May 30, 1961 W. E. BRIGHAM 2,986,393

FEEDING MEANS FOR A METAL PRESS

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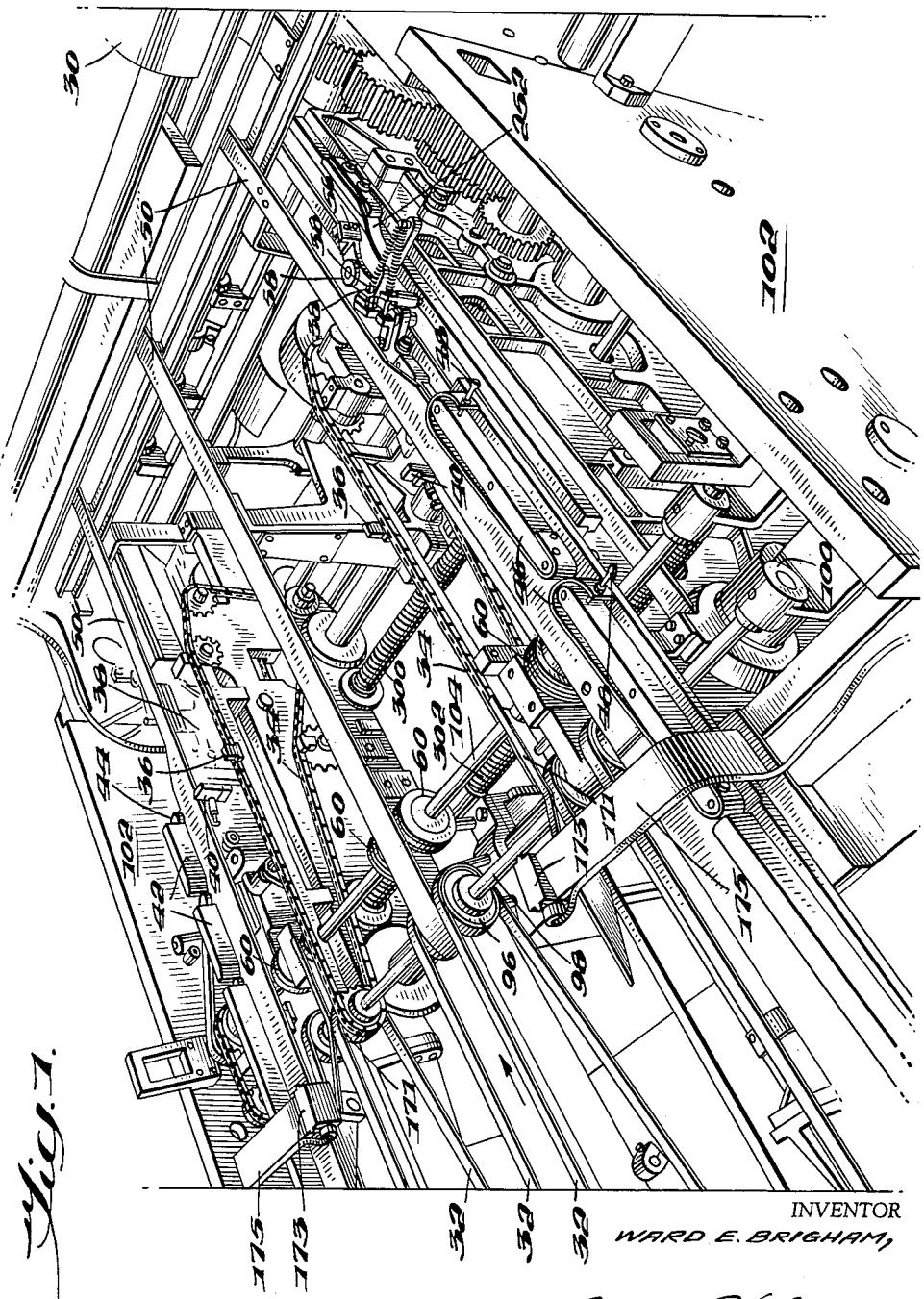


Fig. 1.

INVENTOR
WARD E. BRIGHAM,

BY Edwin V. Sadd, Jr.

ATTORNEY

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FEEDING MEANS FOR A METAL PRESS

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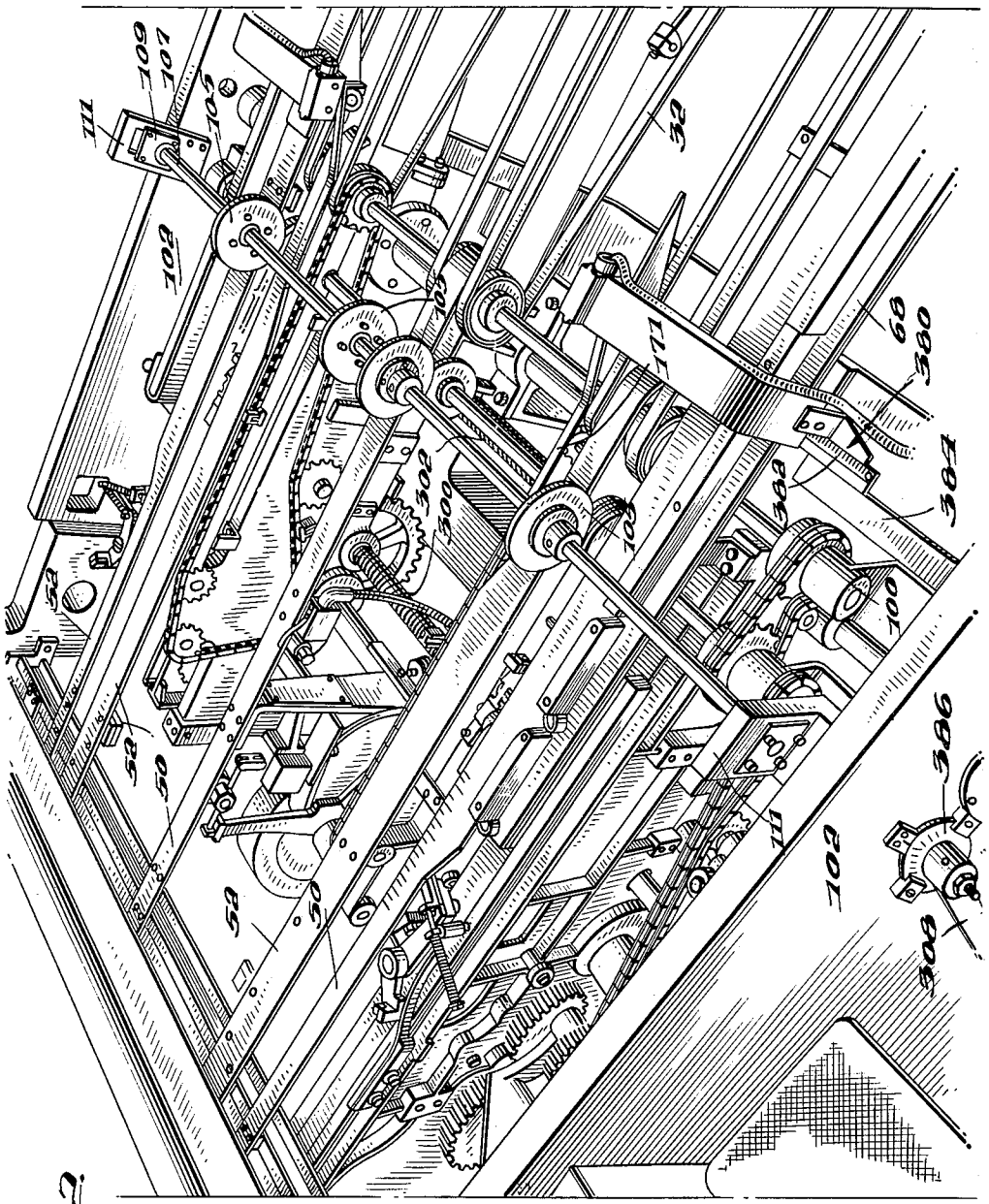


Fig. 2.

INVENTOR
WARD E. BRIGHAM,

BY Edwin V. Sadd, Jr.
ATTORNEY

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FEEDING MEANS FOR A METAL PRESS

