signatures, although said feeder action may be employed for supplying other kinds of sheets such as additional parts or "outserts" for signatures. The supply of partially folded signatures or other sheets which are to be assembled and stitched to those received from the suction feeder may be fed into the machine by hand from an ordinary inclined feed board such as illustrated at 325 of Figures 1, 2, 3 and 6 of the drawings. This feed board is hinged at its forward end 326 to an inclined plate 327 supported upon the side frames of the machine, the hinges being provided with removable pintles to facilitate the detachment of the feed board from the machine. Any other readily attached device may be employed for securing the feed board in position at its forward end. The feed board is supported in the rear by means of upwardly projecting posts 328 mounted upon the machine side frame. A pile of sheets or signatures is indicated upon the feed board in position for hand feeding at 329 in Figure 6 of the drawings.

In carrying out one of the main features of the present invention, provision is made for automatically feeding into the stitching folding machine partially folded signatures or sheets as they are delivered from an ordinary commercial folding machine. To accomplish this any suitable automatic feeding mechanism may be employed to connect up the receiving end of the stitching folder with the delivery of the folding machine which supplies the signatures. This automatic signature feeding mechanism should for convenience be readily interchangeable with the ordinary feed board used in hand feeding, so as to enable the operator to suit

his convenience and the particular work to be performed by using the form of feeder best adapted for the purpose. In Figures 25 to 31 of the drawings is shown an automatic feeding attachment that can be applied to the machine in place of the feed board for accomplishing the stated purpose.

An auxiliary frame 335 is designed to rest upon side frames of the stitcher folder above the position assumed by the feed board 325 when the board is removed. This auxiliary frame is provided with suitable bracket bearings for a main transverse shaft 336 carrying at one end a gear wheel 337 in mesh with a driving reciprocating rack bar 338 designed to be driven by the main cam shaft or any other rotating part of the stitcher folder. Between its ends this shaft 336 is geared by means of miter gears with two longitudinal shafts 340 and 341 which carry adjacent to their opposite ends the gear wheels 345, which mesh with a series of vertical rack bars 346 arranged at the four corners of an open bottom tray 347 having the flanged end bars 348 and the removable and adjustable side bars 349, which can be moved inwardly and outwardly upon the end bars 348 and fastened in the desired adjusted positions by means of pins passing through the angular bracket ends of the side bars 349 and engaging openings in the end bars 348. The end bars 348 have inwardly presented horizontal flanges 348a while the adjustable side bars 349 have inwardly presented flanges 349a. These flanges at the sides and ends of the open bottom tray support a pile of sheets or signatures delivered to it either in packs by hand or automatically from the folding machine as presently to be explained.

Supported beneath the open bottom tray 347 are a series of endless conveyor tapes or belts 350 mounted upon a series of belt pulleys 351 journaled upon any suitable transverse shaft, such as shown, in which case it is the rock shaft of the main drop roller mechanism hereinafter described and a second series of tape pulleys 352 mounted upon a shaft 353 driven by a train of gears 354, 355 and 356, which may be operated from any suitable part of the stitcher folder as for instance by gear 357 mounted upon the feed shaft 190 above referred to.

Arranged between the upper runs of feed tapes 350 are a series of vertical suction tubes 360 connected through flexible hose 361 with the main suction pipe 170, with the result that when the pack of sheets or signatures in the open bottom tray is intermittently lowered from the position shown in Figure 25 to the position shown in Figure 26, the forward portion of the bottom sheet or signature will be gripped by the suction tubes 360 and pulled out from beneath the pack to disengage it from the side and end flanges of the tray. Journaled in the forward end of the open bottom tray is a belt deflecting roller 365, which is adapted to engage and depress the upper runs of the feed tapes 350 in the position shown in Figure 26 so as to partially relieve the bottom sheet or signature from the frictional engagement of the tapes at the moment of transfer from the open bottom tray to the tapes. When the bottom sheet or signature is pulled from the bottom of the tray as explained, the suction in the tubes 360 is broken to free the sheet or signature upon the tapes 350 which carry it forward to the main assembling gauges hereinafter referred to. The tapes 350 and their operating gears and the suction tubes 360 are preferably mounted permanently upon the machine, since they do not interfere with the operation in which signatures are fed from the feed board above referred to.

When it is desired to automatically supply the sheets or signatures to the open bottom feed tray 347, I may provide a conveyor in the form of a series of endless tapes or belts 370 passing around belt pulleys 371, 372 carried by transverse shafts 373, 374 journaled in suitable brackets, such as those shown in the form of extensions to the auxiliary frame 335. The shaft 373 is driven by chain 375 from the shaft 353 above referred to, or by any other suitable source of power. To permit the ready attachment and removal of the automatic signature feeder, the sprocket chain 375 is provided with means for readily disconnecting. The rack bar 338 is disengaged from the gear 337 when the auxiliary feeding attachment is removed. The conveyor 370 may be extended into position to receive partially folded signatures from the delivery of a folding machine indicated at 380 in Figures 25 and 26, the conveyor being so arranged as to convey the successive partially folded signatures to the open bottom tray 347.

It is also desirable to provide automatic means under the control of the height of the pack of sheets or signatures in the tray 347 to regulate the speed of the stitcher folder, so as to avoid supplying the sheets or signatures either too slow or too fast for the operation of the stitcher folder. This control of the speed of one machine by the supply of the product of another machine may be accomplished by various forms of automatic devices. In the accompanying drawings and particularly in Figures 29 to 31, I have shown one form of controller which will accomplish the desired result.

