

April 10, 1945.

J. C. STRICKLER

2,373,149

SHEET FEEDING AND STACKING APPARATUS

Filed March 25, 1943

10 Sheets-Sheet 1

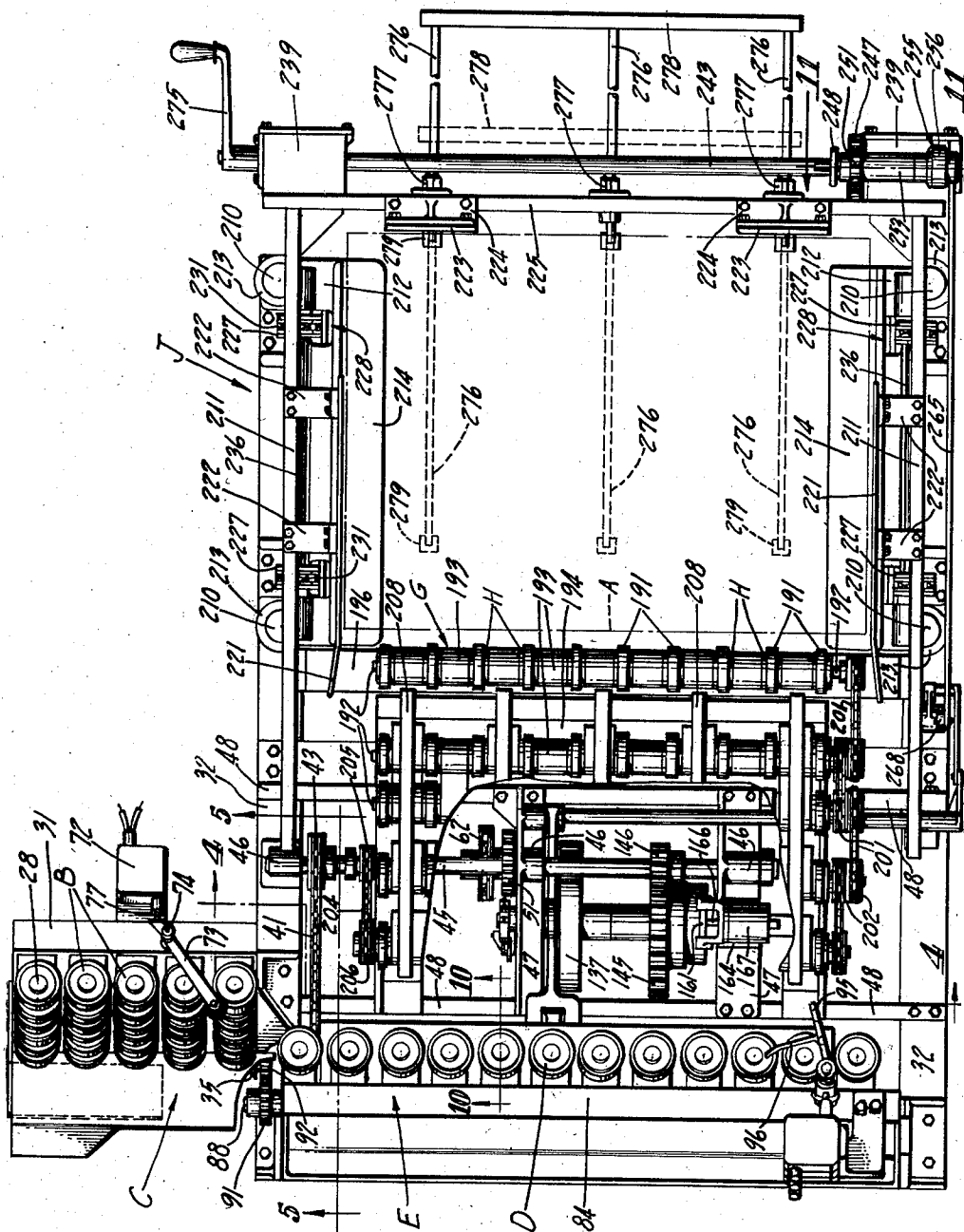


Fig 1

INVENTOR.
John C. Strickler
BY Ivan D. Thornburgh
Charles H. Euna
ATTORNEYS

April 10, 1945.

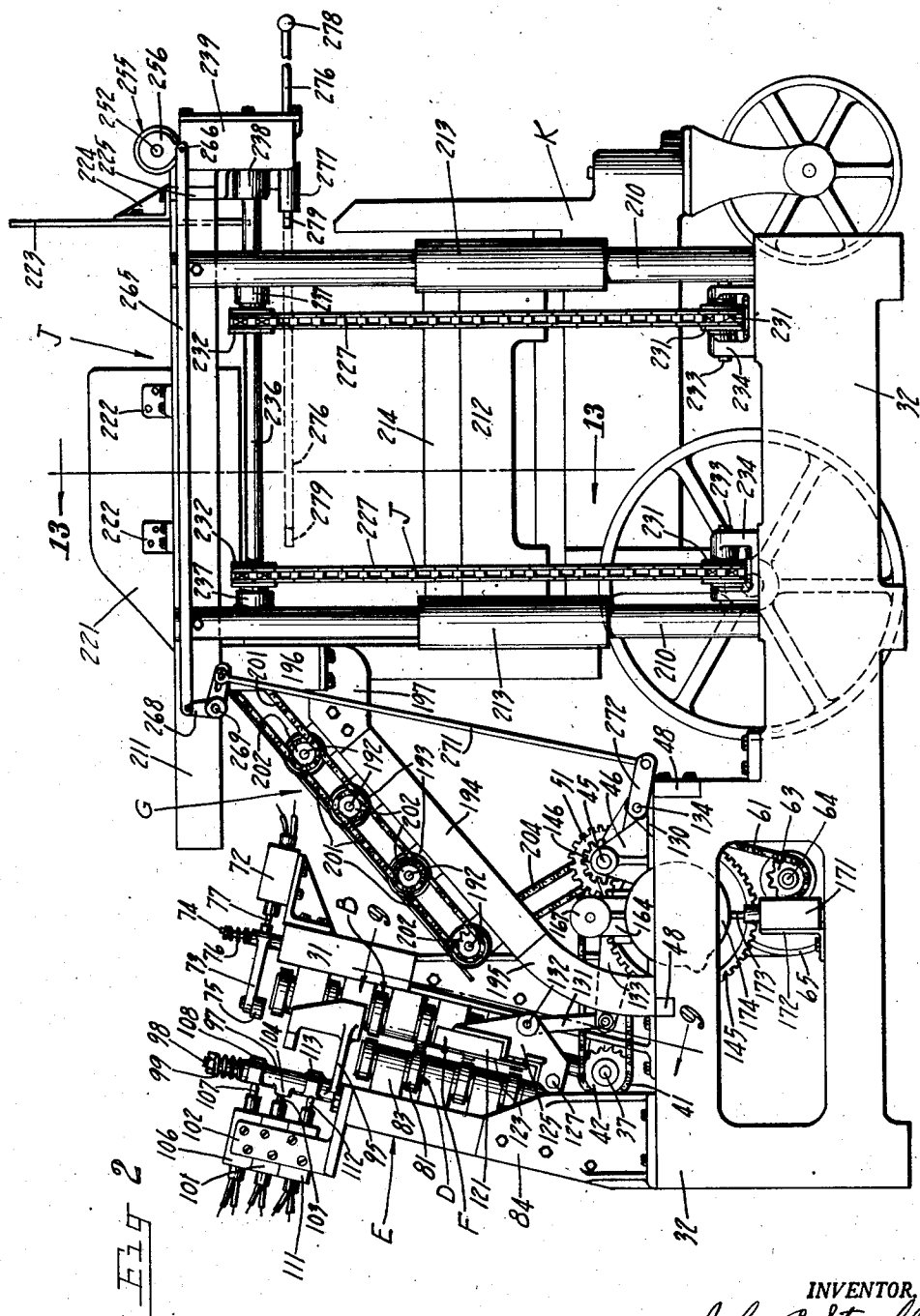
J. C. STRICKLER

2,373,149

SHEET FEEDING AND STACKING APPARATUS

Filed March 25, 1943

10 Sheets-Sheet 2



INVENTOR,
John C. Strickler
BY *Ivan D. Thornburgh*
Charles H. Erbe
ATTORNEYS

April 10, 1945.