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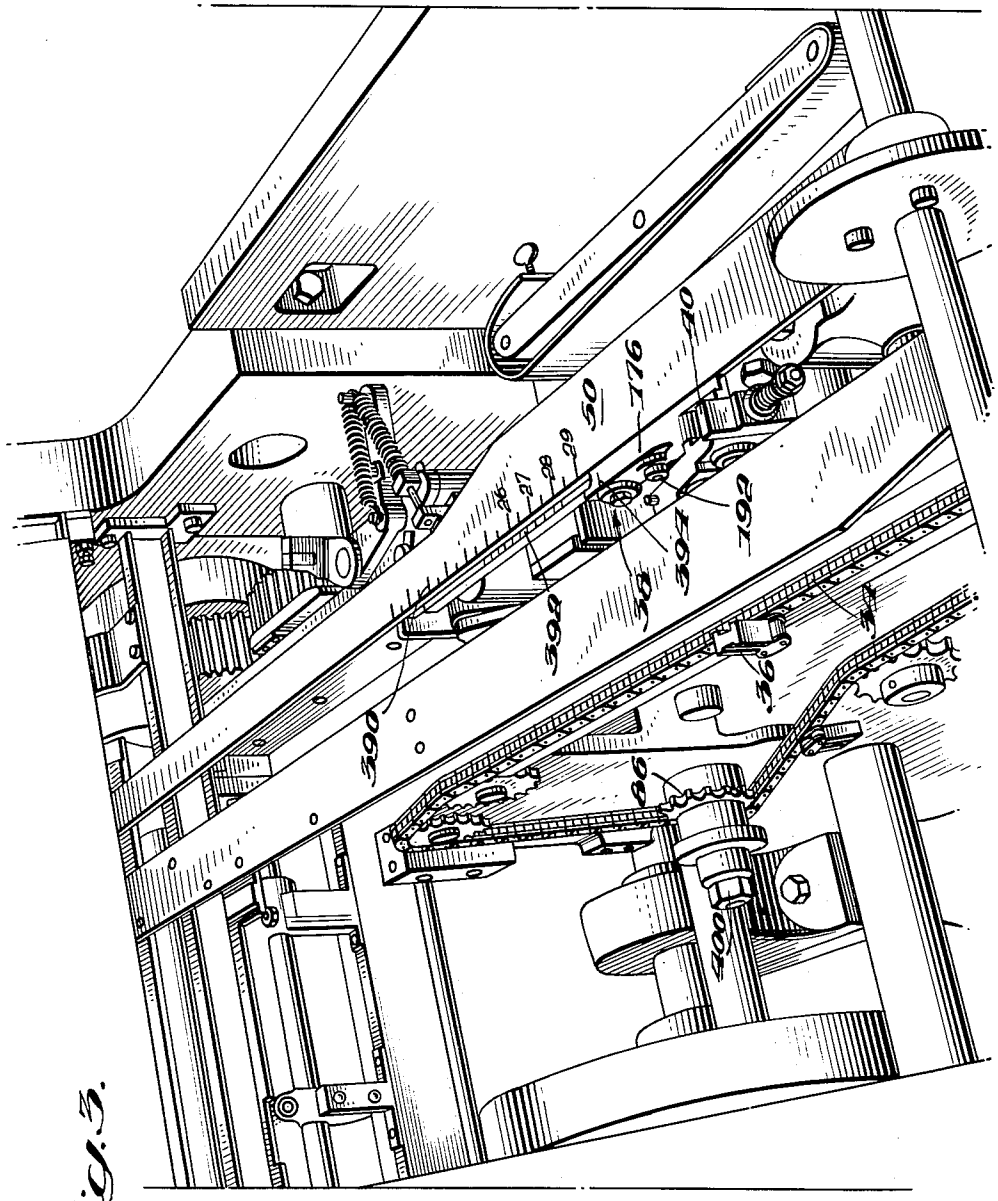


Fig. 3.

INVENTOR
WARD E. BRIGHAM,

BY Edwin V. Ladd Jr.
ATTORNEY

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FEEDING MEANS FOR A METAL PRESS

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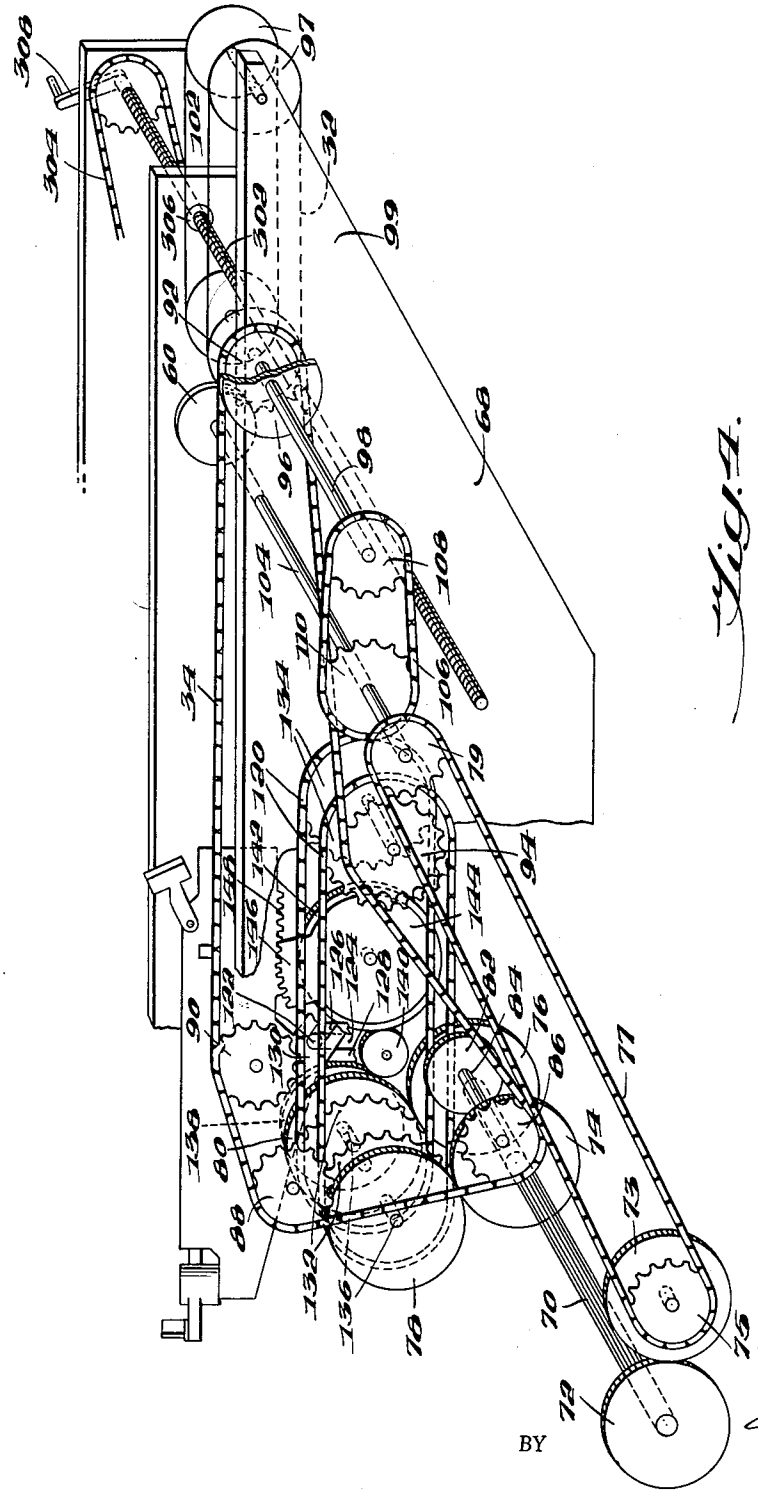


Fig. 4.

INVENTOR
WARD E. BRIGHAM,

BY Edwin V. Ladd Jr.

ATTORNEY

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FEEDING MEANS FOR A METAL PRESS

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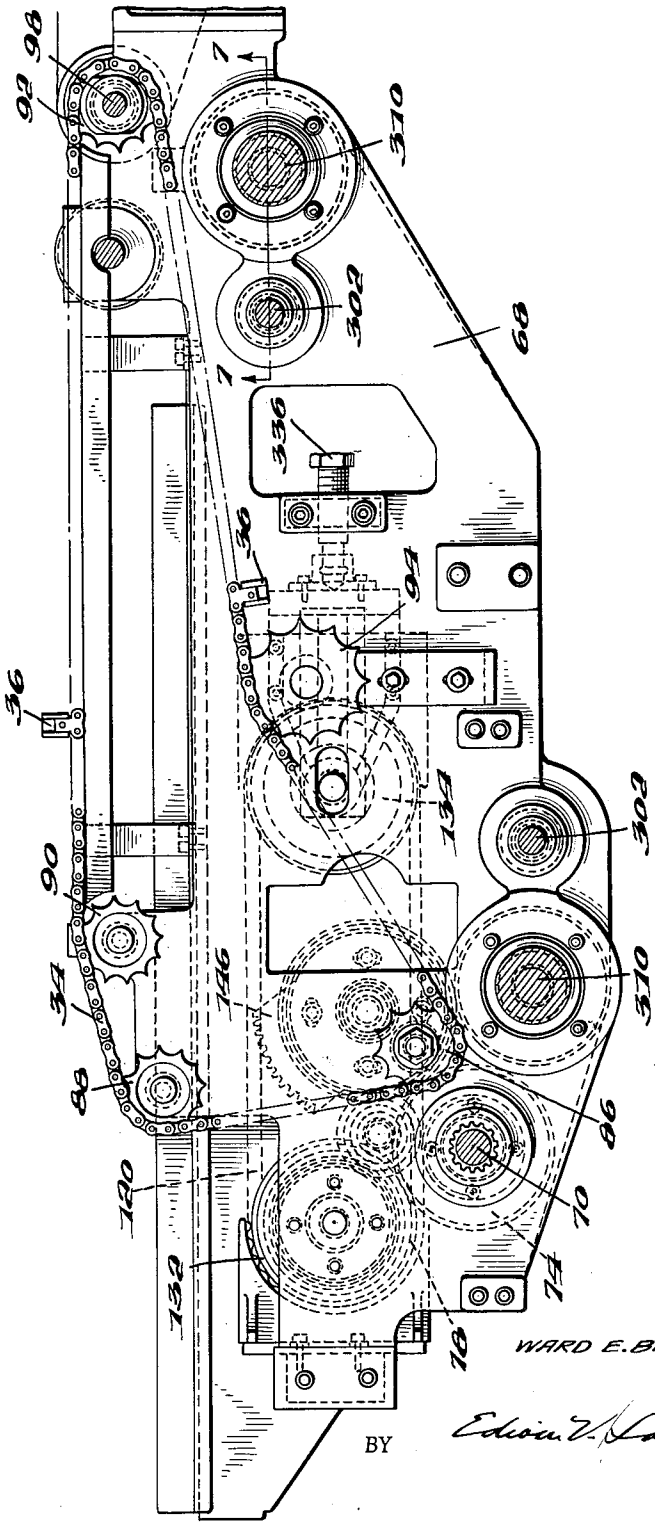


Fig. 5.