385 is a feeler finger resting upon the pack of sheets or signatures in the open bottom tray 347. This finger is freely journaled at 386 upon a bracket 387 and connected through an upwardly projecting arm 385a and link 388 with a rocking frame 389 journaled upon

trunnions 390 in the bracket arms 391. This frame 389 carries a cylinder of glass or other insulating material 395 formed with an offset pocket or recess 396 and containing a quantity of mercury indicated at 397. Suitably supported in this chamber 395 are terminal members 398, 399 dipping respectively in the mercury in the main chamber and offset referred to. These terminal members 398, 399 are in circuit with the motor field 20^a upon opposite sides of an auxiliary resistance 401. The motor armature 20^b is included in the main line circuit 400. It will be understood that field 20^a and armature 20^b represent the motor 20 of the stitcher folder hereinbefore referred to. The motor field 20^a and auxiliary resistance 401 are in circuit with the main line 400 through a field rheostat 402. With this arrangement of controller it will be understood that the feeding away from the stock of signatures held in the open bottom tray 347 faster than such signatures are supplied from the folder, will cause the feeler finger 385 to be shifted from the position shown in full lines in Figure 29 to the position shown in dotted lines in said figure, with the result that the mercury chamber will be shifted to the position illustrated in Figure 30, causing the mercury to flow across the gap and short-circuiting the auxiliary resistance 401 to slow down the motor which is driving the stitcher folder. Upon the return of the pile of signatures in the tray 347 to normal the feeler finger 385 will be returned to its normal position again breaking the circuit through terminals 398, 399 and thereby increasing the speed of the motor of the stitcher folder. The supply of the partially folded signatures from the ordinary folding machine is synchronized as nearly as possible by the adjustment of the field rheostat 402, after which any slight inequalities in the work of the two parts of the mechanism will be automatically cared for by the electric controller just described.

410 is an intermediate supporting plate to which sheets are delivered by the conveyor tapes 310 with their leading edges against the up-turned stop gauges 415 mounted upon a rocking shaft 416, extending transversely of the machine and connected at one end through a rock arm 417, link 418 and rock arm 419 with the rock shaft 420 of the drop roller mechanism as shown in Figure 1. This shaft 420 carries rearwardly presented rack arms 421 supporting in their rear ends the shaft 422 upon which are mounted drop rollers 423, which cooperate with the feed pulleys 287 upon shaft 285 above referred to.

The rock shaft 420 has a downwardly projecting rock arm 425 pivoted to pitman 426, which extends rearwardly and is pivoted to a lever 427 pivoted at 428 and carrying an antifriction roller 429 that is engaged by a cam 430 on cam shaft 35. Spring 431 connects rock arm 425 with a stationary point of the machine frame for throwing drop rollers 423 into action under the control of cam 430.

The gauges 415 are the assembling or collating gauges, which arrest the cover or outside sheets from the suction feeder and the partially folded signatures from the feed board 325, or the automatic feeder above described, and hold them in position for the operation of the drop roller feeding-off devices. While the collated sheets are held upon the gauges 415 they are acted upon by side registering joggers presently to be described and the sheets moving into this collated relation pass beneath and trip the automatic controlling devices, which determine the inter-relation of the several mechanisms and prevent the continued operation in the absence of either of the parts making up a complete assemblage.

The upright controlling lever 239 above referred to, is formed at its upper end with a recess 435 adapted to fit over a lateral lug 436 carried by one of the drop roller rock arms 421 when the drop rollers are in raised position. This engagement holds the drop rollers 423 and connected assembly gauges 415 out of action.

A latching finger 437 mounted upon a rock shaft 438 freely journaled in the rock arms 421 is adapted to engage the rear face of the upper end of controller lever 239 when the latter is latched upon lug 436. A sheet actuated trip finger 439 is keyed to the rock shaft 438 in the central longitudinal plane of the machine and supported thereby above the inclined plate 327, so as to be engaged and raised by a signature passing over said plate 327 into engagement with the collating gauges 415. This action of a signature disengages latch finger 437 from the controlling lever 239.

Beneath the intermediate supporting plate 410 is a transverse rock shaft 440 having an upwardly presented trip finger 441 extending through a slot in plate 410 into the path of sheets conveyed by the tapes 310. This rock shaft 440 carries a latching finger 442, which is normally presented in position to engage the rear face of a lateral lug 239^a of controlling lever 239 to hold the controlling lever in latched position with the drop rollers and gauges raised.

It will be clear that the drop rollers and gauges can operate only when both of the independently operating tripping devices 439 and 441 have been actuated by parts of an assemblage reaching the gauges 415. This latched position of the parts is shown in Figure 6^a of the drawings. When the latches of the controlling lever 239 are so released as shown in Figure 6, said controlling lever is actuated to disengage it from the lug 436 of one of the rock arms 421 and

for releasing the air valve 225, after which the drop rollers and gauges will operate to feed an assemblage of sheets forward to the wire stitching mechanism and the feeders will proceed to present additional partially folded signatures and cover or "outsert" sheets to the conveyors which pass them to the assembly gauges.

At the start of a feeding operation when there are no signatures or cover sheets in position to actuate the controller tripping devices, it is necessary to release and close the air valve 225 to cause the suction feeds to work. To accomplish this I provide the rock arm 232 with a vertically extending rod 445 presented in convenient position for hand operation, whereby the rock arm 232 can be depressed to disengage it from the head 230 of the valve rod 226.

Suitably mounted between the sheet supporting conveyor plates 327 and 410 are the centrally separated transverse registry shafts 450, 451, which are mounted to slide freely in suitable bearings in the machine frame. These shafts are provided at their adjacent inner ends with short rack bars 453 which mesh with a train of small gears 454, so that the movement imparted to one shaft will cause the corresponding movement of the other shaft. The outer end of the shaft 450 is jointed at 455 in the upper end of a lever 456 pivoted at 457 and carrying at its lower end an anti-friction roller 458, which travels upon the cam face 459 mounted upon the rack bar 150 above referred to. The reciprocation of the rack bar 150 will cause shaft 450 to reciprocate inwardly and outwardly. Each of the shafts 450 and 451 has adjustably mounted upon it the jogging gauge plates 460 and 461 presented respectively above the sheet supporting plates 327 and 410. By this means the assemblages of partially folded signatures and cover sheets or "outserts" are jogged and side registered immediately after they reach the assembling gauges 415, the gauges 460 and 461 being, of course, accurately adjusted upon their supporting shafts to suit the size of assemblages being treated.

470 is a rigid auxiliary frame having a transverse bar or shaft 471 which is pivoted at its ends in the side frames of the machine. A series of flat guide bars 472 are adjustably mounted upon transverse shaft 471. In the rear end of said auxiliary frame 470 is mounted the tape roller 299 over which pass the conveyor tapes 310 above referred to. Supported above the tape roller 299 is an upper tape roller 473 mounted in adjustable boxes 474 operating in vertical guide rails or brackets 475 confined by the adjustable springs 476. At the forward end of the auxiliary frame 470 the brackets 480 are adjustably mounted upon the shaft 471, which carry in guideways 481 slightly inclined to the horizontal the adjustable bearing blocks 482 in which are journaled the belt rollers 483. An upper series of feed belts 485 pass around the rollers 473, 483 in cooperative relation with the rear carrying stretches of conveyor belts 310 which receive assemblages from gauges 415 when they are passed on by the drop rollers 423. The upper series of tapes 485 is driven by means of a driving tape or belt 486 driven from a belt pulley 200 on shaft 190.