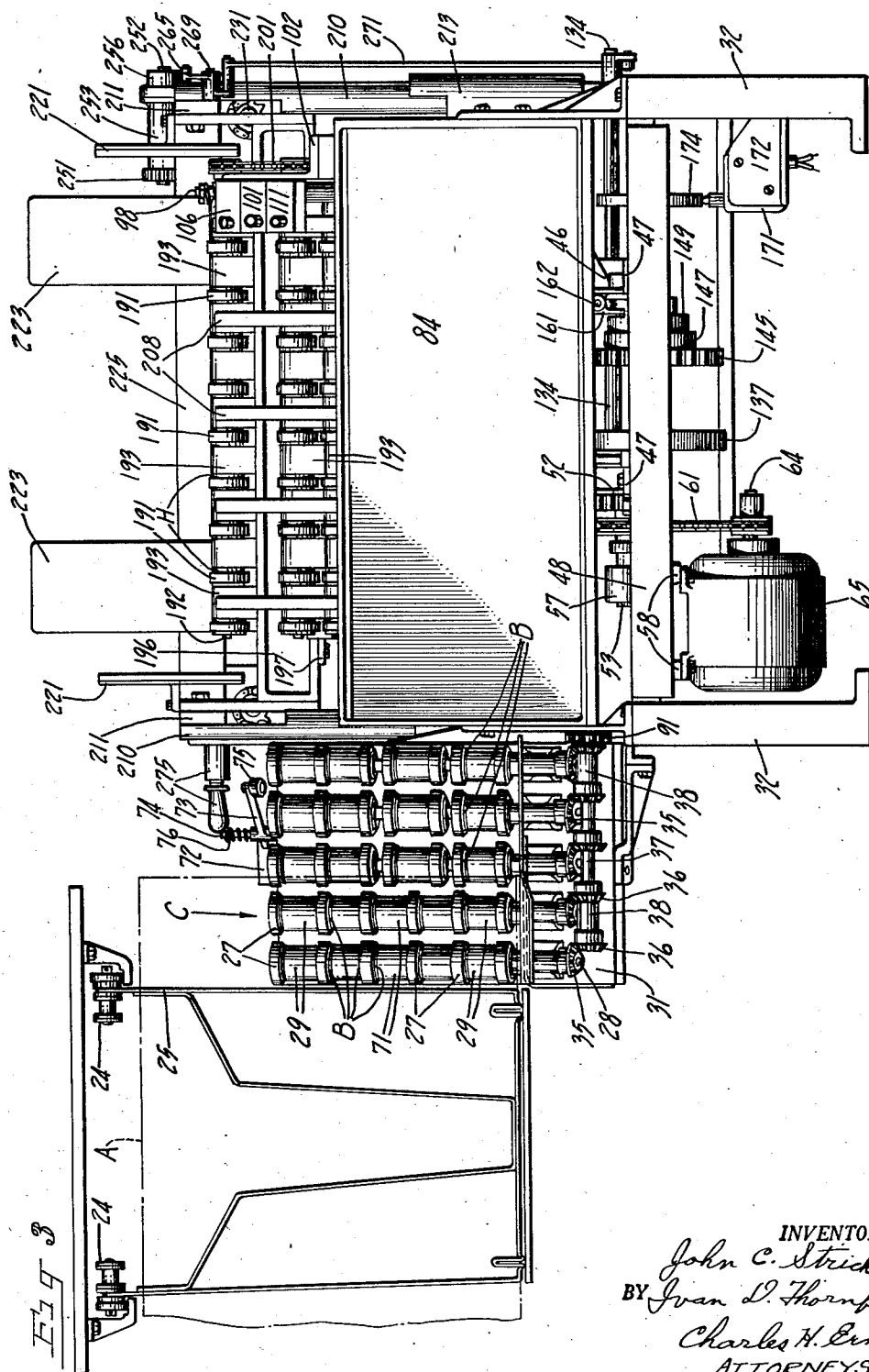
J. C. STRICKLER

2,373,149

SHEET FEEDING AND STACKING APPARATUS

Filed March 25, 1943

10 Sheets-Sheet 3



April 10, 1945.

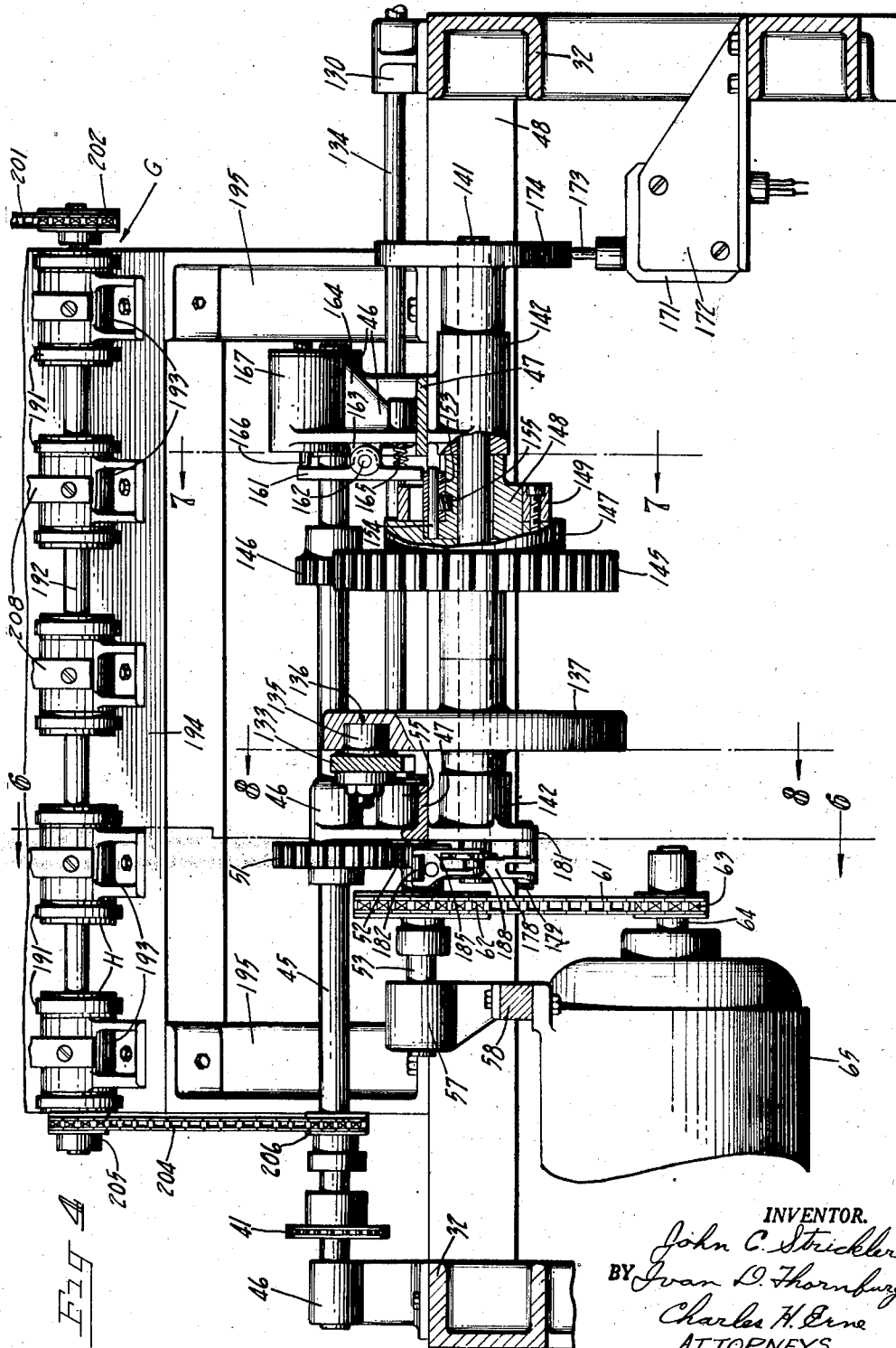
J. C. STRICKLER

2,373,149

SHEET FEEDING AND STACKING APPARATUS

Filed March 25, 1943

10 Sheets-Sheet 4



April 10, 1945.

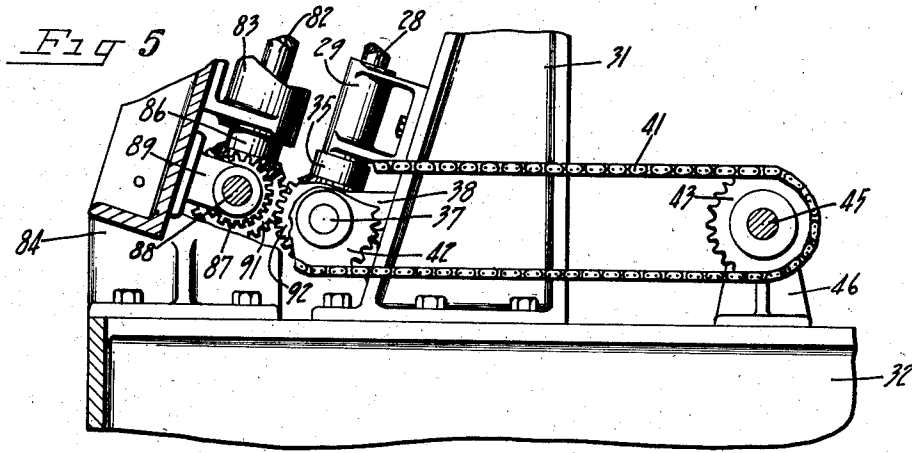
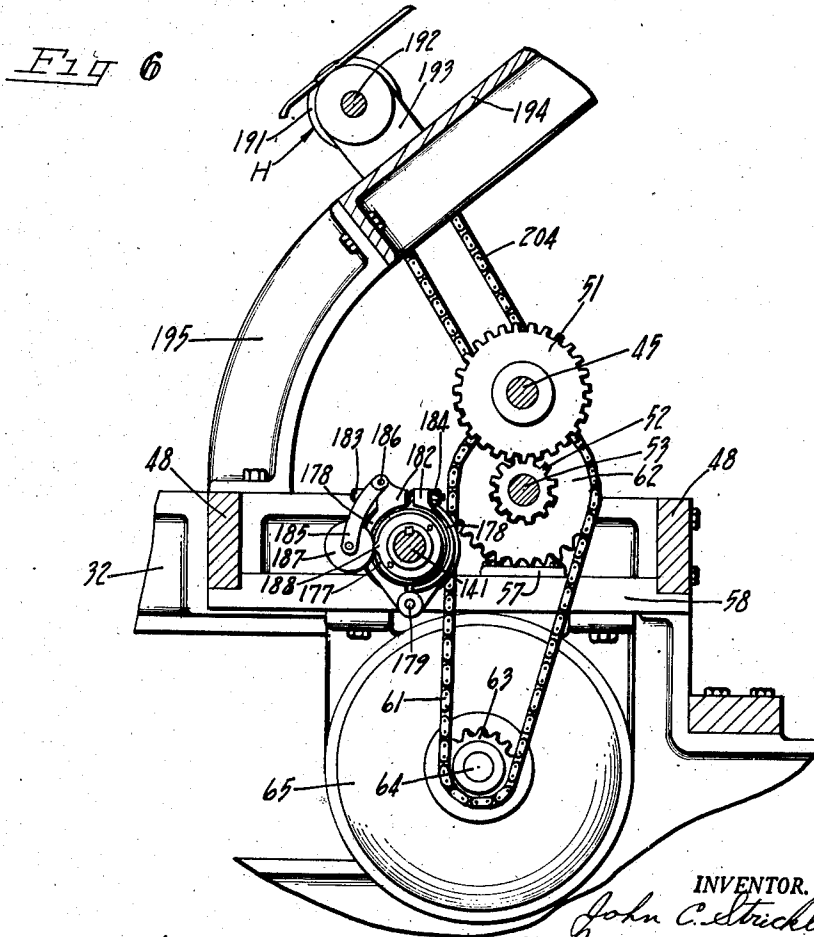
J. C. STRICKLER

2,373,149

SHEET FEEDING AND STACKING APPARATUS

Filed March 25, 1943

10 Sheets-Sheet 5



INVENTOR.
John C. Strickler
BY *Ivan D. Thornburgh*
Charles H. Erne
ATTORNEYS

April 10, 1945.