INVENTOR
WARD E. BRIGHAM,

BY Edwin V. Ladd, Jr.
ATTORNEY

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FEEDING MEANS FOR A METAL PRESS

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Fig. 6.

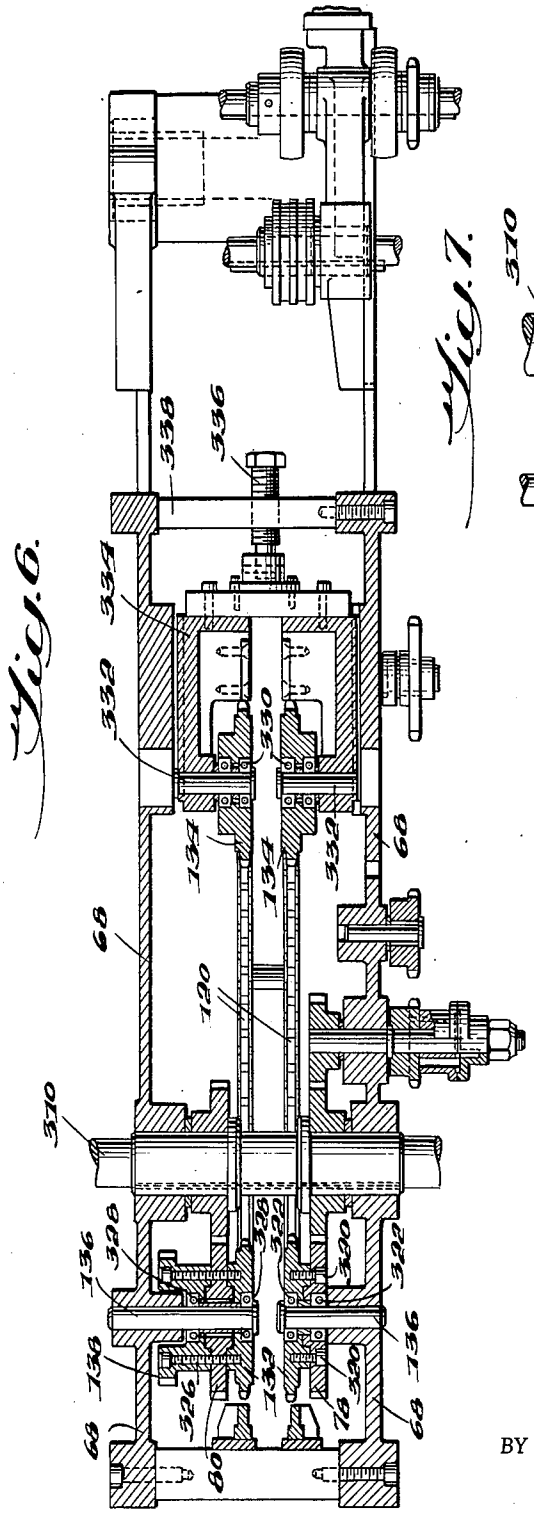


Fig. 7.

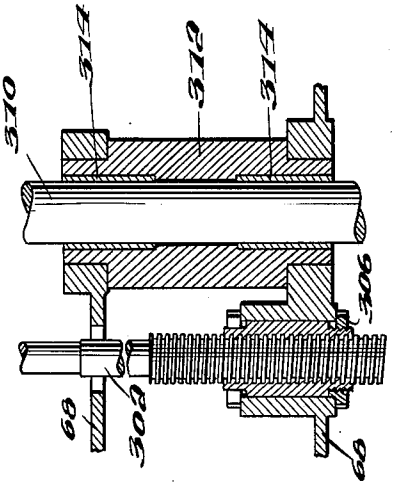
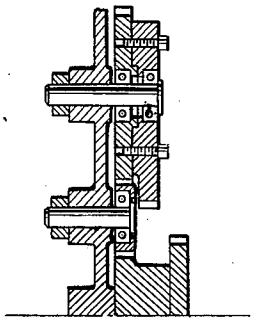


Fig. 8.



INVENTOR
WARD E. BRIGHAM,

BY Edwin V. Sadd, Jr.

ATTORNEY

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FEEDING MEANS FOR A METAL PRESS

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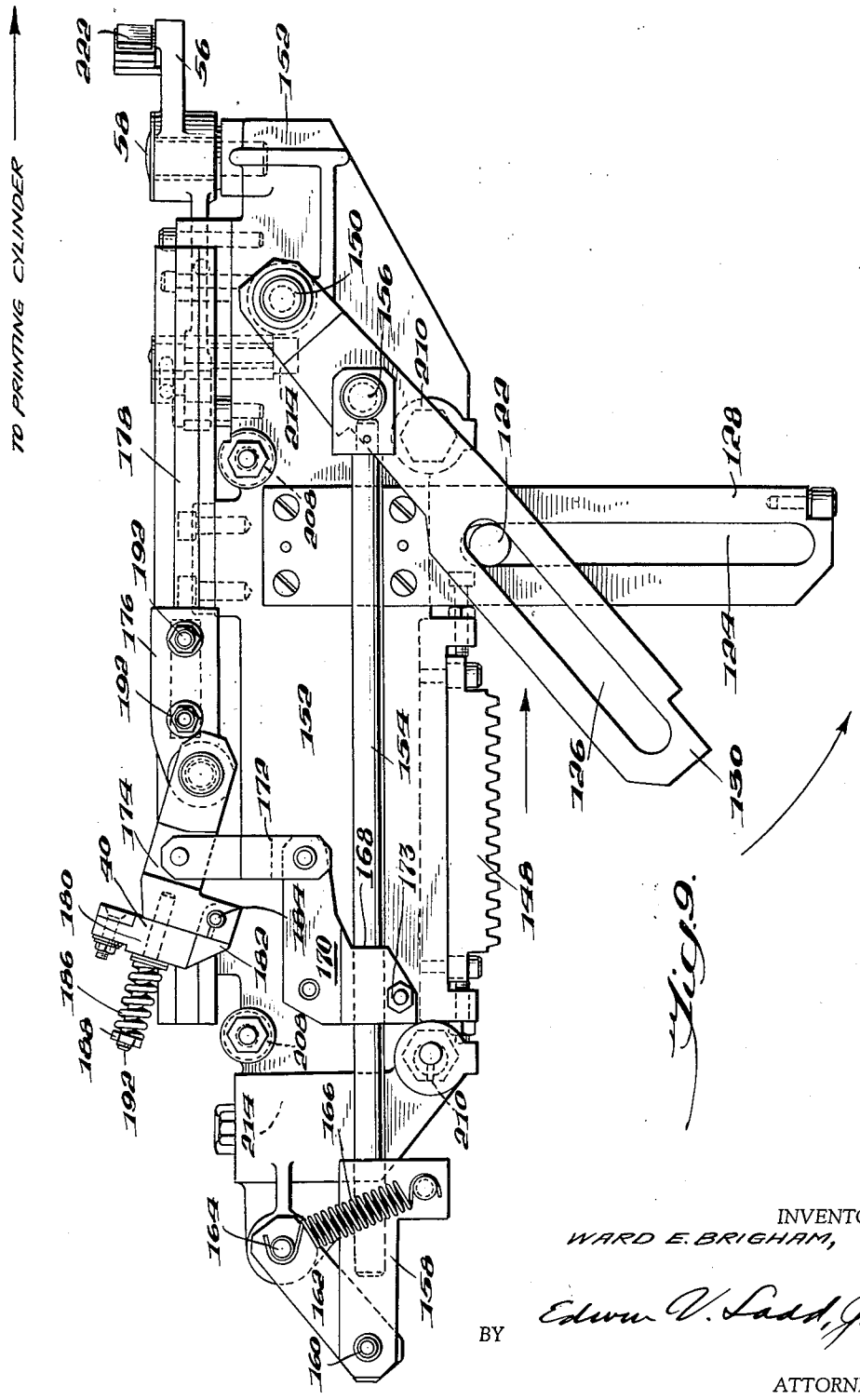


Fig. 9.

INVENTOR
WARD E. BRIGHAM,

BY Edwin V. Ladd, Jr.