This auxiliary frame 470 rests in horizontal position upon the frame lugs 490. The arrangement is such that the auxiliary frame 470 can be raised vertically upon the shaft 471 to permit access to the parts of the machine below the series of tapes and particularly to the wire stitching heads and wire guides hereinafter referred to. The slack in tapes 130 is automatically taken up by the belt tightener pulleys 300 when the frame 470 is moved into elevated position, which position is indicated in dotted lines in Figure 2 of the drawings.

A series of conveyor tapes 500 pass over the tape pulleys 501 around a main tape feeding drum 502, the idler pulleys 503 and belt tightening pulleys 504. The initial carrying operation of said tapes being in a horizontal plane, while the latter carrying operation is in a vertical plane. The tape drum 502 is freely journaled upon transverse rock shaft 505 and is provided at one end with a gear 506 meshing with intermediate gear 507, which is driven by a large gear 508 keyed to the cam shaft 35.

510 is a bracket extending transversely of the machine and threaded upon the longitudinal adjusting screws 511, which are rotatably supported in brackets 512 and 513 and are rotated by the hand-operated shaft 515 which is suitably geared to both of said adjusting screws. Adjustable bracket 510 carries a transverse gauge shaft 520 upon which are mounted a series of rearwardly presented gauge fingers 521 held in normal position by the action of a spring 522 upon said shaft. A controlling arm 523 projects from the shaft 520 at one end in the plane of a controlling plate 530 formed with inclined slots 531, which engage the pins 532 projecting inwardly from parts mounted in the side frame. This controlling plate 530 is connected by a link 535 with a lever 536 pivoted at 537 and engaged at its lower end by a cam 538 mounted upon cam shaft 35. The action of the cam upon the lever 536 causes the controlling plate 530 to move longitudinally and rise upon its pins for moving the gauge fingers 521 into vertical gauging position as indicated in dotted lines in Figure 15, in which position an assemblage of signature parts brought forward by tapes 310 and 500 will be arrested and momentarily held in registered position for the action

of the stitching mechanism which will be presently described.

An upper series of tapes 540 passes around adjustably mounted belt pulleys 541, belt roller 542, the tightening pulleys 543 carried by spring retained rock arms 544, the idler rollers 545 and the main tape roller 502. These tapes 540 cooperate with the tapes 500 above referred to.

A series of stapling devices of any approved construction are adjustably mounted upon the transverse girder member 550 and slotted bar 551 adjustably mounted above said girder by means of set screws 552. The clincher heads of the stapling machines, indicated at 555, are mounted upon slotted bar 551 above the path of signatures, while the lower guide members 556 carrying the wire guides and anvil stocks are adjustably mounted beneath the path of the signatures upon the girder member 550.

560 is a rock shaft extending transversely of the machine and journaled in the brackets 561 and having forwardly projecting rock arms 562 pivotally connected through the ears or lugs 563 with a transverse bar 564 movable vertically in the guide slots 565 and formed with a rib 566 which engages the reciprocating members 567 of the clincher heads. The rock shaft 560 is provided adjacent to one end with a depending rock arm 570 carrying an anti-friction roller 571 operating in a grooved cam 572 keyed to the cam shaft 35.

The vertically reciprocating anvil stocks of the several stapling machines mounted in the usual manner in the members 556 above referred to, are operated by means of a transversely extending slotted bar 575 mounted at its ends upon guide blocks 576 operating in vertical guideways 577. These guide blocks 576 are connected through links 578 and rock arms 579 with a transverse rock shaft 580 provided near one end with a rock arm 581 pivotally connected to an eccentric link 582, operating upon an eccentric 583 freely journaled upon the cam shaft 35 and periodically coupled to the cam shaft through the medium of an automatic clutch controlled by the presence or absence of an assemblage of sheets or signatures in position for stapling. This automatic clutch will presently be described.

The wire for the several stapling machines is carried upon the spools 585 journaled upon pins 586 projecting longitudinally of the machine. The wire from spools 585 passes up over the guide pulleys 587, which rotate upon axes extending at right-angles to the pivot pins 586 and from said guide pulleys to the wire guides 588 leading to the vertically reciprocating anvils and wire feeding devices. The arrangement of the wire supporting spools 585 and guide pulleys 587 tends to straighten and offset the curved set of the wire as it passes to the stapling mechanisms. The mounting of spools 585 upon individual pins as explained is of great convenience in renewing the wire.

The automatic clutch, which controls the operation of the wire stitching machines, is shown particularly in Figures 4, 21 and 22 of the drawings. The operating eccentric 583 freely journaled upon the cam shaft 35 as above explained, carries a clutch pin 590 which projects laterally toward the gear 508 which is keyed to the shaft 35 as already explained. A clutch hook 591 is mounted upon a short rock shaft 592 journaled in the gear wheel 508 parallel to the shaft 35, the hook 591 being supported in position to engage the pin 590 and latch the eccentric 583 to the gear 508. A spring actuated rod 593 is pivoted to the heel of the hook 591 and guided through a lug 594 projecting from the face of gear 508, an expansion spring 595 being confined upon the rod 593 between the guide 594 and a nut 596. Upon the opposite face of gear 508 an arm 598 is secured to the rock shaft 592 approximately parallel with the hook 591. This arm 598 carries an anti-friction roller 599 which is adapted to be engaged by a crescent shaped cam 600 mounted upon a pin 601 having splined sliding bearing 601[a] in the machine side frame and movable parallel with shaft 35 into and out of the path of the anti-friction roller 599. The supporting pin 601 is formed in one edge with an inclined transverse groove 602 in which engages an angularly disposed blade 603 mounted upon a hub 604 secured to a tubular shaft 605, which is freely journaled upon the transverse rod or shaft 504[a] upon which tape tightening pulleys 504 are mounted. This tubular shaft 605 carries at its opposite end a rock arm 606 having an anti-friction roller 607, which operates upon cam 608 keyed to the shaft 35. Pivoted at 610 to the member 603 (Figure 16) is the upwardly presented rod 611 passing through the guide 612 and supporting an expansion spring 613 which is confined upon rod 611 against guide 612 by means of collar 614. Rod 611 is pivoted at its upper end 615 to a controlling lever pivotally mounted upon a stud 617. The controlling lever 616 is adapted to engage the upper end of a vertical arm 618 projecting up from a rock shaft 619 carrying in the central vertical longitudinal plane of the machine trip finger 620, which is adapted to be raised by the passage of an assemblage of sheets or signatures toward the gauges 521. When the finger 620 is tripped by the presence beneath it of an assemblage of sheet parts, the arm 618 is moved from beneath controlling lever 616, which allows connected members 603 and 606 to rock upwardly under control of cam 608. This upward movement of member 603 acting in inclined