J. C. STRICKLER

2,373,149

SHEET FEEDING AND STACKING APPARATUS

Filed March 25, 1943

10 Sheets-Sheet 6

Fig 7

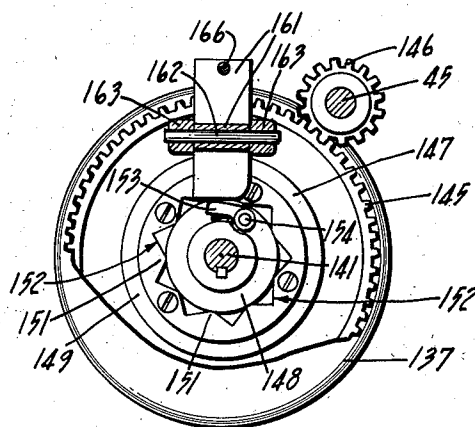
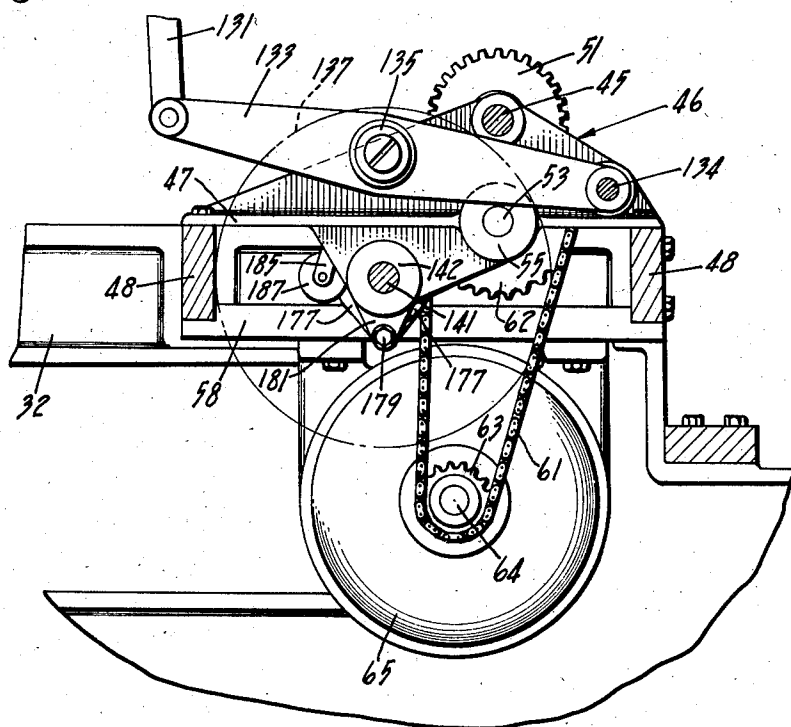


Fig 8



INVENTOR.
John C. Strickler
BY *Ivan D. Thornburgh*
Charles H. Euse
ATTORNEYS

April 10, 1945.

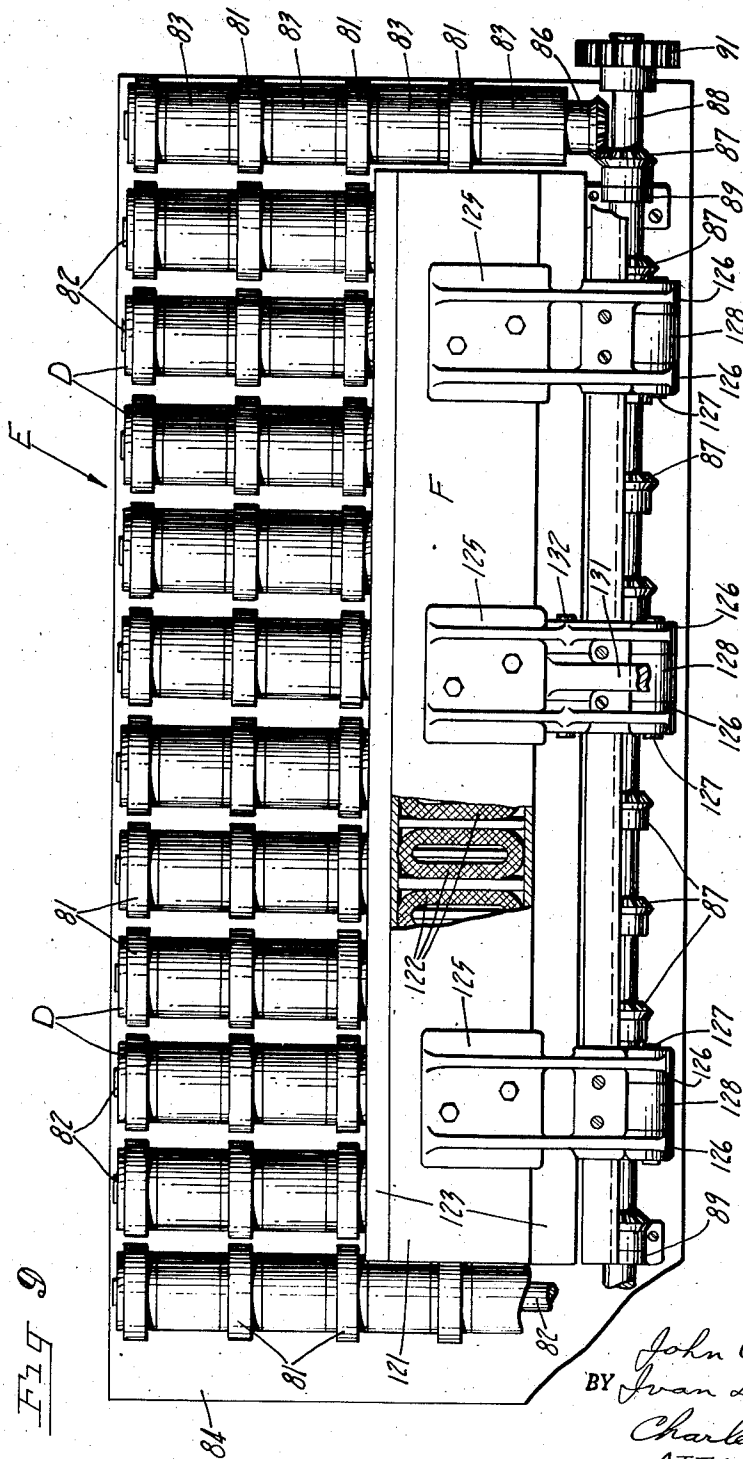
J. C. STRICKLER

2,373,149

SHEET FEEDING AND STACKING APPARATUS

Filed March 25, 1943

10 Sheets-Sheet 7



INVENTOR.

INVENTOR.
BY John C. Strickler
Juan D. Thornburgh
Charles H. Eune
ATTORNEYS

BY *Juan D. Thornburgh*

Charles H. Eune
ATTORNEYS

ATTORNEYS

April 10, 1945.

J. C. STRICKLER

2,373,149

SHEET FEEDING AND STACKING APPARATUS

Filed March 25, 1943

10 Sheets-Sheet 8

Fig 10

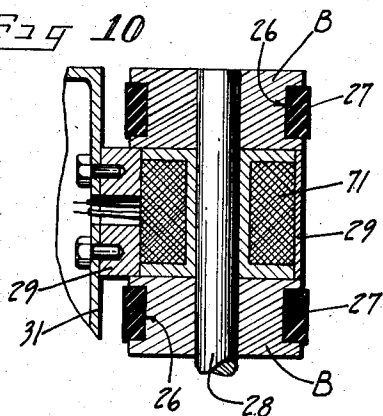


Fig 12

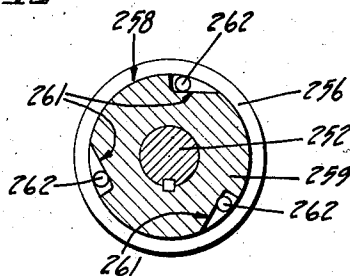
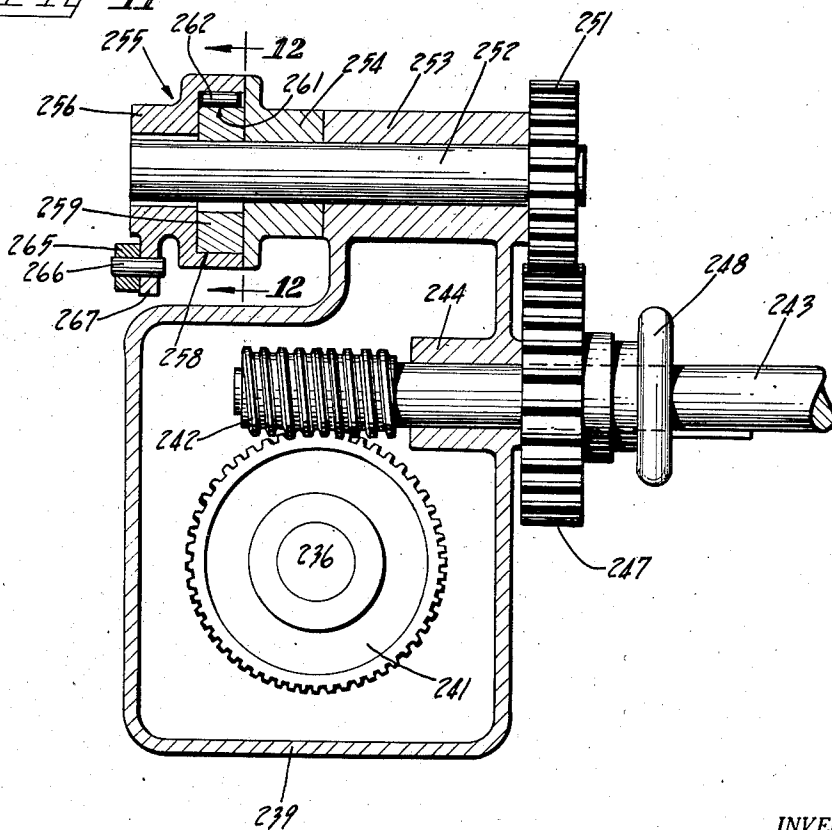


Fig 11



INVENTOR.
John C. Strickler
BY *Ivan L. Thornburgh*
Charles H. Eane
ATTORNEYS

April 10, 1945.