ATTORNEY

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FEEDING MEANS FOR A METAL PRESS

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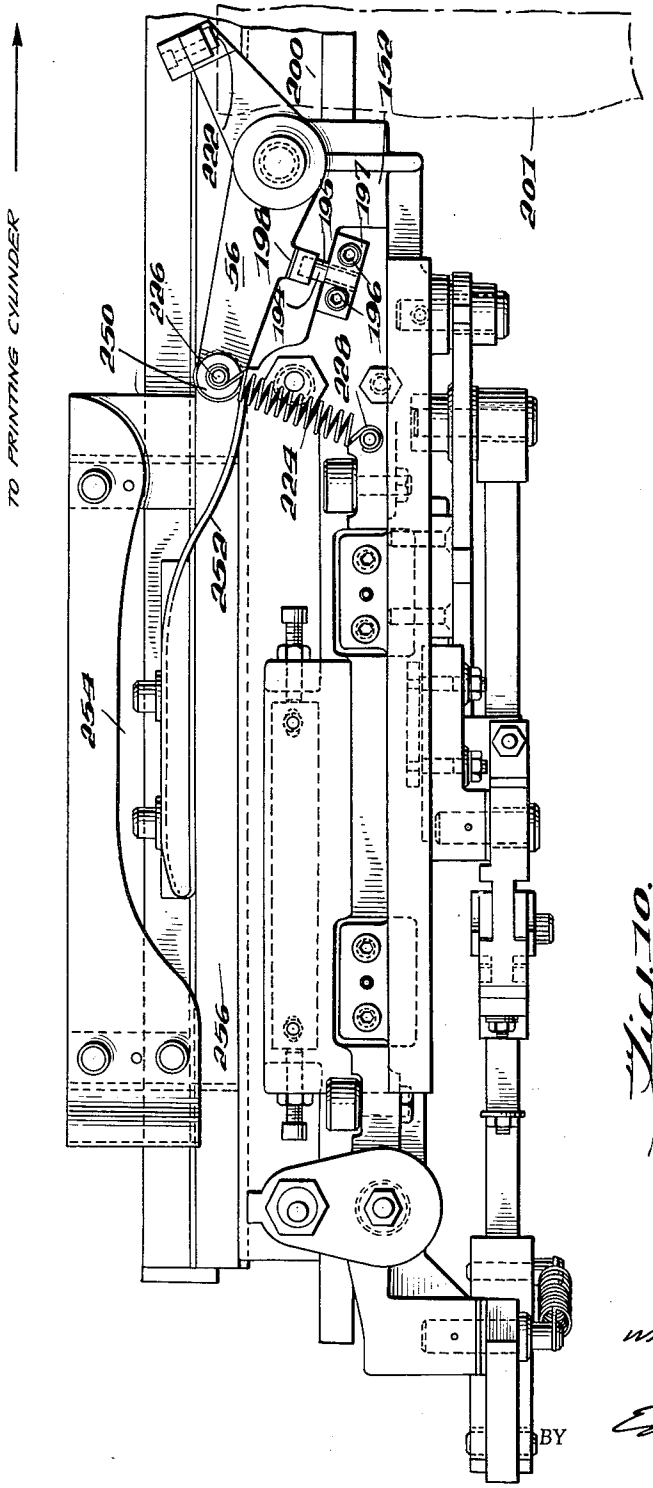


Fig. 10.

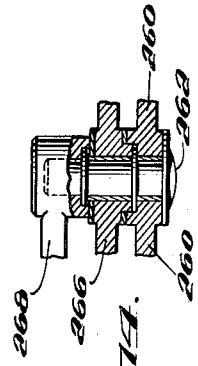


Fig. 14.

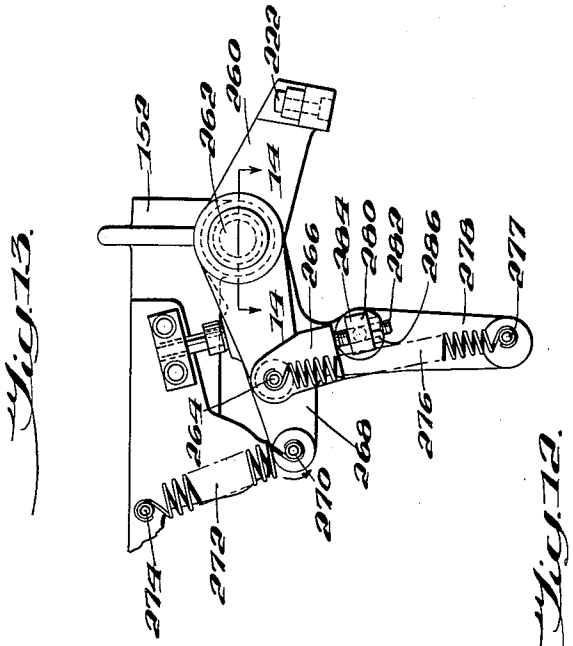
INVENTOR
WARD E. BRIGHAM,

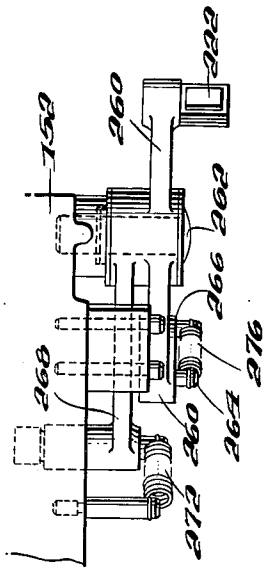
BY Edwin V. Sadd Jr.
ATTORNEY

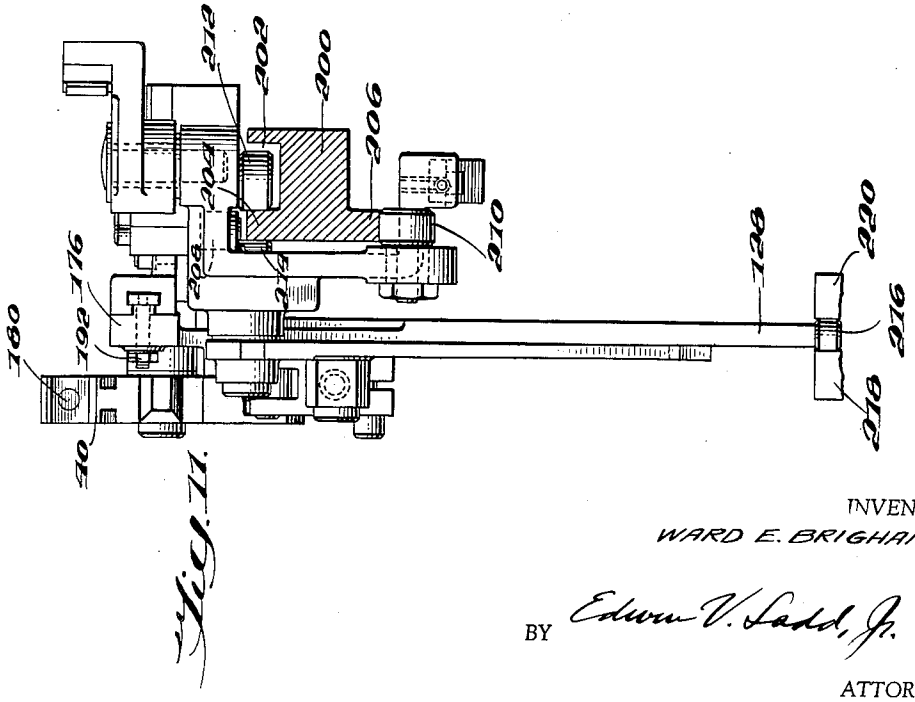
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FEEDING MEANS FOR A METAL PRESS

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INVENTOR
WARD E. BRIGHAM,

BY Edwin V. Ladd, Jr.

ATTORNEY

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FEEDING MEANS FOR A METAL PRESS

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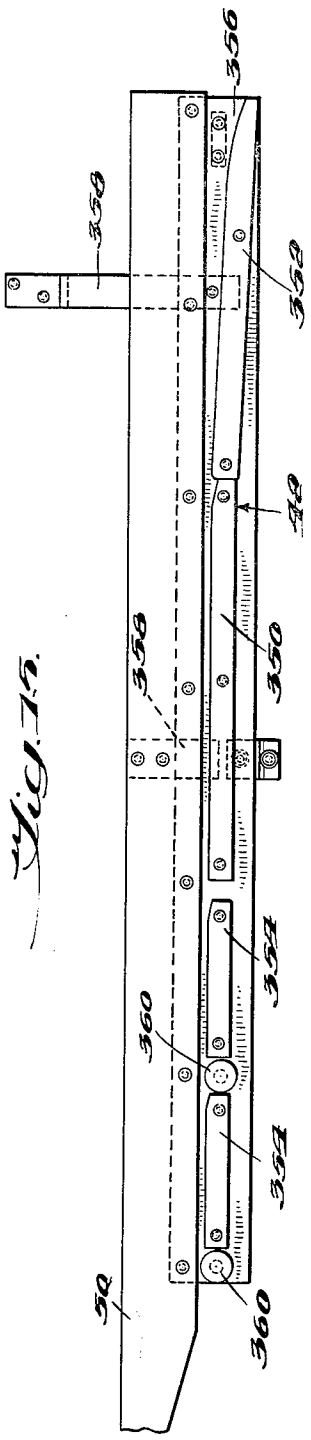


Fig. 15.

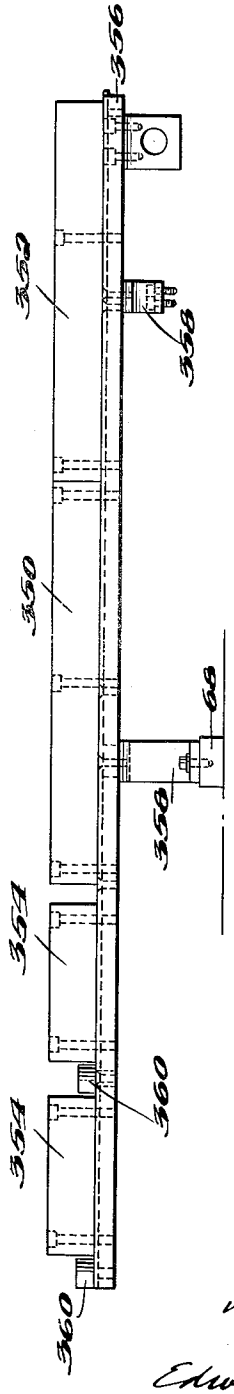


Fig. 16.

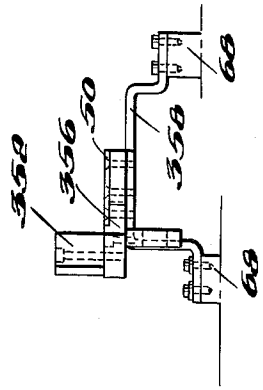


Fig. 17.