groove 602 of pin 601, (see Figs. 21 and 22), slides said pin 601 and cam 600 outwardly toward the machine side frame out of the path of the anti-friction roller arm 598, so that the clutch hook 591 will engage pin 590 and thereby cause the operation of the stapling machine. In the absence of an assemblage of sheets or signatures the trip finger 620 will remain in normal position and prevent the release of controlling lever 616 with the result that cam 600 will remain in the path of roller 599 and raise hook 591 out of the path of pin 590. In this way the described clutch which controls the operation of the stapling machines will be automatically thrown out so as to prevent the operation of the stapling machine when there is no assemblage of sheets to act upon.

The operation of the wire stitching machines and the gauges 521, which holds the assemblage in registered position for receiving the staples, are properly timed so that immediately after an assemblage has been stitched the gauges 521 are elevated and the tapes 500 and 540 convey the stapled sheets or signatures rearwardly over the main tape roller 502 and downwardly at the rear of the machine until arrested by an adjustable folder gauge 650 mounted upon adjusting screws 651, journaled in the machine frame and operated by the hand-crank shaft 652 which is geared to the screws 651 in the usual manner.

The stitched sheets or signatures are supported by the gauge 650 with the line of stitches in the line of fold of the folding rollers 655, 656, between which the bound sheets are tucked by the folding knife 660 mounted upon arms 661 keyed to the ends of the shaft 505 above referred to and operated by an arm 662 operating in a cam groove 663 formed in the inner face of cam disk 82 above referred to.

The folding rollers 655 and 656 are geared together in the usual manner and driven by the sprocket wheel 26, which is mounted upon the journal of the lower folding rollers 655.

As the stitched folded sheets or signatures pass from the folding rollers 655, 656 they pass between the pressure rollers 665, 666 and are deflected downwardly by the deflector 667 to pass between the roller 665 and a pressure roller 668, which latter rollers deposit the folded stitched signatures into the packing mechanism which will now be described.

A suitable angular frame having upright arms 675 carrying anti-friction rollers 676 traveling in vertical guideways 677 of the machine frame and horizontal arms 678 supporting a platform 679 and rearwardly projecting plates or fingers 680, constitutes the main adjustable support or platform for the reception of the completely folded product. This platform carries a transverse shaft 681 adjacent to uprights 675 provided with gears 682 that mesh with vertical rack bars 683 mounted upon the upright frame members. This shaft 681 also carries a hand-wheel 685 by which the shaft can be rotated and a ratchet wheel 686 engaged by a dog 687 pivoted upon a fixed stud 688 for holding the platform in the desired adjusted elevation.

690 is the automatically adjustable abutment against which the completely folded products are piled and packed. This abutment 690 carries grooved anti-friction rollers 691, which operate in engagement with a horizontal track bar 692 mounted centrally in the platform 679. A cord or cable 695 is attached to pin 696 projecting beneath abutment 690 and passes around a guide pulley 697 operating on a horizontal pivot to a large winding sheave or pulley 698 mounted upon a vertical pivot beneath the platform 679, and having secured to its hub a smaller sheave or pulley 699 upon which is wound a second cord or cable 700 having one end attached by spring 701 to stationary bracket 702. The described arrangement tends to automatically and yieldingly pull the abutment 690 toward the vertical transverse plane of deposit of folded products from rollers 665, 668 above referred to.

The plates or fingers 680 are provided with spring latch fingers 705 operating in the usual manner in cooperation with the gravity latch fingers 706 supported above to confine the folded products in a pile or stack. 710 are a series of vertically presented packer arms adapted to reciprocate between the platform plates or fingers 680 and across the plane of deposit of folded products, for packing and piling the successive products behind the latches 705 and 706 against the abutment 690. As the stack of folded products increases in length upon the platform, it will be understood that the abutment 690 yields forwardly under the pressure of the packing arms 710, causing the cord or cable 695 to unwind from sheave 698. When a bunch of the folded products is removed from the stack, the spring 701 acting through sheave 698 will automatically move the abutment 690 rearwardly to fill up the gap and engage the remaining portion of the stack.

The packer arms 710 are rigidly mounted upon the shaft 711 journaled in the lower ends of rock arms 712 carried by and depending from rock shaft 78 above referred to. The operation of this shaft 78 has already been explained. 715 are guide rods passing through guide brackets 716 mounted upon the machine frame and secured at their rear ends to shaft 711 for the purpose of maintaining the packing arms 710 in vertical position, while they are reciprocated by the mechanism described.

In the operation of the improved machine the jobs are folded in the customary manner excepting that the final fold is left off and the work passed into the machine as flat signatures or parts either by hand feeding, by automatic feeding or by receiving the partly folded signatures directly from the ordinary folding machine. The improved machine eliminates in pamphlet, booklet and house organ binding the operations of cover folding, inserting signatures into covers by hand, opening folded books for wire stitching and hand wire stitching; when the work is received directly from the folding machine it eliminates the handling of signatures between the folder and hand stitcher. The improved machine eliminates the necessity for inspection since if for any reason the cover or four page "outsert," or the inside signature does not reach the collating gauges, the work will not advance into the machine until the missing part of the work arrives. The machine will not deliver incomplete copies which have to be later bound by hand, but merely holds up its work until the missing part again puts it into operation. This automatic action does not affect the continued operation of the folding machine, which is delivering directly to the improved wire stitching and folding machine, since the folder can continue to deliver its work into the receiving tray of the improved machine where it will remain until the improved machine goes ahead with its operation, when it will automatically speed up and take away the accumulation of work delivered by the folder. The finishing wire stitching and folding unit when attached to the ordinary folding machine increases the production of the latter inasmuch as the cover or an additional four page signature may be added and bound to the signature received from the folding machine. If neither a cover nor a four page "outsert" is required, the completed unit coming from the folder will be stitched and folded in the form of a self-covered book.