J. C. STRICKLER

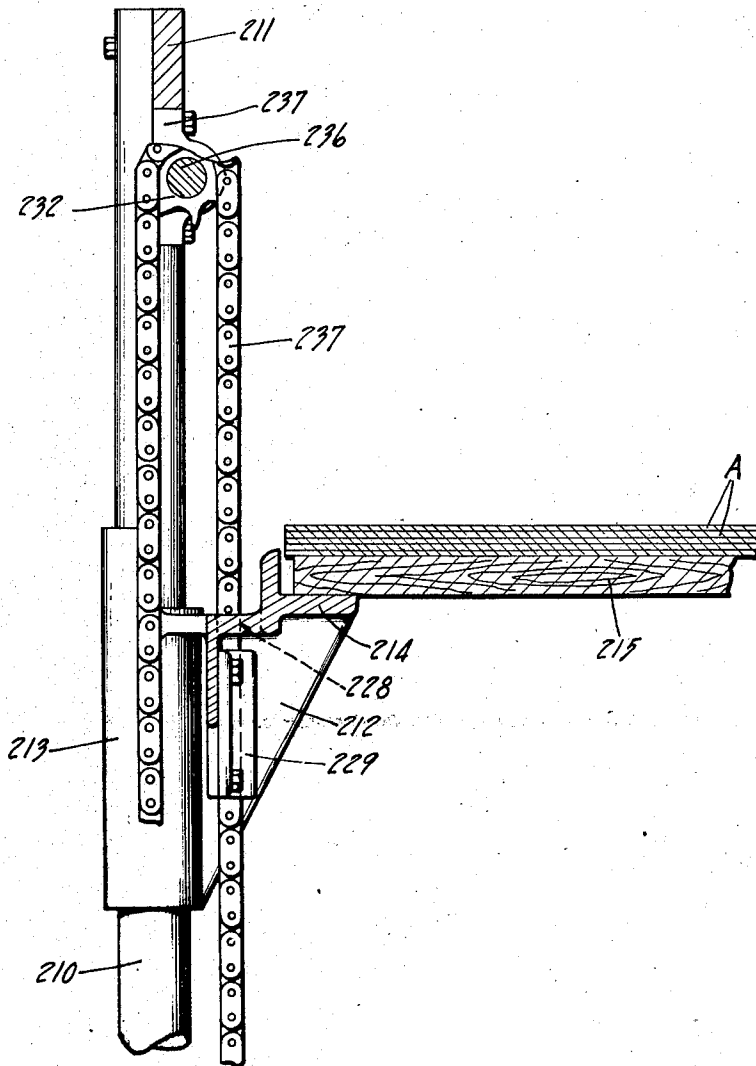
2,373,149

SHEET FEEDING AND STACKING APPARATUS

Filed March 25, 1943

10 Sheets-Sheet 9

Fig 13



INVENTOR.
John C. Strickler
BY *Ivan D. Thornburgh*
Charles H. Burr
ATTORNEYS

April 10, 1945.

J. C. STRICKLER

2,373,149

SHEET FEEDING AND STACKING APPARATUS

Filed March 25, 1943

10 Sheets-Sheet 10

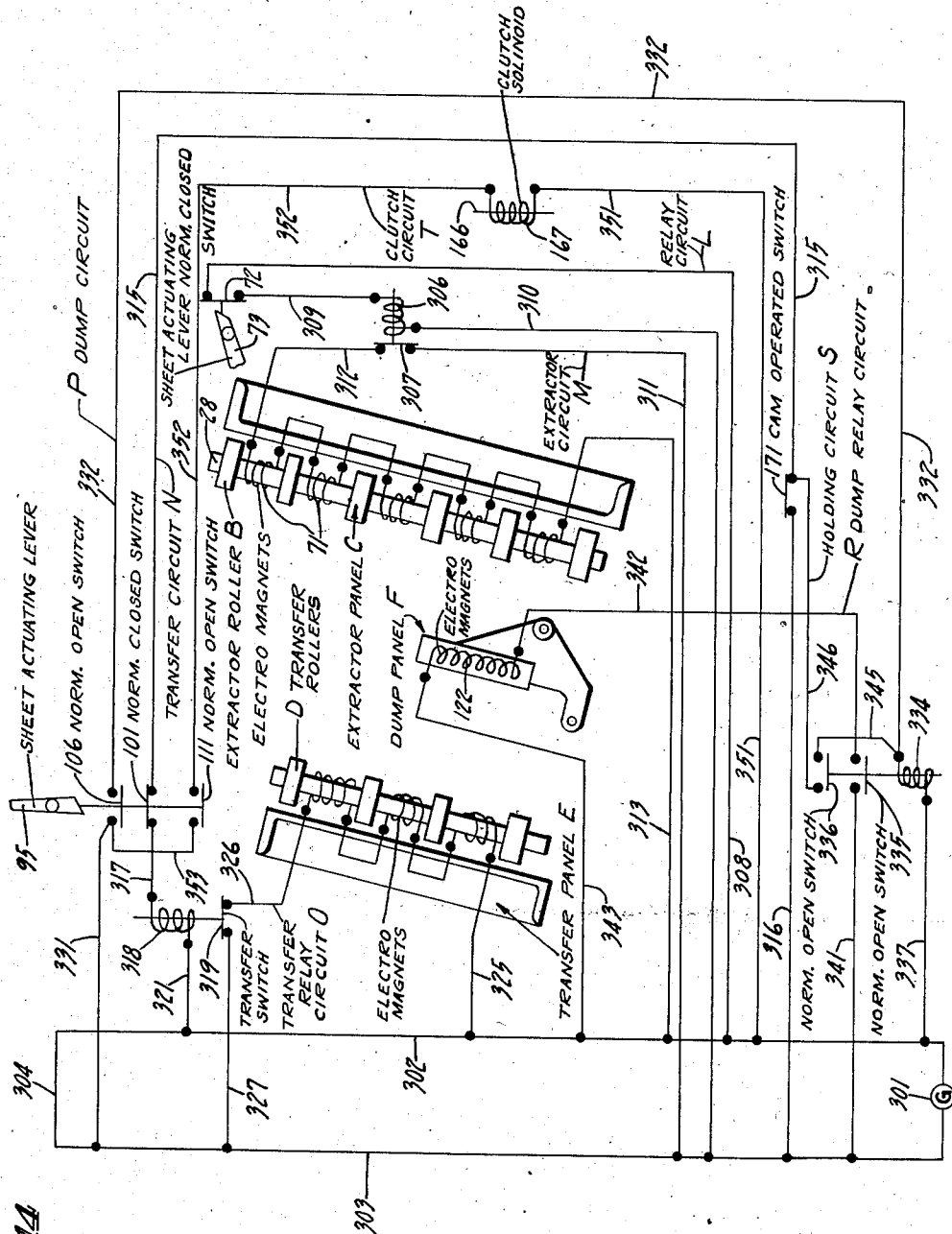


Fig 14

INVENTOR.
John C. Strickler
 BY *Ivan D. Thornburgh*
Charles H. Erbe
 ATTORNEYS

UNITED STATES PATENT OFFICE

2,373,149

SHEET FEEDING AND STACKING
APPARATUS

John C. Strickler, San Francisco, Calif., assignor
to American Can Company, New York, N. Y., a
corporation of New Jersey

Application March 25, 1943, Serial No. 480,547

14 Claims. (Cl. 271-76)

The present invention relates to a sheet feeding and stacking apparatus and has particular reference to extracting sheets in an on-edge position from a moving conveyor and transferring them into a stacked horizontal position ready for removal to a subsequent operation machine, to storage, or other desired place of disposal.

In the manufacture of cans or containers made from sheet material it is sometimes necessary to handle the sheets many times, especially when such sheets are lithographed in numerous colors. Usually the sheets after receiving a treatment in one machine must be piled in an orderly stack before they can be fed properly into a subsequent operation machine. Often the sheets are received in a heated condition which makes manual handling a difficult matter.

For all practical purposes the sheets are more expeditiously handled while in an on-edge position. However, in feeding the sheets into a machine they are better fed in most cases, from a horizontal stack. It is the handling of sheets subject to this combination of conditions that is contemplated in the apparatus of the instant invention.

An object of the present invention is the provision of a sheet feeding and stacking apparatus wherein sheets advancing along a path of travel are successively engaged by magnetic devices disposed in the path of travel of the sheets and such devices remove and advance each sheet along a path of travel different from its former travel.

Another object is the provision in such an apparatus of a conveyor for advancing the sheets in close order in which magnetic rollers disposed in the path of the sheets remove each individual sheet laterally from the conveyor so that the extracted sheet is free of the next following and continuously advancing sheet.

Another object is the provision in an apparatus of this character of a series of properly arranged magnetic elements for extracting each sheet from its advancing path of travel for transferring the sheet to another position and then turning the sheet into position for elevating and stacking.

A further object is the provision in a sheet feeding and stacking apparatus of the character described wherein the magnetization of certain magnetic rollers is controlled by the position of the sheet during its passage through the machine.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a top plan view of a sheet feeding and stacking apparatus embodying the instant invention, with parts broken away;

Fig. 2 is a side elevation of the apparatus shown in Fig. 1;

Fig. 3 is a front view of the apparatus shown in Fig. 1, and showing a portion of a sheet conveyor adjacent the apparatus with a sheet indicated in dot and dash lines;

Fig. 4 is an enlarged transverse vertical section taken substantially along the broken line 4-4 in Fig. 1, with parts broken away;

Fig. 5 is an enlarged fragmentary longitudinal vertical section taken substantially along the line 5-5 in Fig. 1;

Figs. 6, 7 and 8 are vertical sections taken substantially along the respective lines 6-6, 7-7, 8-8 in Fig. 4, with parts broken away;

Fig. 9 is an enlarged vertical view taken along a plane indicated by the line 9-9 in Fig. 2, with parts broken away and with parts shown in section;

Figs. 10 and 11 are enlarged sectional details taken substantially along the respective lines 10-10, 11-11 in Fig. 1, with parts broken away;

Fig. 12 is a sectional detail taken substantially along the line 12-12 in Fig. 11;

Fig. 13 is an enlarged fragmentary section taken substantially along the vertical line 13-13 in Fig. 2; and

Fig. 14 is a wiring diagram of the electrical devices used in the apparatus.

As a preferred embodiment of the invention the drawings illustrate a sheet feeding and stacking machine which is arranged to extract hot metallic sheets A (Fig. 3) from a lithograph sheet drying oven of the character extensively used in the can making industry. The sheets A while supported in an inclined on-edge position are extracted from the lithograph oven by an inclined bank of magnetized extractor rotors or rollers B which constitute an extractor panel C.