INVENTOR
WARD E. BRIGHAM,

BY Edwin V. Ladd Jr.

ATTORNEY

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FEEDING MEANS FOR A METAL PRESS

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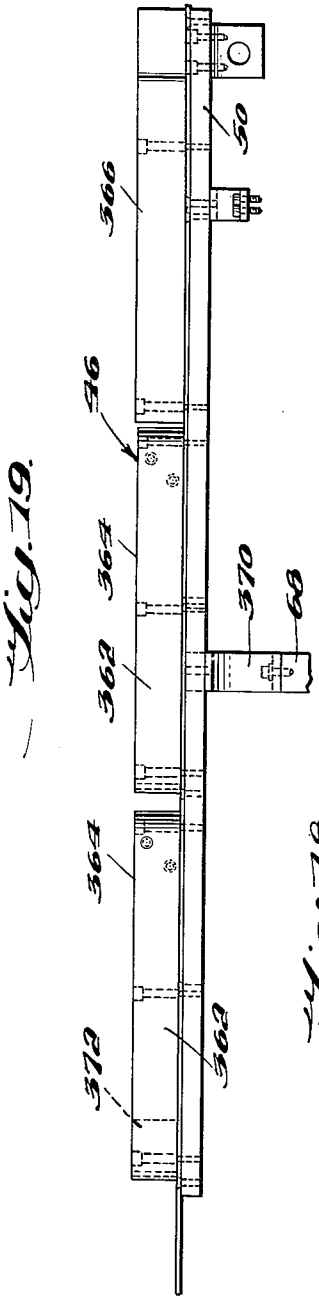


Fig. 19.

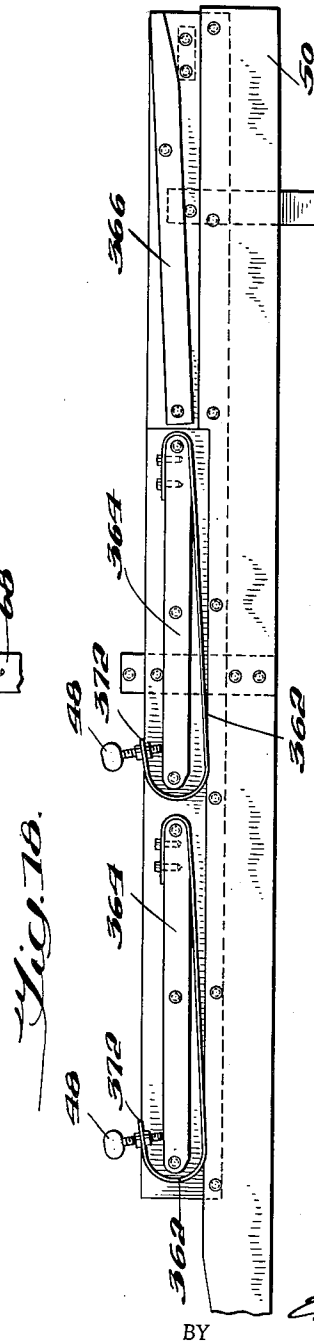


Fig. 18.

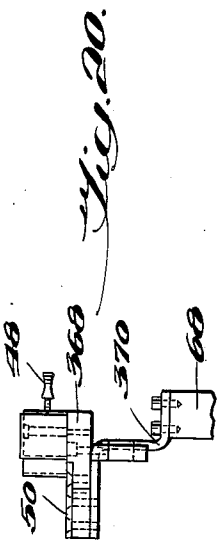


Fig. 20.

INVENTOR
WARD E. BRIGHAM,

BY Edwin V. Sadd, Jr.

ATTORNEY

May 30, 1961 W. E. BRIGHAM 2,986,393

FEEDING MEANS FOR A METAL PRESS

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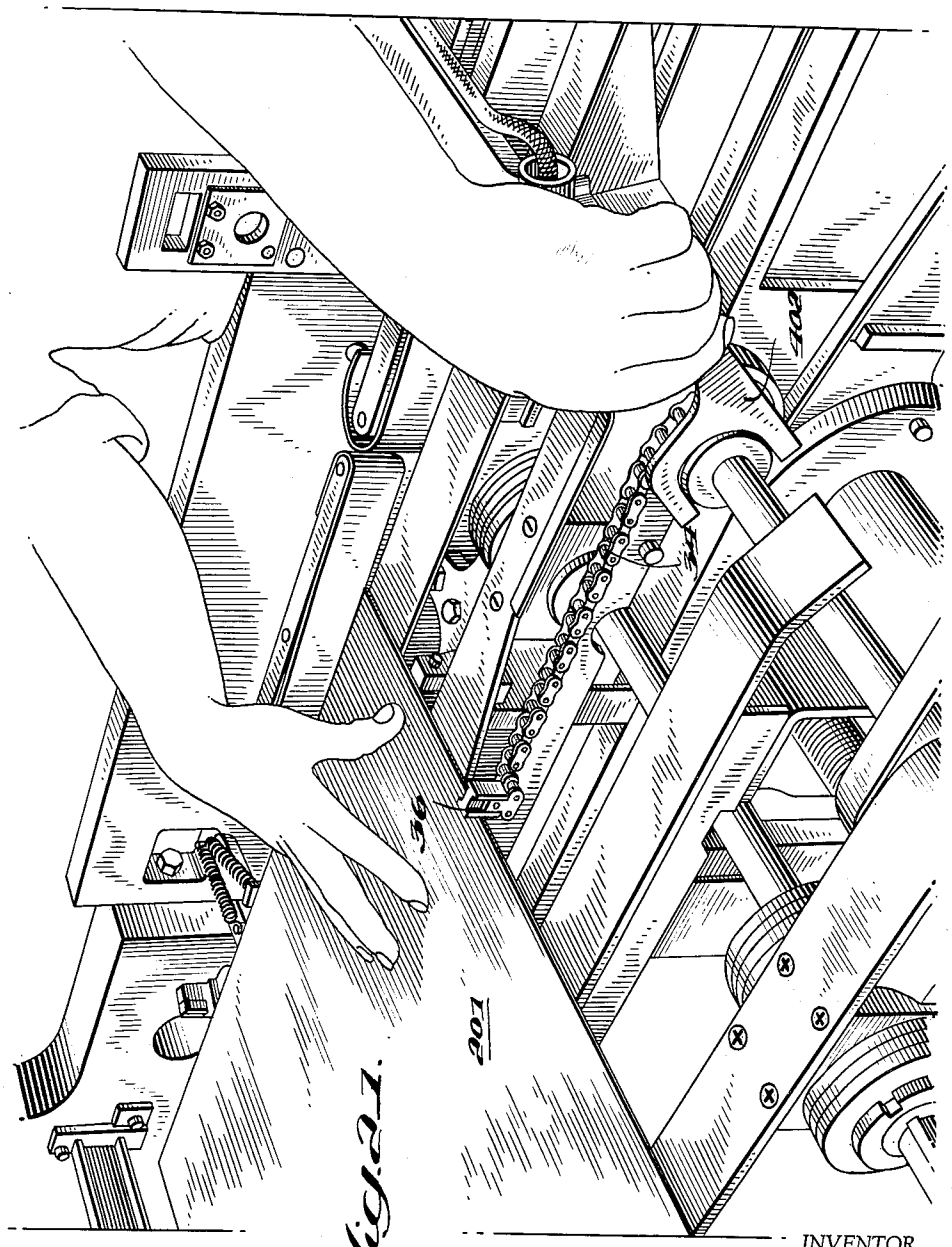


Fig. 21.

INVENTOR
WARD E. BRIGHAM,

BY Edwin V. Ladd, Jr.

ATTORNEY

United States Patent Office 2,986,393
Patented May 30, 1961

2,986,393

FEEDING MEANS FOR A METAL PRESS

Ward E. Brigham, Rutherford, N.J., assignor to Sun Chemical Corporation, Long Island City, N.Y., a corporation of Delaware

Filed Nov. 25, 1957, Ser. No. 698,487

11 Claims. (Cl. 271—46)

This invention relates to a feeding mechanism for a printing cylinder and, more particularly, the invention relates to a high speed feeding mechanism for delivering metallic sheets into a metal decorating press.

The purpose of the feeding mechanism is to take sheets which have been separated and delivered to it by a Dexter feeder or the like and to move the sheets to the press cylinder at exactly the peripheral speed of the press cylinder and in perfect register. The Dexter feeder and the press form no part of the invention.

To accomplish the purpose of the invention, the applicant provides several novel features. The first resides in a combination of conveying mechanisms which bring the sheets up to the press. In considering the speed of conveying the sheets to the press cylinder, the speeds will be related to the surface speed of the cylinder which, in the embodiment described, is X inches.

The sheets are carried forward from the Dexter feeder on belts which travel at a speed of $X-1$ inches per revolution of the press cylinder which is almost the speed of the surface cylinder. In other words, while the cylinder rotates one revolution on a peripheral distance of X inches, the revolution of the press cylinder travels $X-1$ inches. The sheets are picked up from the belts by chains having pusher lugs which engage the rear end of the sheet. While moving onto the chain conveyor, the sheets pass over cylindrical wafer magnets which will operate at a surface speed of approximately $X-9$ inches per revolution of the press cylinder. These magnets slow the sheets down to a point where the pusher lugs on the chains engage the sheets and move them toward the printing cylinders at a speed of $X-4$ inches per sheet.

Toward the end of the travel by the chains, the sheets are driven by a reciprocating carriage having pushers which engage the rear edge of the sheet and which move the sheets at a speed of X inches per sheet to match cylinder surface speed.