725 in Fig. 1 of the drawings, represents an electrical connector for plugging into a power circuit and supplying current to motor 20 through properly insulated supply wires (not shown) which are mounted in the machine frame.

I am not aware that it has ever heretofore been proposed to produce a portable self-contained bindery finishing unit having conveying, stitching and folding mechanisms in a single supporting frame, either with or without an automatically operating pile feeding mechanism. I am also not aware that it has ever been proposed to produce a self-contained folding machine unit having conveying mechanism, folding mechanism and an automatically controlled pile feeding mechanism, which are mounted upon a common supporting frame. Each self-contained unit is preferably provided with its own driving motor and electrical equipment mounted upon the common frame, and the frame is preferably provided with wheels or rollers to facilitate moving the unit from place to place into operating relation to any one of a number of folding machines. I desire to cover, in the hereinafter recited claims, such self-contained units in a broad sense, and also some or all of the described mechanisms in their various cooperative combinations for the purposes explained, as well as the structural novelty of said mechanisms.

I claim:

1. A bindery finishing unit, comprising folding mechanism, conveying mechanism carrying sheets to said folding mechanism, a plurality of superposed means from which sheets are fed to said folding mechanism by said conveying mechanism, said means including an automatically controlled pile elevating mechanism, and a frame supporting all of said mechanisms, whereby said frame and the mechanisms supported thereon may be moved together from place to place as desired.

2. A bindery finishing unit, comprising folding mechanism, conveying mechanism for delivering sheets in superimposed relation to said folding mechanism, a plurality of superposed means from which the sheets are simultaneously fed and delivered to said conveying mechanism, said means including an automatically controlled pile elevating mechanism, a packing box receiving folded products from said folding mechanism, a frame supporting all of said mechanisms and said packing box, and rollers for said frame whereby the latter with the instrumentalities supported thereon may be moved together from place to place as desired.

3. A self-contained folding machine unit, comprising folding mechanism, stitching mechanism, conveying mechanism carrying sheets or signatures to said stitching and folding mechanisms, automatically controlled pile feeding mechanism delivering to said conveying mechanism, a packing box arranged to receive the folded product from said folding mechanism, and a common machine frame supporting all of said mechanisms and said packing box.

4. A self-contained bindery finishing folding machine unit, comprising folding mechanism, stitching mechanism, conveying mechanism carrying sheets or signatures to said stitching and folding mechanisms, automatically controlled pile feeding mechanism delivering to said conveying mechanism, and a common machine frame supporting all of said mechanisms and constituting therewith a portable unit.

5. A bindery finishing unit, comprising

folding mechanism, conveying mechanism carrying sheets to said folding mechanism, a plurality of superposed sheet supporting means from which sheets are delivered to said conveying mechanism, said means including an automatically controlled pile elevating mechanism, a motor for driving said mechanisms, a frame supporting all of said mechanisms and said driving motor, and rollers for said frame whereby the latter with the driving motor and said mechanisms may all be moved together from place to place as desired.

6. A portable self-contained bindery finishing folding machine unit, comprising folding mechanism, stitching mechanism, conveying mechanism carrying sheets to said stitching and folding mechanisms, automatically controlled pile feeding mechanism delivering to said conveying mechanism, a motor for driving said mechanisms, and a unit forming supporting machine frame common to all of said mechanisms and said driving motor.

7. A self-contained folding machine unit comprising folding mechanism, stitching mechanism associated with said folding mechanism, conveying mechanism arranged to carry sheets or signatures to said stitching and folding mechanisms, automatically controlled pile feeding mechanism delivering to the said conveying mechanism, a packing box arranged to receive folded stitched products from said folding mechanism, a motor for driving said mechanisms, and a supporting machine frame common to all of said mechanisms, said packing box and said driving motor.

8. A bindery finishing unit, comprising folding mechanism, conveying mechanism carrying sheets or signatures in superimposed relation to said folding mechanism, a plurality of superposed means from which sheets or signatures are fed and simultaneously delivered to said conveying mechanism, said means including an automatically controlled pile elevating mechanism having a suction separator, an air pump communicating with said separator, a motor for driving said mechanisms and said air pump, a frame supporting all of said mechanisms, the air pump, and said driving motor, and rollers for said frame whereby the latter with said mechanisms, the air pump, and the driving motor may all be moved together from place to place as desired.

9. A portable self-contained folding machine unit, comprising folding mechanism, stitching mechanism, conveying mechanism carrying sheets or signatures to said stitching and folding mechanisms, automatically controlled pile feeding mechanism delivering sheets to said conveying mechanism, said feeding mechanism having a suction separator, an air pump communicating with said separator, a motor for driving said mechanisms and air pump, and a supporting machine frame common to all of said mechanisms, said air pump and said motor, the whole constituting a portable finishing unit for binderies.

10. A bindery finishing unit, comprising folding mechanism, collating mechanism from which sheets are delivered to said folding mechanism, a plurality of superposed means from which sheets are fed and simultaneously delivered to said collating mechanism, said means including an automatically controlled pile elevating mechanism, and a frame supporting all of said mechanisms whereby said frame and the mechanisms supported thereon may be moved together from place to place as desired.

11. A bindery finishing unit, comprising folding mechanism, collating mechanism associated therewith, conveying mechanism for delivering sheets from the collating mechanism to said folding mechanism, a plurality of superposed means from which sheets are fed and delivered simultaneously to said collating mechanism, said means including an automatically controlled pile elevating mechanism, a motor for driving said mechanisms, a frame supporting all of said mechanisms, and rollers for said frame whereby the latter with the motor and said mechanisms may all be moved together from place to place as desired.

12. A self-contained folding machine unit, comprising folding mechanism, stitching mechanism, collating mechanism associated therewith, two conveying mechanisms leading to said collating mechanism, automatically controlled pile feeding mechanism delivering to one of said conveying mechanisms, and a unitary machine frame common to and supporting all of said mechanisms.

13. A self-contained folding machine unit, comprising folding mechanism, stitching mechanism, collating mechanism associated therewith, two conveying mechanisms leading to said collating mechanism, automatically controlled pile feeding mechanism delivering to one of said conveying mechanisms, a motor for driving said mechanisms, and a unitary machine frame common to and supporting all of said mechanisms and motor.