The extractor panel of rotors B advance each sheet to a bank of magnetic transfer rotors or rollers D which constitute a transfer panel E. These rotors shift the sheet to a position adjacent a dump panel F. The dump panel changes the direction of travel of the sheet and carries it into contact with an inclined elevator panel G having magnetized elevator rotors or rollers H which advance the sheet to a higher elevation and then discharge it horizontally into a stacker mechanism J. The discharged sheets fall in stacked arrangement onto the platform of a portable car-

riage or truck K which is placed in the stacker mechanism for the reception of the sheets.

In conventional lithographing ovens the sheets A while passing through the oven are carried on a continuously moving, horizontal, endless chain conveyor 24 having spaced and parallel wickets 25 (Fig. 3). It is these wickets that support the sheets in a slightly off-vertical or on-edge position, as hereinbefore mentioned. The conveyor extends beyond a sheet feeding and stacking machine.

In the sheet feeding and stacking machine of the present invention, the extractor panel C of feed rotors B extends out at the side and at right angles to the path of travel of the oven conveyor 24. The incline of the extractor panel corresponds with the inclination of the sheets on the conveyor.

There preferably are five vertically inclined rows of rotors B in the extractor panel C. The outer two rows of rotors are so placed as to be in the path of travel of the sheets A on the oven conveyor 24 and are just outside of the oven wickets 25 (Fig. 3). The rotors are made of soft iron and are formed with wide annular grooves 26 which retain resilient rubber treads 27 (Fig. 10). These treads engage the sheets and prevent them from becoming scratched.

The rotors B are mounted on vertically inclined shafts 28 which are journaled in spaced bearings 29 secured to an overhanging bracket 31 (Figs. 1 and 3) bolted to one of a pair of spaced and parallel side frames 32 which constitute a portion of the main frame of the machine. The rotors are continuously rotated by bevel gears 35 (Fig. 3) which are mounted on the lower ends of the rotor shafts 28. The bevel gears mesh with similar driving gears 36 which are carried on a horizontal shaft 37 journaled in a pair of spaced bearing blocks 38 bolted to the overhanging bracket 31.

The horizontal shaft 37 is continuously rotated by an endless drive chain 41 (see Figs. 1, 2, 4 and 5) which operates over a driven sprocket 42 mounted on the inner end of the shaft 37 and over a driving sprocket 43 mounted on a power shaft 45. The power shaft is journaled in three bearing brackets 46. One of these bearing brackets is bolted to one side of the side frames 32. The other two are formed with long support plates 47 which are secured to a pair of cross beams 48 that tie the side frames together. One of these brackets is disposed intermediate the other two brackets and is hereinafter referred to as the intermediate bearing bracket.

The power shaft 45 is rotated by a spur gear 51 (Figs. 4 and 6) which is mounted on the shaft and which meshes with a driving pinion 52 carried on a short jack shaft 53. The jack shaft is journaled at its ends in a bearing 55 (see also Fig. 8) formed in the intermediate bearing bracket 46 and in a bearing block 57 secured to one of a pair of spaced and parallel hanger bars 58 bolted to the cross beams 48.

The jack shaft 53 is continuously rotated by a main driving endless chain 61 which operates over a driven sprocket 62 mounted on the jack shaft and over a main driving sprocket 63 carried on a rotor shaft 64 of an electric motor 65. This motor constitutes the main source of power for the entire machine. The motor is bolted to the hanger bars 58. It is through this train of gears and sprockets connecting with the motor that the rotors B of the extractor panel C are driven.

The rotating rotors B of the extractor panel

C are magnetized and attract a sheet A in the sheet extraction from the oven conveyor wickets 25. They also provide for advancement of the sheet into the stacking machine. The two outer rows of rotors B which are disposed in the path of travel of the sheets on the oven conveyor are magnetized by electro-magnets 71 (see Fig. 10). These electro-magnets surround the two outer rotor shafts 28 and are disposed in the bearings 29 between the rotors. In this manner the electro-magnets when energized set up a magnetic field through the adjacent rotors B and when a sheet being advanced by the conveyor engages the magnets, it is attracted. The magnets are electrically energized by way of suitable electric circuits which will be hereinafter explained in connection with the electric wiring diagram.

The remaining three rows of rotors B are in themselves permanent magnets the outer peripheral shoulder portions of the rotors on either side of the annular groove 26 in which the tread 27 is disposed, serving as the north and south poles of the magnets. In this manner the magnet rotors set up a permanent magnetic field.

Hence when the outer vertical edge portion of a sheet A in a wicket 25 of the oven conveyor comes adjacent the two outer rows of magnetized and rotating rotors B, the attracted sheet is withdrawn edgewise from the wicket and passes into the grip of the permanently magnetized rotors in the following three rows.

As hereinbefore mentioned, these permanently magnetized rotors B deliver the extracted sheet into the transfer panel E. It should be understood that the rotation of the rotors B by motor 65 is sufficiently rapid relative to the comparatively slow advancement of the conveyor 24 to extract a sheet from its supporting wicket 25 so that it will clear and not obstruct the movement of a following sheet or a following wicket of the conveyor. The wickets at all times clear the rotors as best seen in Fig. 3.

Provision also is made to prevent premature picking-up of the following sheet A. This is brought about by de-energizing the electro-magnets 71 immediately following the extraction of each sheet and as soon as the leading portion of the extracted sheet is well within the attraction of the permanent magnet rotors.

De-energizing of the electro-magnets 71 is effected by the opening of a normally closed electric switch 72 (Figs. 1, 2 and 3) which is mounted on the back of the overhanging bracket 31. This switch is in the circuit of the electro-magnets and will be referred to more fully hereinafter in the explanation of the wiring diagram.

From a mechanical point of view, the switch is operated by a lever 73 which is mounted on a pivot pin 74 secured in the overhanging bracket 31. The inner end of the lever 73 extends into the path of travel of the sheet A advancing through the rotor panel C and carries an actuating roller 75 against which the leading edge of the sheet engages as it advances. A tension spring 76 surrounds the pivot pin 74 and keeps the lever in proper sheet engaging position. One end of the spring is secured to the pin while the opposite end is attached to the lever. The outer end of the lever engages against a movable element 77 of the switch 72.

The transfer panel E of rotors D is located adjacent the extractor panel C and is disposed at a slight angle from the vertical so as to correspond to the inclination of the extractor panel and to form a continuation thereof. The trans-

fer panel, however, is located on the opposite surface of the advancing sheet. This transfer panel E includes twelve vertically inclined rows of the rotors D. Each rotor is provided with a rubber tread 81 (Figs. 2 and 9) similar to the treads 27 of the rotors B.

The transfer rotors D are mounted on vertically inclined spaced and parallel shafts 82 which rotate in bearing blocks 83 secured to an inclined front bracket 84 bolted to the side frames 32. The rotors D are similar in construction to the rotors B and normally are held magnetized by electro-magnets which are similar in construction and location to the electro-magnets 71 in the extractor panel C.

The transfer rotors D and their shafts 82 are continuously rotated by bevel gears 86 (see Figs. 5 and 9) which are mounted on the lower ends of the shafts. These bevel gears mesh with and are driven by similar gears 87 in turn mounted on a horizontal drive shaft 88 journaled in bearings 89 bolted to the inclined front bracket 84. The drive shaft is rotated by a spur gear 91 (see also Fig. 1) which is mounted on one end of the shaft. This gear meshes with and is driven by a spur gear 92 which is carried on the inner end of the horizontal shaft 37 of the extractor panel C. In this manner the rotors D of the transfer panel E are rotated in time with the rotors B of the extractor panel C. This provides a smooth transfer of the sheets from one panel to the other.

Hence an extracted sheet A is pulled out by the extractor panel C and is delivered into the transfer panel E which in turn advances it to a centralized position in the machine. As a sheet A approaches this centralized position, its leading edge engages against and rocks an actuating lever 95 (Figs. 1 and 2). Upon actuation of the lever further edgewise travel of the sheet is terminated. At the same time the sheet is pushed bodily away from and is stripped off the rotors D, the sheet moving in the direction of the dump panel F. A long arm 96 which is formed on the lever assists in the stripping operation.

The outer end of the lever 95 is formed with a long vertical hub 97 which is mounted on a stationary pivot pin 98 secured in the inclined front bracket 84. The lever is maintained under pressure of a tension spring 99 which surrounds an upwardly projecting portion of the pivot pin. One end of the spring is connected to the pin while the other end is secured to the lever.

Besides stopping the sheet A in its centralized position in the machine and in addition to the bodily stripping of the sheet away from the transfer panel rotors D, the rocking lever 95 performs three other functions which will now be explained. The first of these functions of the lever has to do with de-energizing the electro-magnets of the rotors D. This is brought about by the opening of a normally closed electric switch 101 (Figs. 1 and 2) which connects with the magnets and which is arranged in suitable electric circuits which will be explained in connection with the wiring diagram.

Mechanically considered this switch is mounted on a switch bracket 102 bolted to the front bracket 84. The switch is formed with a movable element 103 which engages against and is shifted by a cam projection 104 formed on the hub 97 of the lever 95. Hence when the lever is rocked, its cam projection actuates the switch.

As to the second function of the lever 95, certain magnets are energized in the dump panel F so that the panel takes hold of the sheet as it is

stripped off the transfer panel E. This energizing of the dump panel magnets is effected by the closing of a normally open electric switch 106 which is in electrical magnetic circuits of the dump panel. These circuits will be considered in detail in connection with the wiring diagram. Switch 106 is located above the switch 101 and is secured to the same bracket 102. The switch is formed with a movable element 107 which is actuated by a cam projection 108 formed on the hub 97 of the lever 95.

The third function of the lever 95 relates to setting the dump panel F into motion, as will be hereinafter more fully explained. This operation of the dump panel is brought about by the closing of a normally open electric switch 111 which is a part of electrical circuits to be discussed in detail with a description of the wiring diagram. Switch 111 is located below the switch 101 and is secured to the same switch bracket 102. This switch 111 is formed with a movable element 112 which is actuated by a cam projection 113 carried on the hub 97 of the lever 95. Thus it will be seen that all three switches 101, 106 and 111 are operated in the desired sequence by the rocking of the lever 95 when a sheet A engages the lever.