Over the greater portion of its length of travel, the reciprocating carriage is driven by chains having a carriage engaging lug. A gear connected through a gear train to the printing cylinder engages the reciprocating carriage and drives it for the final 3 inches of its travel toward the printing cylinder.

By providing this positive driving connection between the printing cylinder and the reciprocating carriage, perfect register, which would be unobtainable with a chain drive, is obtained.

Side register is provided initially by leaf spring arrangements on one side of the feeding mechanism which force the sheets against solid surfaces on the other side of the feeding mechanism for preliminary register. Final register is provided by the reciprocating carriage which has arms brought inwardly by mating cams to engage the side edges of the sheets to achieve the final position. These arms move with the carriage and maintain the final position during the last inch of travel into the printing cylinder.

There are two reciprocating carriages which form the

essential feeding mechanism. These carriages are disposed at either side of the feed table between heavy plates. The plates are connected to threaded shafts which can be turned to move the plates and carriage in and out to accommodate varying width sheets.

It is an object of the invention to provide a high speed feeding mechanism in which chain driven lugs bring the sheets close to the printing cylinder and in which reciprocating carriages carry the sheets the remaining distance into the printing cylinder, the final three inches of travel being effected through a positive gearing arrangement driven directly from the printing cylinder.

It is another object of the invention to provide a mechanism in the reciprocating carriages which will project pusher lugs during the travel toward the printing cylinder and will retract the pusher lugs on the return stroke.

It is another object of the invention to provide side register arms on the reciprocating carriages with cam means for causing the arms to engage the side edges of the sheets during the last portion of the sheets' travel into the printing cylinder.

These and other objects of the invention will become more readily apparent from the following detailed description of the invention taken in conjunction with the accompanying drawings in which:

Fig. 1 is a perspective view taken from one side of the feeding mechanism.

Fig. 2 is a perspective view taken from the opposite side of the feeding mechanism;

Fig. 3 is a perspective view of a fragment of the feeder mechanism;

Fig. 4 is a schematic perspective view of the feeder mechanism;

Fig. 5 is an elevational view of the carriage mount;

Fig. 6 is a developed sectional view of the carriage mount;

Figs. 7 and 8 are detailed sectional views of the carriage mount taken along lines 7—7 and 8—8 of Fig. 5 respectively;

Fig. 9 is a side elevational view of the carriage;

Fig. 10 is a top plan view of the carriage;

Fig. 11 is an end view of the carriage;

Fig. 12 is a fragmentary top plan view of the carriage showing the side register mechanism for the right side of the machine;

Fig. 13 is a fragmentary side elevational view of the mechanism of Fig. 12;

Fig. 14 is a cross-sectional view taken along lines 14—14 of Fig. 13;

Fig. 15 is a top plan view of the rigid guide way;

Fig. 16 is an elevational view thereof;

Fig. 17 is a side elevational view thereof;

Fig. 18 is a top plan view of the leaf spring guide way;

Fig. 19 is a side elevational view thereof;

Fig. 20 is an end view thereof;

Fig. 21 is a perspective view showing the method of setting the machine up for various sheet sizes.

As indicated above the Dexter feeder and the printing press form no part of this invention and will not be described. As viewed in Fig. 1, the Dexter feeder would appear at the left side of the machine and a fragment of the printing press is shown at 30 in the right hand side of the view.

The principal conveying elements are the belts 32 which receive the sheets from the Dexter feeder, the chains 34 on which are mounted pusher lugs 36 and the carriage 38 on which is mounted a pusher lug 40. The sheets are guided on the left side facing the printing press by rigid guide members 42 spaced alternately with rollers 44. On the right side of the machine, urging the sheets toward the rigid guide ways are leaf spring guide members 46 having

adjusting screws 48. The sheets are supported by slats 50 and 52. Comparing Figs. 1 and 2, it will be observed that the slats 52 are removable to accomodate inward adjustment of the carriage conveying mechanisms described below.

Final side registration is provided by arms 56 pivotally mounted at 58 to the carriage 38.

The speed of movement of the sheets onto the chain conveyors 34 from the belts 32 is controlled by cylindrical wafer magnets 60. The belts 32 have a linear speed of $X-1$ inches per revolution of the press cylinder as compared to X inches per sheet of press cylinder surface speed. The belts deliver the sheet over the cylindrical wafer magnets 60, which are operated at a surface speed of approximately $X-9$ inches per revolution of the press cylinder. These magnets slow the sheet down gradually to the point where preliminary pusher lugs 36 travelling on chains 34 at a speed of approximately $X-4$ inches per revolution of the press cylinder catch up to the sheet and carry it beyond the magnets.

Drive mechanism for conveyor chain

Figs. 3 and 4 show details of the mechanism for transmitting motion from the printing cylinder to the conveyors. The main driving element is a spline shaft 70 which is fixed to a gear 72 driven directly by the main cam shaft which is directly geared to the printing cylinder. The spline shaft drives a complete assembly such as is shown in Fig. 4, two such complete assemblies being utilized for the feeding mechanism. In the preferred embodiment, the spline shaft is broken at the center, intermediate the two assemblies, and is driven by gears mounted on either side of the printing cylinder. The spline shaft is fixed to main gear 74 and 76 which engage the carriage drive gears 78 and 80 respectively. Gear 74 meshes with gear 82 which is fixed to one end of shaft 84, the other end of which is fixed to a sprocket 86. Conveyor chain 34 engages sprocket 86 passing over idler sprockets 88, 90 and 92 and tensioning sprocket 94, the sprocket 92 being mounted for rotation with respect to its shaft 98. Thus, the conveyor chain 34 is driven directly from spline shaft 70 which is in turn connected directly to the press cylinder.

Belt drive mechanism

Gear 72 drives a gear 73, having a sprocket 75 fixed thereto. Through a chain 77 this sprocket 75 drives a sprocket 79 fixed to shaft 104. A sprocket 110 is keyed to shaft 104 to drive a sprocket 108 through chain 106. The sprocket 108 drives the shaft 98 to which are keyed pulleys 96. The pulleys 96 drive the belts 32 which are wrapped around pulleys 97 rotatably mounted on the end 99 of carriage mount frame 68.

The wafer magnets 60 are fixed to shaft 104 and are rotated by the shaft 104 when it is driven by the chain 77 and sprocket 79.

There will be applications in which non magnetic sheets are fed into the decorating press. In such instances, the cylindrical wafer magnets will not be effective to slow the sheets. To obviate this difficulty, discs 105 (Fig. 2) are rotatably mounted on a shaft 107. The shaft 107 is journaled in blocks 109 which are in turn mounted for vertical sliding movement in brackets 111 fixed to the frame members 102. The discs 105 can be normally adjusted sideways so that sheets passing through will be forced into frictional engagement with the cylindrical wafer magnets 60 and slowed down accordingly.

Carriage drive mechanism

Each of the two carriages 38, is driven over the major portion of its stroke by parallel chains 120 which carry between them a roller 122 which rides in the slots 124 and 126 of depending arms 128 and 130 respectively on the carriage. The chains pass around drive sprockets 132 and idler sprockets 134. The drive sprockets are connected through stub shafts 136 to gears 78 and 80. Gears 78 and 80 are driven by the spline shaft 70 through gears 74 and 76 as indicated above.

It is important in obtaining exact registration that the carriages 38 be driven over the last approximately 3 inches of travel toward the cylinder press by a gear drive connected directly to the cylinder press. To this end a gear 138 is fixed to gear 80 and directly driven by the printing cylinder through gear 76 on spline shaft 70. An intermediate gear 140 connects gear 138 to gear 142 which is rotatably mounted on the frame member 68. Fixed to gear 142 is a fractional pinion gear 144 having gear teeth 146 engageable with a rack 148 on the carriage 38. The positioning of teeth 146 is such that in the last approximately 3 inches of the travel of carriage 38 toward the printing cylinder, the teeth 146 engage the rack 148 and transmit the motion of the carriage directly through a gear chain from the printing cylinder. This arrangement permits subsequently perfect registration which would not be possible with tolerance errors occurring in a chain drive.

Operation of pushers on reciprocating carriage

Carriages 38 move back and forth as the roller 122 travels around between chains 120. A reciprocating movement is permitted by virtue of the fact that the roller is permitted to slide up and down in slot 124 of arm 128 on the carriage. (See Figs. 9 and 11.) The same roller also engages the slot 126 of arm 130 which is pivoted at 150 to the frame 152 of the carriage. One end of a link 154 is pivotally connected to arm 130 at 156. The other end of the link is fixed to a bracket 158. Bracket 158 is pivotally connected at 160 to a link 162 which is pivoted at 164 to the frame 152. A tension spring 166 normally urges the bracket 158 in an upward direction. The link 154 is slidably mounted in a bore 168 in a clamping block 170, the block 170 being connected through a link 172 to carriage pusher lug 40, and having a nut 173 to clamp the block onto link 154.

As shown in Fig. 9, when roller 122 reaches the bottom of its stroke, the arm 130 has pivoted downwardly drawing the link 154 down with it. Link 154 moves through parallel positions because of the parallelogram linkage arrangement described above. The dropping of link 154 pulls the pusher lug 40 down below the surface of the slat 50 on which the sheets ride. Thus, on the return stroke of the carriage, when the roller is in its lower position, the pusher lug is out of the path of travel of sheets being driven by conveyor chains 34.

The pusher lug 40 consists principally of a first member 174 which is pivoted to an adjustable member 176 slidably mounted in a key way 178 on the frame 152. A second pusher lug member 180 has a projection 182 pivoted at 184 in a slot in the first member 174. A compression spring 186 connected at one end 188 through a bolt 190 to the first member 174 urges the second member 180 against the first member 174. The compression spring 186 provides a certain desired resiliancy in the pusher lug which smooths the engagement of the pusher lug with the sheet and which avoids buckling the sheet when it is moved into engagement with the printing cylinder.