14. A bindery finishing unit, comprising folding mechanism, collating mechanism associated therewith and from which sheets are fed to said folding mechanism, a plurality of superposed means from which sheets are fed and delivered to the collating mechanism, said means including two automatically controlled pile feeding mechanisms, and a frame supporting all of said mechanisms whereby said frame and the

mechanisms supported thereon may be moved together from place to place as desired.

15. A self-contained folding machine unit, including associated conveying mechanism, folding mechanism, a driving motor, and automatic means controlling the speed of the motor.

16. A self-contained folding machine unit, comprising folding mechanism, conveying mechanism carrying sheets or signatures to said folding mechanism, a driving motor, and automatic means under control of the supply of material to said conveying mechanism for controlling the speed of the motor.

17. A self-contained folding machine unit, comprising folding mechanism, conveying mechanism supplying sheets or signatures to said folding mechanism, automatic feeding mechanism delivering sheets or signatures to said conveying mechanism, a driving motor for said mechanisms, and automatic means under the control of said feeding mechanism for controlling the speed of said motor.

18. A finishing folding machine unit, including associated folding mechanism and conveying mechanism adapted to receive material from an external source, a driving motor, and means under the control of the supply of material for controlling the speed of the motor.

19. A self-contained folding machine unit, including associated conveying mechanisms, folding mechanism, automatic feeders delivering respectively to said conveying mechanisms, a driving motor and means under the control of one of said feeders for controlling the speed of the motor.

20. A portable self-contained folding machine unit, including associated conveying mechanisms, folding mechanism, an automatic feeder delivering to one of said conveying mechanisms, said other conveying mechanism being adapted to receive material from an external source, a driving motor, and means under the control of material supplied to said other conveying mechanism for controlling the speed of the motor.

21. A portable self-contained folding machine unit, comprising folding mechanisms, two conveying mechanisms supplying sheets or signatures to said folding mechanism, collating mechanism associated with said conveying mechanisms, an automatic feeder delivering to one of said conveying mechanisms, said other conveying mechanism being adapted to receive material from an external source, a driving motor, and means under the control of material supplied to said other conveying mechanism for controlling the speed of the motor.

22. A self-contained folding machine unit, comprising folding mechanism, two conveying mechanisms leading to said folding mechanism, collating mechanism associated with said conveying mechanisms, automatic feeders delivering respectively to said conveying mechanisms, a driving motor, and means under the control of one of said feeders for controlling the speed of the motor.

23. A self-contained folding machine unit, comprising folding mechanism, two conveying mechanisms leading to said folding mechanism, collating mechanism associated with said conveying mechanisms, automatic feeders delivering respectively to said conveying mechanisms, means for automatically supplying material to one of said feeders from an outside source, a driving motor, and means under the control of one of said feeders for controlling the speed of the motor.

24. A self-contained folding machine unit, comprising, folding mechanism, two conveying mechanisms leading to said folding mechanism, collating mechanism associated with said conveying mechanisms, automatic feeders delivering respectively to said conveying mechanisms, one of said feeders being arranged to receive and pile material at the top and periodically deliver to a conveying mechanism from the bottom, a driving motor, and means under the control of one of said feeders for controlling the speed of the motor.

25. A self-contained folding machine unit, comprising folding mechanism, conveying mechanisms supplying sheets or signatures to said folding mechanism, automatic feeders delivering respectively to said conveying mechanisms, stitching mechanism, a driving motor, and means under the control of one of said feeders for controlling the speed of the motor.

26. A self-contained folding machine unit, comprising folding mechanism, conveying mechanisms supplying sheets or signatures to said folding mechanism, two automatic feeders arranged one above the other and delivering respectively to said conveying mechanisms, stitching mechanism, a driving motor, and means under the control of one of said feeders for controlling the speed of the motor.

27. A self-contained folding machine unit, comprising associated stitching and folding mechanisms, conveying mechanisms supplying sheets or signatures thereto, collating mechanism associated with said conveying mechanisms, automatic feeders delivering respectively to said conveying mechanisms, a driving motor, and means under the control of one of said automatic feeders for controlling the speed of said motor.

28. In a folding mechanism, the combination of conveying mechanism, folding mechanism receiving sheets or signatures therefrom, transfer feeding mechanism arranged to receive partly folded sheets from an independent folding machine and de-

liver them periodically to said conveying mechanism, a driving motor, and means controlled by the accumulation of sheets in said transfer feeder for controlling the speed of the motor.

29. In a folding mechanism, the combination of conveying mechanism, folding mechanism receiving sheets or signatures therefrom, transfer feeding mechanism arranged to receive and pile partly folded sheets from a folding machine and periodically deliver them from the bottom to said conveying mechanism, a driving motor, and means controlled by the accumulation of sheets in said transfer feeder for controlling the speed of the motor.

30. In a folding mechanism, the combination of conveying mechanism, folding mechanism receiving sheets or signatures therefrom, collating mechanism, an automatic pile feeder, transfer feeding mechanism arranged to receive partly folded sheets from a folding machine and deliver them periodically to said conveying mechanism, a driving motor, and means controlled by the accumulation of sheets in said transfer feeder for controlling the speed of the motor.

31. In a folding mechanism, the combination of conveying mechanism, folding mechanism receiving sheets or signatures therefrom, collating mechanism, an automatic pile feeder, stitching mechanism, transfer feeding mechanism arranged to receive partly folded sheets from a folding machine and deliver them periodically to said conveying mechanism, a driving motor, and means controlled by the accumulation of sheets in said transfer feeder for controlling the speed of the motor.

32. A self-contained folding machine unit, comprising conveying mechanisms leading to an assembling station, collating mechanism at said assembling station, successively acting stitching and folding mechanisms receiving assemblages from said conveying mechanisms, automatic feeders delivering respectively to said conveying mechanisms, a driving motor, and means under the control of collated sheets for controlling the passage of sheets to the stitching and folding mechanisms.

33. A self-contained folding machine unit, comprising conveying mechanisms, leading to an assembling station, collating mechanism, at said assembling station, successively acting stitching and folding mechanisms receiving assemblages from said conveying mechanisms, automatic feeders delivering respectively to said conveying mechanisms, a driving motor, and means under the control of collated sheets for controlling the operation of one of said feeders.