The dump panel F is located adjacent the transfer panel E and extends for nearly the full length of the latter panel, as best illustrated in Fig. 9. Its function is to pick a stripped sheet A off the transfer panel E and to rock it from a nearly vertical on-edge position into a position of approximately forty-five degrees from the horizontal, so that it can be easily picked-up by the elevator panel G.

For this purpose the dump panel F is formed with an elongated rectangular shaped casing 121 (see also Fig. 2) which houses a plurality of electro-magnets 122. The front of the casing, i. e., the face adjacent the transfer panel E carries a sheet supporting plate 123 which extends parallel with and is closely adjacent a sheet when it is held on the transfer panel. The magnets, when energized, set up a magnetic field of sufficient strength through the supporting plate to pick-up the displaced sheet from the transfer panel rotors D and to hold it against the supporting plate. It is these magnets that are controlled by the opening and closing of the electric switch 106.

The casing 121 of the dump panel F is fixed to a plurality of depending bracket arms 125 which at their lower ends are formed with clevises (see Fig. 9). These clevises hold pivot pins 127 which operate in bearing blocks 128 bolted to the inclined front bracket 84 of the transfer panel E. It is on these pivot pins that the dump panel rocks to turn the sheet into its angular position as mentioned above.

The dump panel F is rocked on its pivot pins 127 by cam action. This is brought about by movement of a link 131 (Figs. 2, 8 and 9). One end of the link is connected to the dump panel by a pivot pin 132 which is secured to the center bracket arm 125. The opposite end of the link is pivotally connected to a cam arm 133 which is mounted on the inner end of a long pivot shaft 134 (see also Fig. 4) carried in the intermediate bearing bracket 46 of the power shaft 45 and in a bracket 130 bolted to one of the side frames 32. Between its ends the cam arm carries a cam roller 135 that operates in a cam groove 136 of a rotatable face cam 137.

The face cam 137 is mounted on a cam shaft

141 journaled at its ends in bearings 142 formed in the two bearing brackets 46. The cam shaft is periodically rotated through a one revolution cycle for each sheet transfer. This rotation of the shaft is brought about by a clutch gear 145 which is loosely mounted on the shaft. The gear is continuously rotated by a pinion 146 mounted on the power shaft 45 (see also Fig. 7).

The clutch gear 145 is formed with an enlarged clutch hub 147 that surrounds a stepped or shouldered clutch driving member 148 which is keyed onto the cam shaft 141. A clutch ring 149 is bolted to the outer face of the clutch hub and this ring also surrounds the driving member. The ring is formed with a plurality of internal V-shaped teeth 151 which are set off by adjacent V-shaped notches 152.

In radial alignment with these notches 152 and teeth 151, a yieldable driving pawl 153 is mounted on a pivot pin 154 carried in the stepped or shouldered portion of the clutch driving member 148, as best shown in Fig. 4. The driving pawl 153 is pressed outwardly by a compression spring 155 which is interposed between the pawl and the outer surface of the driving member and is seated in recesses or sockets formed in these parts.

The driving pawl 153 is held normally in a depressed position against the resistance of its spring 155 by a vertically disposed locking latch finger 161 (Figs. 4 and 7) which keeps the pawl away from the teeth 151 of the rotating clutch gear 145. The latch finger is mounted on a pivot pin 162 which is carried in a pair of spaced bearing lugs 163 formed on a solenoid base 164 which is integral with the outer bearing bracket 46 (see also Figs. 1 and 2).

The lower end of the latch finger 161 is maintained under pressure of a compression spring 165 which is interposed between the finger and the solenoid base 164. The upper end of the finger is normally maintained in engagement with the inner end of a movable solenoid core 166 by the spring 165. Core 166 is a part of a normally de-energized electric solenoid 167 horizontally mounted on the solenoid base. This solenoid is controlled by the electric switch 111 and is connected in the circuits which will be explained later with the wiring diagram.

When a sheet A is attracted to the dump panel F by the energizing of its electro-magnets 122, the clutch solenoid 167 is simultaneously energized and its core 166 moves outwardly. This is only a momentary action. The outwardly moved core presses against the upper end of the latch finger 161 and rocks the finger on its pivot pin 162. Rocking of the latch finger shifts its lower end toward solenoid base 164 and against the resistance of the holding spring 165. The lower end of the finger thus rides off or out of engagement with the clutch driving pawl 153. This releases the pawl and its free end springs out under the force of its spring 155.

The free end of the clutch pawl 153 thereupon comes into engagement with one of the clutch teeth 151 in the clutch ring 149 on the rotating gear 145. The clutch gear and the clutch driving member 148 are thus locked together and the cam shaft 141 rotates. Rotation of the cam shaft continues for one revolution during which time the solenoid is de-energized. The latch finger 161 immediately returns to its original position and is in place to reengage the finger, thus unclutching the parts.

Rotation of the cam shaft 141 also revolves

the cam 137 through one revolution. The cam in turn oscillates the cam lever 133 and this rocks the dump panel F through a dumping cycle, first tilting the panel from its upright position into an angular position for delivery of the sheet carried thereon to the elevator panel G and then returning it to its original upright position for the reception of a subsequent sheet.

While the dump panel F is in its inclined position its electro-magnets 122 are de-energized to permit delivery of the sheet A therefrom. The magnet circuit is broken by the opening of a normally closed electric switch 171 (Figs. 2, 3 and 4) which is mounted on a bracket 172 secured to one of the side frames 32. The switch is formed with a movable element 173 which engages against and which is actuated by an edge cam 174 mounted on the outer end of the cam shaft 141. In this way the cam opens the switch at the proper time to de-energize the electro-magnets.

Upon completion of the cycle of the cam shaft 141, the clutch members 148, 149 are disengaged and rotation of the shaft is instantly arrested as the pawl 153 rides under the latch finger 161 and the free end of the pawl disengages the tooth 151 of the clutch gear ring 149.

Instantaneous stopping of the cam shaft after disengagement of the clutch parts 148, 149 is brought about by a conventional brake device which includes a brake drum 177 (Fig. 6) mounted on the inner end of the cam shaft 141. The drum is surrounded by a pair of curved brake arms 178, located one on each side of the shaft. One end of each of these arms is mounted on a common pivot stud 179 secured in a lug 181 (see Figs. 4 and 8) formed on the intermediate bearing bracket 46.

The opposite ends of the brake arms 178 are formed with hollow bosses 182 through which a draw-bolt 183 extends. One end of the bolt is locked in place in its boss by a locknut 184. The opposite end is formed with a large head which engages against a bifurcated lever 185 mounted on a pivot pin 186 carried in the adjacent boss 182. The lever carries a cam roller 187 which operates on an edge cam 188 secured to a side of the brake drum 177.

The brake drum 177 and the cam 188 rotate with the cam shaft 141 and when the shaft completes its cycle the cam pushes the lever 185 outwardly and thus draws the bolt 183 tight in its bosses 182. This draws the bosses toward each other and hence squeezes the brake arms 178 against the brake drum and stops the released cam shaft from further rotation. This is a usual brake construction.

The elevator panel G of rotors H, which receive a sheet A from the dump panel F when the latter is in its inclined position, is in back of the dump panel and is disposed at approximately a forty-five degree angle. This corresponds to the position of the dump panel when the latter is in its sheet delivery position. The elevator panel extends across the machine the full width of the sheets traveling through it.

The rotors H are similar to the permanent magnet rotors B and are in themselves permanent magnets having resilient rubber treads 191. There preferably are five horizontal rows of these rotors in the elevator panel G. These rotors are mounted in spaced relation on horizontal rotor shafts 192 (Figs. 1, 2, 3, 4 and 6) journaled in bearings 193. The lower four rows of these bearings are secured to an inclined bed plate 194

which is bolted to curved brackets 195 fastened to the cross rails 48. The top row of rotor shaft bearings 192 is secured to a cross rail 196 which is carried on end brackets 197 bolted to the bed plate.

The rotors H are continuously rotated in unison and in the proper sheet feeding direction by short endless chains 201 which extend between adjacent pairs of shafts 192, as best shown in Figs. 1 and 2. There are four such chains shown in the drawings. These chains operate over sprockets 202 which are mounted on the outer ends of the shafts. The lowermost shaft 192 in the panel is the drive shaft for the others. This shaft is driven from the power shaft 45 by an endless drive chain 204 which operates over sprockets 205, 206 mounted on the respective shafts (see Fig. 4).

When a sheet A is delivered to the elevator panel G, approximately one half of the sheet extends above the dump panel F and this upper portion of the sheet is laid down onto the rotors H of the lower shafts 192 of the elevator panel. The permanently magnetized rotors immediately pick up the sheet and slide it along the surface of the dump panel and advance it upwardly along the inclined elevator panel. It should be understood that the magnets 122 in the dump panel are deenergized at this time. Support strips 208 secured to the bearing brackets extend upwardly along the path of travel of the sheet and keep the latter in a flat condition while being elevated.

At the top of the elevator panel G an elevated sheet A, under its own momentum catapults out into space and falls into the stacking mechanism J. The stacking mechanism includes a super-structure into which the portable truck K may be wheeled for loading. This super-structure is carried on the side frames 32 of the machine and comprises four vertical guide posts 210 (Figs. 1, 2 and 13), located two on each side of the machine adjacent the delivery end of the elevator panel. The lower ends of these posts are secured in the side frames 32 and the upper ends are secured to longitudinal top beams 211. The two posts on each side of the machine carry a sheet carrier bracket 212 therebetween. Each bracket is formed with two spaced and vertically parallel bearings 213 that surround and slide on the guide posts.

The carrier brackets 212 are formed with inwardly projecting angle shaped support rails 214 which extend the full length of the brackets. These two rails thus are on opposite sides of the machine and support between them a removable wooden or other material platform 215 which receives the sheets A as they are delivered from the elevator panel and fall into the stacking mechanism.

The sheets A are guided during this fall onto the platform 215 by vertical side guide plates 221 which are supported on brackets 222 bolted to the top beams 211. End stop plates 223 secured to brackets 224 bolted to a cross rail 225 secured to the outer ends of the top beams, arrest the travel of the sheets when they are delivered from the elevator panel and thus insure even and uniform stacking of the sheets on the platform.