Sheets of various lengths can be accommodated by the carriages 38 through the adjustment provided by adjustable member 176. Member 176 can be slid along the key way 178 and fixed in any longitudinal position by nuts 192 as determined by the setting procedures illustrated in Figs. 3 and 21 to be described below. When adjustable member 176 is moved along key way 178, the complete assembly including the pusher lug 40, link 172 and member 170 slide along with the adjustable member. Member 170 is permitted to move with respect to link 154 because of the sliding engagement of link 154 in slot 168. Because of the parallel link arrangement operating link 154, the retracting and projecting move-

ment of pusher lug **40** is not affected by the positioning of the pusher lug assembly along the length of link **154**.

Detection of improper feeding

As shown in Figs. 1 and 2, fingers **171** are positioned above the table and are operably connected to micro switches **173** mounted by brackets **175** to the frame. If the sheets are improperly fed by belts **32** and chain conveyor lugs **36**, the reciprocating carriage lugs **40** will come up under the sheets lifting them slightly. The lifting of the sheets will cause the operation of fingers **171** and, through suitable circuitry not shown, will shut down the machine.

Carriage mounting arrangement

The carriage mounting arrangement is shown in Figs. 9, 10 and 11. Fixed to the outside frame member **68** is a rail **200** having a channel-shaped groove **202**. Flanges **204** and **206** provide upper and lower bearing surfaces which are engaged by rollers **208** and **210** respectively. A stabilizing roller **212** rides in channel **202** and a second stabilizing roller **214** bears against the opposite side of flange **204**. Substantially identical arrangements of rollers cooperating with the rail **200** are mounted at each end of the carriage as shown in hidden lines in Fig. 9. An additional stabilizing roller **216** mounted at the lower end of arm **128** rides between rails **218** and **220**. The rails **218** and **220** are fixed to the frame members **68** immediately beneath the lower path of travel of the carriage driving chains **120**.

Final side register mechanism

The side register mechanism on the left and right sides of the machine are mounted on and moved with the carriages **38**. The mechanism on the left side of the machine is comparatively rigid whereas the mechanism on the right side of the machine has a spring biasing arrangement which permits the mechanism to accommodate sheets of slightly varying widths. Figs. 9 and 10 show the mechanism on the left side of the machine with the carriages moving in the direction of the arrows. The side register arms **56** are pivotally mounted at **58** to the carriage frame **152** as mentioned above. At the end of the arm **56** is a sheet engaging surface **222**. At the other end of the arm **56** is a tension spring **224** normally urging the arm about its pivot point **58** to hold the arm into engagement with a cam surface **252**, the details of which are to be described below. The tension spring **224** is fixed at one end **226** to the arm **56** and at the other end **228** to the frame **152**.

An abutment **194** is fixed to the frame **152** by bolts **196**. The abutment engages a surface **198** on the arm **56** to limit the angular movement of the arm **56** about its pivot point **58** under the pull of the tension spring **224**. The abutment **194** consists of a pin **195** threaded into a block **197** which is fixed to the carriage frame. The threaded engagement of pin **195** with block **197** permits the adjustment of the normal angular position of the arm **56**.

On the lower surface of the arm **56** is a roller **250** which is engageable with a leaf spring cam surface **252** fixed to the rail **200** (Fig. 10). As the carriage moves in the direction of the arrow in Fig. 10, the leaf spring cam **252** and the cam surface beyond causes the arm **56** to pivot clockwise thereby moving surface **222** into engagement with the sheet for perfect side register. In passing over leaf spring cam **252**, the roller passes through a box cam slot **254** as the sheet is being moved into the printing cylinder. The roller drops down into the area indicated at **256** for the return stroke. On the return stroke, the roller passes under leaf spring cam **252** and leaf spring cam **252** is forced aside to permit the roller to pass out through the position shown in Fig. 10.

The tension spring **224** holds the arm **56** into tight engagement with the cam surface which pivots the arm to be described below.

It will be observed from a consideration of Fig. 10 that if a sheet, a fragment of which is shown at **201**, is slightly wider than anticipated, the arm **56** cannot accommodate the sheet because of the rigid connection between the end having roller **250** which bears against the cam surface and the surface **222** which engages the edge of the sheet **201**. Accommodation of the variations in width of the sheets is provided by the side register mechanism on the right side of the machine as illustrated in Figs. 12, 13 and 14. In this arrangement the arm consists of a member **260** pivoted at **262** to the frame **152** and carrying at one end thereof the sheet engaging abutment **222**. The other end of member **260** carries a pin **264** and a short abutment stub **266**. Another part of the arm consists of a member **268** also pivoted at **262** to the frame **152**. One end of the member **268** carries a roller **270** which engages a leaf spring cam in the same manner as roller **260** does, as shown in Fig. 10. The roller end of member **268** has fixed thereto one end of a tension spring **272**, the other end of which is fixed to the carriage frame **152** at **274**.

The arm members **268** and **260** are caused to work together by a tension spring **276** which is connected to member **260** at its end **264** and which is connected to member **268** at the end **276** of a projection **278**, integral with member **268**. The projection **278** carries an abutment **280** consisting of a screw **282** threaded into a block **284** and carrying a lock nut **286** to fix the screw in the block **284**. The block **284** is fixed to the projection **278**. Tension spring **276** normally holds abutment stud **266** fixed to arm member **260** tightly against the end of abutment screw **282**. However, when the edge of a sheet engages the abutment **222** and the roller **270** is moved counterclockwise in the direction of the arrow by a leaf spring cam arrangement, the engagement of abutment stub **266** with screw **282** will be separated, with the spring **276** tending to bias abutment surface **222** against the edge of the sheet **201**. Thus, the spring **276** acting on the member **260** and its abutment surface **222** forces the sheet tightly against the abutment **222** of arm **56** on the left side of the machine.

The cams **252** on either side of the machine are located with respect to the printing cylinder to cause the cooperating arms to engage the sides of the sheets as the chopped gear **144** engages the rack **148** on the carriage. Thus for the last approximately 3 inches of travel, the carriage, for rear register, and the side register arms are in effect locked together and to the rotation of the cylinder to effect perfect register of the sheets into the printing cylinder.

Mechanism for lateral adjustment of carriage mount

As shown in Figs. 1, 2 and 4, there are two threaded rods **300** and **302** passing through left and right frame members **102**. The rods are journaled in the frame members **102** and are interconnected by a chain **304** diagramatically illustrated in Fig. 4. The threaded rods **300** and **302** cooperate with threaded bushings **306** fixed in carriage mount frames **68**. A crank shown at **308** in Fig. 2 and diagramatically illustrated in Fig. 4 rotates the rod **302**, through chain **304**, the rod **300**. The rotation of the rods **300** and **302** acts through the bushings **306** to move carriage mounts **68** toward and away from each other thereby carrying carriages **38** toward and away from each other.

The frame members **68** are slidably mounted on support rods **310** which are securely fixed to the left and right frame members **102**. A detail of the construction of the frame members **68** and their relationship to the threaded rods **302** and the mounting rod **310** is illustrated in fragmentary view Fig. 7. There it is seen that the frame members **68** are spaced apart by blocks **312**

carrying bearing material **314** which supports the carriage mount frame member **68** slidably on the rod **310**.

Mounting arrangement for the carriage drive chains

Referring to Figs. 6 and 7, the carriage drive chains **120** pass over the drive sprockets **132** and idler sprockets **134**. The drive sprockets are mounted in stub shafts **136** which are fixed to the carriage mount frame members **68**. Bolts **320** fix one of the drive sprockets **132** to its associated gear **78**, the gear and sprocket being rotatably mounted on the stub shaft **136** by bearings **322**. The opposing sprocket **132** is fixed to its drive gear **80** and gear **138** by bolts **326**, the assembly being mounted on stub shaft **136** by bearings **328**. The idler sprockets **134** are mounted by bearings **330** to idler stub shafts **332** fixed in a cage **334**. The cage **334** floats between frame members **68** and is adjustably mounted to the frame members by a threaded bolt **336** which threadably engages a cross piece **338** extending between the two frame members. Thus, if the chains **120** become elongated due to wear, they can be tightened by turning bolt **336**, drawing the cage **334** away from the drive sprockets **132**.

Preliminary side register

Before being captured by the side register devices on the reciprocating carriages **38** and while passing over the belt feeders **32** and chain conveyors **34**, preliminary side register is effected by rigid guide members **42** and leaf spring guide members **46** as illustrated in Fig. 1. Details of the rigid and leaf spring guide members are shown in Figs. 15–21.

Referring particularly to Figs. 16 and 17, the rigid guide members **42** consist of an elongated longitudinally extended bar **350**, elongated bar **352** inclined in the longitudinal axis of the machine and two short bars **354** all fixed to a plate **356**. Plate **356** is mounted by brackets **358** to the carriage mount frame member **68**. Rollers **360** are rotatably mounted on plate **356** adjacent the short bars **354**. The slat **50** is also shown mounted on the plate **356**.

Figs. 18–20 show the mounting of the resilient leaf spring quide members **46**. These consist of leaf springs **362** mounted on elongated bars **364**. Preliminarily to the leaf springs **362** is an elongated bar **366** which is inclined to the longitudinal axis for preliminary centering of the sheets as they pass off the conveyor belts **32**. The bars **364** and **366** are mounted on plates **368** fixed by brackets **370** to carriage mount frame member **68**. Tension adjusting screws **48** are threaded in the ends **372** of the leaf springs **362** and bear against the bars **364** to apply proper tension to the leaf springs. The right hand slat **50** is shown fixed to the plate **368**.