34. A self-contained folding machine unit, including associated conveying mechanisms, collating mechanism, folding mechanism, automatic feeders delivering respectively to said conveying mechanisms, stitching mechanism, a driving motor, and means under the control of collated sheets for controlling the passage of sheets to the stitching and folding mechanisms and the operation of one of said feeders.

35. In a folding mechanism, the combination of conveying mechanism, folding mechanism, collating mechanism, an automatic pile feeder, transfer feeding mechanism arranged to receive partly folded sheets from a folding machine and deliver them periodically to said conveying mechanism, a driving motor, means controlled by the accumulation of sheets in said transfer feeder for controlling the speed of the motor, and means under the control of collated sheets for controlling the operation of said pile feeder.

36. In a folding mechanism, the combination of conveying mechanism, folding mechanism, collating mechanism, an automatic pile feeder, transfer feeding mechanism arranged to receive and pile partly folded sheets from a folding machine and deliver them periodically to said conveying mechanism, a driving motor, means controlled by the accumulation of sheets in said transfer feeder for controlling the speed of the motor, and means under the control of collated sheets for controlling the operation of said pile feeder and the passage of collated sheets to the folding mechanism.

37. In a folding mechanism, the combination of conveying mechanism, folding mechanism, collating mechanism, an automatic pile feeder, stitching mechanism, transfer feeding mechanism arranged to receive partly folded sheets from a folding machine and deliver them periodically to said conveying mechanism, a driving motor, means controlled by the accumulation of sheets in said transfer feeder for controlling the speed of the motor, and means under the control of collated sheets for controlling the operation of the stitching mechanism.

38. In a folding mechanism, the combination of conveying mechanism, folding mechanism, collating mechanism, an automatic pile feeder, stitching mechanism, transfer feeding mechanism arranged to receive partly folded sheets from a folding machine and deliver them periodically to said conveying mechanism, a driving motor, means controlled by the accumulation of sheets in said transfer feeder for controlling the speed of the motor, and means under the control of collated sheets for controlling the operations of the pile feeder and stitching mechanism and the passage of collated

sheets to the stitching and folding mechanisms.

39. A bindery finishing unit, comprising cooperating conveying, stitching and folding mechanisms, a plurality of superposed means from which sheets are fed and delivered simultaneously to said conveying mechanism, said means including an automatically controlled pile elevating mechanism, a frame supporting all of said mechanisms, and rollers for said frame whereby the latter and the mechanisms supported thereon may be moved together from place to place as desired.

40. A bindery finishing unit, including cooperating conveying, collating, stitching, and folding mechanism, a plurality of superposed means from which sheets are fed and delivered to said collating mechanism, said means including an automatically controlled pile elevating mechanism and a second conveying mechanism, and a frame supporting all of said mechanisms whereby said frame and the mechanisms thereon may be moved together from place to place as desired.

41. A bindery finishing unit, including cooperating conveying, stitching and folding mechanisms, and a plurality of means from which sheets are fed and delivered to said stitching and folding mechanisms successively by said conveying mechanism, said means including an automatically controlled pile elevating mechanism and a second conveying mechanism extending over said pile elevating mechanism and receiving sheets therefrom, and a frame supporting all of said mechanisms whereby said frame and the mechanisms thereon may be moved together from place to place as desired.

42. A bindery finishing unit, including cooperating collating, stitching, folding, and conveyor mechanisms, and a driving motor, together with a series of superposed means from which sheets are fed and delivered to said mechanisms, and a frame supporting all of said mechanisms, said means, and said driving motor, whereby the frame and instrumentalities supported thereon may be moved together from place to place as desired.

43. A bindery finishing unit, comprising collating, stitching, and folding mechanisms, a conveyor mechanism for delivering sheets from the collating mechanism to the stitching mechanism and said folding mechanism, a driving motor for said mechanisms, means for delivering the sheets to said collating mechanism and including an automatically controlled pile elevating mechanism and a second conveyor mechanism arranged in superposed relation at opposite sides of the first named conveyor mechanism, a frame carrying all of said mechanisms, and rollers for said frame whereby the latter with the mechanisms supported thereon may be moved together from place to place as desired.

44. A bindery finishing unit comprising stitching and folding mechanisms, a conveyor mechanism for carrying sheets from the stitching mechanism to the folding mechanism, a plurality of superposed means from which sheets are fed to said stitching mechanism and including an automatically controlled pile elevating mechanism, collating gages disposed between said means and the stitching mechanism, sheet controlled means controlling the operation of said collating gages, and a frame supporting all of said mechanisms, the gages, and said means whereby the frame and the various instrumentalities supported thereon may be moved together from place to place as desired.

45. A bindery finishing unit, comprising cooperating collating, stitching, folding, and conveying mechanisms, a plurality of superposed, automatically controlled feeding mechanisms delivering sheets thereto and including a pile elevating mechanism, and a frame supporting all of said mechanisms whereby the frame and the mechanisms supported thereon may be moved together from place to place as desired.

46. A bindery finishing unit, comprising cooperating collating, stitching, folding, and conveying mechanisms, two superposed, automatically controlled feeding mechanisms delivering sheets thereto and including a pile elevating mechanism, a driving motor for said mechanisms, a frame supporting said mechanisms and the driving motor, and rollers for said frame whereby the latter with the driving motor and aforesaid mechanisms may be moved together from place to place as desired.

47. A portable self-contained bindery finishing unit, including cooperating conveying, stitching and folding mechanisms, an automatically controlled pile feeder having suction separating means, an air pump, a second automatic feeder, sheet collating means, and a driving motor.

48. A bindery finishing unit, comprising conveying mechanism and successively acting stitching and folding mechanisms, past which sheets are fed by said conveying mechanism, a series of superposed means for feeding and delivering the sheets to said conveying mechanism, said means including an automatically controlled pile elevating mechanism, and a frame carrying all of said mechanisms whereby the frame and the mechanisms thereon may be moved together from place to place as desired.

49. A bindery finishing unit, comprising conveying mechanism, a plurality of superposed means from which sheets are fed and delivered to said conveying mechanism and including an automatically controlled pile elevating mechanism, stitching and folding

mechanisms receiving sheets from said conveying mechanism, a driving motor, and a wheeled frame or carriage supporting all of said mechanisms and said motor whereby they may be moved together from place to place as desired.