When beginning to build up a stack of sheets on a platform 215, the platform is near the upper end of the elevator panel G so that the sheets will not have far to fall. However, provision is made to lower the platform gradually as the stack builds up so that the top of the stack will always

be a convenient distance below the delivery end of the elevator panel. For this latter purpose the carrier brackets 212 are supported on pairs of vertically disposed endless carrier chains 227. The inner runs of the chains extend through openings 228 (Fig. 13) formed in the brackets where they are secured in place by clamp plates 229.

The carrier chains 227 operate over lower idler sprockets 231 (Fig. 2) and over upper driving sprockets 232. There are two of these chains and two sets of sprockets on each side of the machine. Each lower idler sprocket 231 is mounted on a short idler shaft 233 carried in a bearing bracket 234 bolted to the side frame 32. The two upper driving sprockets 232 on each side are mounted on a common sprocket shaft 236 which is carried in spaced bearing blocks 237 secured to the upper ends of the vertical guide posts 210 (see Fig. 13) on that side.

The outer ends of the two sprocket shafts 236 extend beyond their outer guide posts 210 and are carried in bearings 238 formed in a pair of gear casings 239 (Figs. 1 and 2) located one on each side of the machine and bolted to the cross rail 225. Within these gear casings each sprocket shaft 236 terminates and carries a worm wheel 241 (see Fig. 11). The two worm wheels mesh with worms 242 which are mounted on both ends of a drive shaft 243 which extends across the rear of the machine. Adjacent these worms the drive shaft is carried in bearings 244 formed in the gear casing.

The drive shaft 243 is intermittently moved through a partial or step rotation by a spur gear 247 which is feathered onto the shaft. The gear may be shifted manually into a non-operating position, as will be explained hereinafter. A knob 248 is formed on the gear for this purpose. Gear 247 meshes with and is rotated by a pinion 251 which is mounted on the inner end of a ratchet shaft 252 carried in a bearing 253 formed on the gear casing 239. The shaft extends beyond the bearing and on its outer end carries a collar 254 which forms a loose cover for a conventional "free wheeling" ratchet device 255.

The ratchet device 255 includes a cylindrical ratchet casing 256 which is loosely mounted over the extreme outer end of the ratchet shaft 252 and which is secured to the collar 254. The casing is formed with a cylindrical recess 258 (see also Fig. 12) which houses a cylindrical driving member 259 keyed onto the shaft 252. The outer periphery of this driving member is formed with a plurality of wedge shaped notches 261. Each of these notches retains a roller 262 which is interposed between the member and the casing. This is a usual "free wheeling" ratchet construction.

When the ratchet casing 256 is rocked in the proper direction the platform 215 is lowered the desired distance, i. e., approximately equal to the thickness of one sheet A. When the ratchet casing 256 is rocked in the opposite direction, the rollers 262 ride back into their notches 261 and the platform 215 remains stationary. One such intermittent platform lowering movement followed by one rest period takes place with each sheet delivery of the elevator panel G.

Rocking of the ratchet casing is brought about by a long horizontal actuating link 265 (Figs. 1, 2 and 11) which is disposed near the top of the stacking mechanism J and which extends along one of the longitudinal top beams 211. One end of this link is connected to a pivot pin 266 car-

ried in a lug 267 formed on the ratchet casing. The other end of the link connects with a vertical leg of a bell crank lever 268 mounted on a pivot stud 269 secured in the adjacent top beam 211. A horizontal leg of the bell crank lever 268 is connected by a depending rod 271 to an arm 272 mounted on the pivot shaft 134 of the dump panel actuating lever or cam arm 133.

When the platform 215 on which the sheets A are received, is loaded to capacity, it is lowered into position onto the portable truck K which is disposed under the stacking mechanism J as hereinbefore mentioned. This lowering of the platform is effected manually by turning a crank handle 275 (Fig. 1) which is applied to the outer end of the ratchet drive shaft 243. Before turning the handle, however, the drive gear 247 (Fig. 11) is disengaged from its pinion 251 by pulling the gear back along the shaft and releasing the shaft from the "free wheeling" ratchet device 255. Turning of the shaft 243 by means of the handle 275 thus lowers the platform quickly.

When the loaded platform 215 has been lowered onto the truck K, the latter is removed to any suitable place of deposit and a new platform 215 is placed on the carrier brackets 212. The carrier brackets and the new platform then are elevated, by manual operation of the crank handle 275 in the reverse direction, thus bringing the platform into a proper position preparatory to receiving a new load of sheets. The truck may be unloaded at that time and the empty truck replaced in position under the new platform or a different truck may be used.

During this transfer of a loaded platform 215 to the truck K and the insertion of a new platform the rest of the machine continues operating. At that time the sheets as they are delivered from the elevator panel G are received on a temporary support which includes a plurality of stack bars 276 (Figs. 1 and 2). For obvious reasons these need support only a few sheets.

The drawings show three stack bars 276 which are slidable in bearing blocks 277 bolted to the cross rail 225. The outer ends of the bars are secured to a common transverse handle bar 278 by means of which the bars 276 are pushed into operative position as shown in dotted lines (Fig. 1). During most of the time the bars are in a withdrawn position, as shown in full lines. The inner ends of the stack bars are formed with small stop plates 279 which limit their outward travel and prevent them from being drawn out of their bearings when they are shifted into non-operating position. This completes the description and explanation of the machine proper.

Reference should now be had to the wiring diagram in Fig. 14. This diagram illustrates the various electric circuits used in supplying electric energy to the electro-magnets in the different panels and to the solenoids and relays utilized in establishing and maintaining these circuits. Electric energy is supplied in any suitable manner, as by a generator 301 and is transmitted along a pair of main lead wires 302, 303 and a connecting wire 304.

The normally energized electro-magnets 71 in the extractor panel C are maintained in this condition by a relay circuit L which includes the normally closed switch 72 operated by the sheet actuated lever 73. The relay circuit includes a solenoid 306 which operates a normally closed relay switch 307 connected into an extractor circuit M which includes the electro-magnets 71.

Electric energy for the relay circuit L is supplied from the generator 301 by way of a wire 308 which connects the main lead wire 302 to one side of the lever actuated switch 72. The opposite side of this switch is connected by a wire 309 to one side of the relay solenoid 306. The other side of the solenoid coil is connected by a wire 310 to the lead wire 303.

Electric energy from the generator 301 flowing along this circuit keeps the solenoid 306 energized and thus retains the relay switch 307 in its normally closed condition. One side of the relay switch 307 is connected by a wire 311 to the main lead wire 302. The opposite side of the switch is connected by a wire 312 to the upper electro-magnets 71 in the two outer rows of such magnets. The magnets in each row are connected in series and the lower magnets are connected by a wire 313 to the main lead wire 302. This wiring completes the extractor circuit M which remains closed as long as the relay switch 307 remains closed.

When a sheet A engages the switch lever 73 it opens the switch 72 and this breaks the relay circuit L. The solenoid 306 is thereupon de-energized. De-energizing of this circuit opens the relay switch 307 and this breaks the extractor circuit M. The electro-magnets 71 are thus de-energized and remain in such a condition until the lever operated switch 72 is again closed.

As hereinbefore mentioned the de-energizing of the electro-magnets in the transfer panel E is simultaneous with the energizing of the magnets 122 in the dump panel F and with the energizing of the clutch solenoid 167. These operations are brought about by the actuation of the three switches 101, 106, 171 which are under control of the switch actuating lever 95. Switch 101 de-energizes the complete battery of electro-magnets on panel E and at the same instant closes the switch 106 which energizes the electro-magnets in the dump panel F. The change of magnetic flux from the E to the F panel moves the sheet from the former to the latter and brings to a smooth stop the fast traveling sheet.

The first of these functions, the de-energizing of the electro-magnets in the transfer panel E is brought about by the opening of the normally closed switch 101 which is included in a transfer circuit N. In this circuit one side of the lever switch 101 is connected by a wire 315 to the normally closed cam operated switch 171. The other side of switch 171 is connected by a wire 316 to the main lead wire 303. The opposite side of the lever switch 101 is connected by a wire 317 to a solenoid 318 of a transfer relay switch 319. The solenoid coil is also connected by a wire 321 to the main lead wire 302.

As long as both switches 101, 171 are closed this transfer circuit N is complete and electric energy from the generator 301 flows and maintains the solenoid 318 in an energized condition. It is this condition that holds the transfer relay switch 319 closed.

The transfer relay switch 319 is included in a transfer relay circuit O which also includes the electro-magnets of the transfer panel E. In this circuit the magnets are connected in series. One end of the series is connected by a wire 325 to the main lead wire 302. The other end of the series is connected by a wire 326 to one side of the transfer relay switch 319. The other side of the switch is connected by a wire 327 to the main lead wire 303.

Hence as long as the transfer relay switch 319

remains closed, the transfer relay circuit O will remain complete and electric energy will flow from the generator 301 through the circuit and energize the electro-magnets of the transfer panel. When the lever switch 101 is opened by a sheet A engaging and rocking the lever 95, the transfer circuit N is immediately broken and the solenoid 318 becomes de-energized. This opens the relay switch 319. Opening of this switch breaks the transfer relay circuit O and the electro-magnets thereupon become de-energized. When the sheet A is drawn away from the transfer panel E by the dump panel F, the lever 95 is released and the lever switch 101 closes thereby re-establishing the circuits N and O for the next incoming sheet.

The energizing of the normally de-energized electro-magnets 122 in the dump panel F to draw the sheet A away from the transfer panel E is brought about by the normally open lever switch 100 which is closed by the action of the lever 95. This switch is included in a dump circuit P. One side of the switch is connected by a short wire 331 to the main lead wire 303. The opposite side of the switch is connected by a long wire 332 to a solenoid 334 of a double relay having switches 335, 336. The solenoid is connected also by a wire 337 to the main lead wire 303.

Hence when a sheet A actuates the lever 95 and closes the lever switch 100, electric energy from the generator 301 flows through the dump circuit and the solenoid 334 becomes energized. Energizing of the solenoid closes the double relay switches 335, 336.

Relay switch 335 forms part of a dump relay circuit R which includes the electro-magnets 122. One side of the switch is connected by a wire 341 to the main lead wire 303 while the opposite side is connected by a wire 342 to the magnets. The magnets are also connected by a wire 343 to the main lead wire 303.

Thus when the relay switch 335 closes it establishes the dump relay circuit R and electric energy flowing from the generator 301 along this circuit energizes the electro-magnets 122. It is the energizing of these magnets that shifts the sheet A from the transfer panel E to the dump panel F as hereinbefore explained.

Since the closing of lever switch 100 is of merely momentary duration a holding circuit S is provided to maintain the electro-magnets 122 in an energized condition until the dump panel F rocks back and delivers its sheet to the elevator panel G. This holding circuit S includes the relay switch 336 of the double relay and the normally closed cam operated switch 171 hereinbefore mentioned. In this circuit one side of the relay switch is connected by a wire 345 to the outlet side of the solenoid 334. The other side of the switch is connected by a wire 346 to the cam operated switch 171.

Hence when the double relay switch 336 closes it establishes the holding circuit S and electric energy from the generator 301 flows along the main lead wire 302, wire 337, through solenoid 334, along wire 345, relay switch 336, wire 346, cam operated switch 171, wire 316, returning by way of the main lead wire 303 to the generator. This circuit cuts out the lever operated switch 100 and hence the magnets 122 remain energized when this switch opens during the dump travel of the dump panel F.

When the dump panel F has rocked far enough to deliver its sheet to the elevator panel G, the

holding circuit S is broken and this de-energizes the electro-magnets 122 and releases the sheet so that it can be attracted by the permanent magnets H in the elevator panel. Breaking of the holding circuit is brought about by the opening of the cam operated switch 171 as hereinbefore mentioned. Opening of this switch de-energizes the solenoid 334 and this opens the double relay switch 335, 336. The holding circuit S and the dump relay circuit R are thereupon immediately broken and the magnets are de-energized.

The setting of the dump panel F into motion to carry the sheet A from the transfer panel E to the elevator panel G is brought about by the energizing of the clutch solenoid 167 as hereinbefore explained. This solenoid is part of a clutch circuit T which includes the normally open lever switch 111. One side of the solenoid is connected by a wire 351 to the main lead wire 302 while its opposite side is connected by a wire 352 to the lever switch 111. The switch is also connected by a short wire 353 to the wire 331 connecting with the main lead wire 303.

Hence when the lever switch 111 is momentarily closed by the operation of the lever 95, the clutch circuit T is immediately established and electric energy from the generator 301 flows along the circuit. This energy momentarily energizes the clutch solenoid 167 and thereby sets the dump panel F in motion. As hereinbefore explained, this operation needs only a momentary impulse of energy since the clutch which controls the action of the dump panel will complete its one revolution cycle and reset itself when once released.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. A sheet feeding apparatus, comprising in combination, a conveyor for advancing sheets along a path of travel, an extractor panel of rollers disposed adjacent said conveyor, said panel comprising a plurality of electro-magnetized rollers and a plurality of permanently magnetized rollers, said electro-magnetized rollers being disposed in the path of travel of the sheets for engaging and extracting individual sheets from said conveyor, said permanently magnetized rollers being disposed adjacent said electro-magnetized rollers for engaging and for continuing the extraction of the sheets from said conveyor, and devices operable by each sheet as it advances along said rollers for de-magnetizing said electro-magnetized rollers to insure full extraction of the sheet from said conveyor before a following sheet is extracted.

2. A sheet feeding and stacking apparatus, comprising in combination, a conveyor for advancing sheets along a path of travel, an extractor panel of magnetized rollers disposed adjacent said conveyor and extending into the path of travel of the sheets for engaging and extracting individual sheets from said conveyor, a transfer panel of magnetized rollers disposed adjacent said extractor panel for engaging and further advancing the extracted sheets, and means for receiving and stacking the extracted sheets.

3. A sheet feeding and stacking apparatus, comprising in combination a conveyor for advancing sheets along a path of travel, an extractor panel of magnetized rollers disposed adjacent said conveyor and extending into the path of travel of the sheets for engaging and extracting individual sheets from said conveyor, a transfer panel of magnetized rollers disposed adjacent said extractor panel for engaging and further advancing the extracted sheets, stripper devices for separating the extracted and advanced sheets from the transfer panel, and means for receiving and stacking the stripped-off sheets.

4. A sheet feeding and stacking apparatus, comprising in combination, a conveyor for advancing sheets along a path of travel, an extractor panel of magnetized rollers disposed adjacent said conveyor and extending into the path of travel of the sheets for engaging and extracting individual sheets from said conveyor, a transfer panel of magnetized rollers disposed adjacent said extractor panel for engaging and further advancing the extracted sheets, stripper devices operable by the advancing sheets for separating the extracted sheets from the transfer panel, and means for receiving and stacking the stripped-off sheets.

5. A sheet feeding and stacking apparatus, comprising in combination, a conveyor for advancing sheets along a path of travel, an extractor panel of magnetized rollers disposed adjacent said conveyor and extending into the path of travel of the sheets for engaging and extracting the sheets individually from said conveyor, a transfer panel of magnetized rollers disposed adjacent said extractor panel for engaging and further advancing the extracted sheets, and a dump device for receiving the extracted and advanced sheets from said transfer panel and for turning them into a different position.

6. A sheet feeding and stacking apparatus, comprising in combination, a conveyor for advancing sheets along a path of travel, an extractor panel of magnetized rollers disposed adjacent said conveyor and extending into the path of travel of the sheets for engaging and extracting the sheets individually from said conveyor, a transfer panel of magnetized rollers disposed adjacent said extractor panel for engaging and further advancing the extracted sheets, a dump panel of electro-magnets for receiving the extracted and advanced sheets from said transfer panel and for turning them into a different position, and means for receiving and stacking the turned sheets.

7. A sheet feeding and stacking apparatus, comprising in combination, a conveyor for advancing sheets along a path of travel, an extractor panel of magnetized rollers disposed adjacent said conveyor and extending into the path of travel of the sheets for engaging and extracting individual sheets from said conveyor, a transfer panel of magnetized rollers disposed adjacent said extractor panel for engaging and further advancing the extracted sheets, a dump device for receiving the extracted and advanced sheets from said transfer panel and for turning them into a different position, conveyor means for receiving the turned sheets from said dump device and for carrying them to a higher elevation, and means for receiving and stacking the elevated sheets in a horizontal position.

8. A sheet feeding and stacking apparatus, comprising in combination, a conveyor for advancing sheets along a path of travel, an extractor

panel of magnetized rollers disposed adjacent said conveyor and extending into the path of travel of the sheets for engaging and extracting the sheets individually from said conveyor, a transfer panel of magnetized rollers disposed adjacent said extractor panel for engaging and further advancing the extracted sheets, a dump device for receiving the extracted and advanced sheets from said transfer panel and for turning them into a different position, an elevator panel of magnetic rollers for receiving the turned sheets from said dump device and for carrying them to a higher elevation, and devices for rotating said extractor, transfer and elevator panel rollers in synchronism.

9. A sheet feeding and stacking apparatus, comprising in combination, a conveyor for advancing sheets along a path of travel, an extractor panel of magnetized rollers disposed adjacent said conveyor and extending into the path of travel of the sheets for engaging and extracting the sheets individually from said conveyor, a transfer panel of magnetized rollers disposed adjacent said extractor panel for engaging and further advancing the extracted sheets, a dump device for receiving the extracted and advanced sheets from said transfer panel and for turning them into a different position, actuating means including clutch devices for actuating said dump devices through a sheet turning cycle, electric instrumentalities for setting said actuating means in motion in synchronism with the advancement of the sheets along the transfer panel, and means for receiving and stacking the turned sheets.

10. In a sheet feeding and stacking apparatus, the combination of a transfer panel of magnetized rollers for engaging and advancing sheets, a dump panel of electro-magnets for receiving the advanced sheets and for turning them into a different position, and electric instrumentalities connecting with said dump panel electro-magnets for energizing and de-energizing them in synchronism with the turning of the sheet to pick up and release the sheet on said dump panel.

11. A sheet feeding and stacking apparatus, comprising in combination, a conveyor for advancing sheets along a path of travel, an extractor panel of magnetized rollers disposed adjacent said conveyor and extending into the path of travel of the sheets for engaging and extracting the sheets individually from said conveyor, a transfer panel of rollers disposed adjacent said conveyor for further advancing the sheets, said transfer panel comprising a plurality of electro-magnetized rollers and a plurality of permanently magnetized rollers, said electro-magnetized rollers being disposed adjacent the sheet entrance side of said transfer panel for receiving the sheets from said extractor panel, and electric devices for demagnetizing said electro-magnetized rollers between the transfer of the sheets from the extractor panel to the transfer panel so that interference between successive sheets will be eliminated.

12. A sheet feeding apparatus, comprising in combination: a conveyor for holding and advancing along a predetermined path of travel a plurality of sheets maintained in spaced relation, an edge portion of each sheet extending laterally beyond said conveyor, a magnetized roller located adjacent a side of said conveyor and disposed in the path of travel of the laterally extending edge portions of the sheets for individually engaging the sheets as the latter move into contact with the roller, said roller extracting a

sheet engaged thereby laterally from the conveyor before the succeeding spaced sheet in the conveyor engages against the roller, and means for receiving the extracted sheets.

13. A sheet feeding apparatus, comprising in combination: a conveyor for holding and advancing along a predetermined path of travel a plurality of sheets in spaced relation, an edge portion of each sheet extending laterally beyond said conveyor, an electro-magnetized roller located adjacent a side of said conveyor and disposed in the path of travel of the laterally extending edge portions of the sheets for engaging the sheets individually as the latter move into contact with the roller, said roller extracting an engaged sheet laterally from the conveyor before the succeeding spaced sheet in the conveyor engages against the roller, means for receiving the sheets from said electro-magnetized roller for continuing the extraction of the sheets from said conveyor, and means for de-magnetizing said electro-magnetized roller during the continuing of the extraction of the sheets by said receiving means to insure full extraction of a sheet from said conveyor

before extraction of the succeeding sheet thereon is instituted.

14. A sheet feeding apparatus, comprising in combination: a horizontally disposed conveyor for holding and advancing along a predetermined path of travel a plurality of sheets in spaced relation and supported on edge in an inclined position with a lateral edge portion of each sheet extending beyond a side of the conveyor, a magnetized roller located adjacent the side of the conveyor and disposed in the path of travel of the lateral edge portions of the sheets and extending beyond the side of the conveyor for engaging the sheets individually as the same move into contact with the roller, said roller extracting an engaged sheet laterally of the conveyor and having an axis disposed at substantially the same angle of inclination as that of the lateral edge portion of a said sheet so that the roller will engage the sheet squarely along its surface, and means for receiving the sheets successively extracted by said magnetized roller.

JOHN C. STRICKLER.