50. A portable self-contained bindery finishing unit, comprising in combination means for flat feeding signature parts, means for flat feeding cover sheets, automatically controlled means for collating signature parts and cover sheets, successively operating stitching and final fold mechanisms arranged to act upon collated flat signature parts and cover sheets for producing completed covered pamphlets, a driving motor, automatic means controlling the operation of the stitching mechanism, and a unitary movable frame or carriage supporting said mechanisms.

51. A portable self-contained bindery finishing unit, comprising in combination means for flat feeding signature parts, an automatically controlled pile feeder mechanism for flat feeding cover sheets, automatically controlled means for collating signature parts and cover sheets, successively operating stitching and final fold mechanisms arranged to act upon collated flat signature parts and cover sheets for producing completed covered pamphlets, a driving motor, automatic means controlling the operation of the stitching mechanism, and a unitary movable frame or carriage supporting said mechanisms.

52. The combination, in a machine of the character set forth, of suitable conveying, stitching and folding mechanisms, with a conveyor mounted upon a hinged frame, capable of being raised out of its operative position to afford access to parts of the stitching mechanism.

53. The combination, in a machine of the character set forth, of suitable conveying, stitching and folding mechanisms, with a hinged conveyor frame, capable of being raised out of its operative position to afford access to parts of the stitching mechanism, and a series of conveyor tapes carried by said hinged frame.

54. The combination, in a machine of the character set forth, of suitable conveying, stitching and folding mechanisms, with a hinged conveyor frame, capable of being raised out of its operative position to afford access to parts of the stitching mechanism, and two series of conveyor tapes mounted upon said hinged frame respectively above and below the path of sheets.

55. In a machine of the character set forth, the combination of conveying mechanism arranged to receive sheets from two sources, collating mechanism, and sheet actuated controlling means for said collating mechanism adapted to prevent the sheet releasing operation of said mechanism in the absence of a sheet from either source.

56. In a machine of the character set forth, the combination of suitable collating gauges, and two sources of sheet supply, with a controller for said collating gauges, and independent trips arranged respectively in the paths of sheets from the two sources of supply and adapted to prevent the sheet releasing operation of said controller in the absence of a sheet from either source.

57. In a machine of the character set forth, the combination of suitable collating gauges, two sources of sheet supply, and stitching mechanisms, with a controller for said collating gauges, and independent trips arranged respectively in the paths of sheets from the two sources of supply and adapted to prevent the sheet releasing operation of said controller in the absence of a sheet from either source.

58. In a machine of the character set forth, the combination of suitable collating gauges, two sources of sheet supply, stitching mechanism, and folding mechanism, with a controller for said collating gauges, and independent trips arranged respectively in the paths of sheets from the two sources of supply and adapted to prevent the sheet releasing operation of said controller in the absence of a sheet from either source.

59. In a machine of the character set forth, the combination of suitable collating gauges, two sources of sheet supply, and drop roller feed mechanism arranged to feed collated sheets from said collating mechanism, with a controller for said collating gauges and drop roller mechanism, and independent trips arranged respectively in the paths of sheets from the two sources of supply and adapted to prevent the operation of said controller in the absence of a sheet from either source.

60. In a machine of the character set forth, the combination of suitable collating mechanism, conveying mechanism leading from said collating mechanism, and drop roller feed mechanism delivering from said collating mechanism to said conveying mechanism, with a controller for said collating mechanism and said drop roller mechanism, and independent trips arranged respectively in the paths of sheets from two sources of supply and adapted to prevent the operation of said controller in the absence of a sheet from either source.

61. In a machine of the character set forth, the combination with a conveying mechanism, of collating gauges arranged to assemble sheets upon said conveying mechanism, drop roller feed mechanism cooperating with said conveying mechanism, an automatic feeder, a controller controlling the operation of said collating gauges said drop roller mechanism and said automatic

feeder, and independent sheet actuated tripping devices arranged respectively in the paths of two sources of sheet supply and adapted to prevent the operation of said controller in the absence of a sheet from either source.

62. In a machine of the character set forth, the combination with a conveying mechanism, of means for supplying sheets through two sheet paths to said conveying mechanism, collating gauges arranged to assemble sheets upon said conveying mechanism, drop roller feed mechanism cooperating with said conveying mechanism, an automatic feeder constituting one of said sheet supplies leading to one of said sheet paths, a controller controlling the operation of said collating gauges, said drop roller mechanism and said automatic feeder, and independent sheet actuated tripping devices arranged respectively in the two paths of sheet supply and adapted to prevent the operation of said controller in the absence of a sheet from either source.

63. In a machine of the character set forth, the combination of conveying mechanism, with a sheet arresting gauge comprising a bracket, a gauge shaft mounted on said bracket and carrying a gauge, a controlling arm projecting from said gauge shaft, and an intermittently operated controlling plate engaging said controlling arm.

64. In a machine of the character set forth, the combination of conveying mechanism, with a sheet arresting gauge comprising a bracket, a gauge shaft mounted on said bracket and carrying a gauge, said gauge shaft having a spring holding said gauge normally out of action, a controlling arm projecting from said gauge shaft, and an intermittently operated controlling plate engaging said controlling arm.

65. In a machine of the character set forth, the combination of conveying mechanism, with a sheet arresting gauge comprising a bracket, a gauge shaft mounted on said bracket and carrying a gauge, a controlling arm projecting from said gauge shaft, an intermittently operated controlling plate engaging said controlling arm, said controlling plate being formed with inclined slots engaging guide pins, and means for moving said plate upon its guide pins.

66. In a machine of the character set forth, the combination of conveying mechanism, stitching mechanism, and folding mechanism, with a sheet arresting gauge mounted between the stitching mechanism and folding mechanism, said gauge comprising an adjustable bracket, a gauge shaft mounted on said bracket and carrying a series of gauge fingers, means normally supporting said gauge fingers in inactive position, a controlling arm projecting from said gauge shaft, and an intermittently operated controlling plate engaging said controlling arm.

67. In a machine of the character set forth, the combination of suitable conveying tapes having horizontal and vertical runs, a tape drum arranged to guide said tapes from their horizontal to their vertical run, folding rollers arranged at the end of the vertical run of said conveyor tapes, and a folding knife having its supporting arms journaled upon the axis of said tape drum.

EARL D. RADER.