Adjustment to accommodate sheets of various widths and lengths

The adjustment for width of the sheet to be printed is illustrated in Fig. 2. As indicated above, the carriage mounts **68** which carry the preliminary side register guide members and the final side register mechanism, can be moved in and out by turning crank **308**. Fixed to the carriage mount **68** is a pointer **380** which cooperates with a scale **382** fixed on a bracket **384**. The bracket **384** is mounted on the left frame member **102**. Cooperating with the scale **382** and pointer **380** is a graduated dial wheel **386** fixed to the crank **308**.

To set the carriage mounts **68** transversely for the proper sheet width, the sheet is first measured and the pointer **380** is set against the corresponding scale marking on scale **382** by rotating crank **308**. The dial wheel which reads directly in thousanths of an inch is set to the proper fraction of an inch by further rotation of the crank **308**.

Because all of the drive mechanism of the carriage mount **68** is taken off spline shafts **70**, the carriage mount **68** can be moved during operation in order to make a further adjustment under operating conditions.

The next adjustment is of the reciprocating pushers. As indicated in Fig. 3, slat **50** is provided with a scale **390**. Scale **392** is provided on the reciprocating carriage **38**. The end of the scale **392** on the reciprocating carriage is set against the scale marking **29** on slat **50** by turning the press by hand through means not shown.

The individual adjustable pusher members **176** are set so that a graduation line **394** is set to the exact length of sheet to be printed on the scale **392** mounted on the reciprocating pusher carriage. This adjustment is made by loosening the two nuts **192** on the adjustable member **176** and the nut **173**. After the member **176** is properly located, referring to Fig. 9, a lower clamping block **170** is then shifted so that link **172** is vertical. Then the nuts **192** and **173** are retightened.

The pusher lugs **36** on conveyor chains are then set to provide a proper relationship between pusher lugs **36** and carriage pusher lugs **40**. The setting of the pusher lugs **36** is illustrated by reference to Figs. 3 and 21.

Without a sheet on the feed table, the press is moved through a forward cycle and then on the return stroke of the reciprocating carriage, the press is stopped at precisely the point at which the carriage pusher lugs **40** come up to the level of the top of the slats. At this point a sheet is placed on the table in the manner shown in Fig. 21 with the rearward edge just contacting the carriage pusher lugs **40**. Nuts **400** on chain drive sprocket **86** are loosened to release the drive sprocket from the gear **82** which drives it. Using a spanner wrench **402** the chain **34** is moved until the lug pushers **36** just touch the rearward edge of the sheet **201**. The nuts **400** are then tightened to fix the position of the sprocket **86** with respect to its driving gear **82**.

These operations having been performed for both sides of the machine, the machine is ready for operation.

Operation

After the machine has been set up to feed sheets of the predetermined size, the machine is ready for operation. The sheets are fed from the Dexter feeder or the like onto belts **32** where they are fed toward the decorating press at a speed of 43 inches per revolution of the press cylinder, the surface speed of the printing cylinders in this exemplary movement being 44 inches per revolution of the press cylinder. The belts deliver the sheets over the cylindrical wafer magnets **60** which are moving at a surface speed of approximately 35 inches per revolution of the press cylinder. The pusher lugs **36** on conveyor chain **34** are moving at approximately 40 inches per sheet and catch up to the sheets and engage the rear edges thereof.

Farther down the feed table toward the printing cylinder, the lugs **40** on the reciprocating carriage are cammed up through the operation of the chain roller **122** on the arm **130** of the carriage and begin their forward stroke at a speed of 44 inches per revolution of the press cylinder. This linear speed exceeding that of the lugs **36** on the conveyor chain, the pusher lugs **40** on the reciprocating carriage catch up to the rear edge of each sheet and contniue its movement toward the press cylinder. In the final three inches of movement toward the press cylinder chopped pinion gear **144** engages the rack **148** on the reciprocating carriage and drives the reciprocating carriage forward to cause the sheets to enter the normal grippers on the printing cylinder in substantially perfect register. While the sheets are moving forward as above described, they are guided for side register by the preliminary guide members **42** and **46**. In the final few inches of travel, the leaf spring cams **252** cause arms **56** on the side register mechanisms to engage the side edges of the sheets to hold them in precise side register while the

carriage moves the sheets into the printing cylinder. At this point the grippers on the press cylinders close and take control of the sheet.

In a general manner, while there has been disclosed in the above description, what is deemed to be the most practical and effiecient embodiment of the invention, it should be well understood that the invention is not limited to such embodiment as there might be changes made in the arrangement, disposition and form of the parts without departing from the principle of the present invention as comprehended within the scope of the accompanying claims.

What is claimed is:

1. A mechanism for feeding work into a printer comprising, a support, a carriage mounted on said support for longitudinal movement, a work engaging abutment on said carriage, first drive means including an endless chain connected to said carriage to reciprocate said carriage on said support, means separate from said chain for positively driving said carriage for the end portion of the feeding stroke of said carriage, a cam surface mounted on said support, a side register pivoted on said carriage, and a follower on said register engaging said cam surface to move said register into engagement with said work during said end portion of said feeding stroke.

2. A mechanism for feeding work into a printer comprising, a support, a carriage mounted on said support for longitudinal movement, a work engaging abutment movably mounted on said carriage, drive means including spaced sprockets and an endless chain connected to said carriage to reciprocate said carriage on said support, a drive roller on said chain, a first plate depending from said carriage and having a first elongated slot engaged by said roller, a second plate pivoted to said carriage at a point longitudinally spaced from said first slot, said second plate having a second elongated slot engaged by said drive abutment, and linkage connecting said second plate to said work engaging abutment, whereby movement of said drive roller from one side of a sprocket to the other side of said sprocket will move said work engaging abutment.

3. A mechanism for feeding sheets from a preliminary feeder or the like into a rotary printing cylinder comprising; two spaced generally parallel supports each having mounted thereon: chain and lug pusher drive means for bringing said sheets almost up to the peripheral speed of said cylinder, a reciprocable carriage for bringing the sheet speed up to said cylinder peripheral speed, gear and rack means for positively driving said carriage for the last portion of its stroke toward said feeder; and means for moving said supports toward and away from each other to accommodate varying width sheets.

4. A mechanism for feeding metallic sheets from a preliminary feeder or the like into a rotary printing cylinder comprising, a support, magnets for slowing the sheets from a preliminary feeder, drive means for bringing said sheets almost up to approximately the peripheral speed of said sprinter, a chain driven carriage for bringing the sheet speed up to said printer surface speed, and gear and rack means for positively driving said carriage for the last portion of its stroke toward said feeder and means interconnecting said gear and rack means and said printing cylinder.

5. A mechanism for feeding sheets into a printing cylinder comprising, a frame for supporting said sheets, at least one reciprocating carriage having a sheet engaging portion for pushing said sheets into said cylinder, gear means connecting said printing cylinder to said carriage to provide a direct gear connected drive of said carriage during at least the last portion of its stroke toward said printing cylinder, at least one side register arm mounted on said carriage, means moving said arm into engagement with said sheet during at least the last portion of the direct gear drive portion of said carriage stroke, whereby said arms and sheet engaging portion lock said sheet to said carriage for positive gear drive into said cylinder.

6. A mechanism for feeding sheets into a printing cylinder comprising, a frame for supporting said sheets, two reciprocating carriages each having a sheet engaging portion for pushing said sheets into said cylinder, gear means connecting said printing cylinder to said carriages to provide a direct gear connected drive of said carriages during at least the last portion of their stroke toward said printing cylinder, a first side register arm movably mounted on one carriage, a second side register arm movably mounted on the other carriage, cam means on either side of said support cooperating with said arms to move said arms into engagement with the sides of said sheets only when said carriage is in its gear connected relation to said cylinder.

7. A mechanism for feeding sheets from a preliminary feeder into a rotary printer at a controlled final speed comprising a support having a feed path extending across the support in one direction, means for feeding sheets to said support at a first end of said feed path, means on said support adjacent the first end of said feed path for moving said sheets along said path at a controlled rate of speed slower than the final feed speed, a reciprocating carriage conveyor mounted on said support at the other end of said feed path, a first drive means for reciprocating said carriage and advancing said sheet at a second speed slower than said final speed, and faster than said second speed, and a second drive means comprising a rack on said carriage and a pinion meshing with said rack and driven by said printer for advancing said carriage at said final speed, and means for disconnecting said pinion from said rack on the return stroke of said carriage.

8. A mechanism for feeding sheets from a preliminary feeder into a rotary printer at a controlled final speed comprising a support having a feed path extending across the support in one direction, means for feeding sheets to said support at a first end of said feed path—magnets for slowing the sheets from the preliminary feeder—a reciprocating carriage conveyor mounted on said support at the other end of said feed path, a first drive means for reciprocating said carriage and advancing said sheet at a second speed slower than said final speed, and faster than said second speed, and a second drive means for advancing said carriage at said final speed, final sheet guide means effective during the period of said final speed mounted on both sides of and near said other end of said feed path adapted to move toward and away from each other to accommodate varying width sheets.

9. A mechanism for feeding work into a printer comprising, a support, at least one carriage mounted on said support for longitudinal movement, a work engaging abutment on said carriage, a first drive means connected to said carriage to reciprocate said carriage on said support throughout the majority of its length of travel, a second drive means comprising a rack on said carriage, and a pinion meshing with said rack and driven by said printer for positively driving said carriage for a small portion of the carriage stroke nearest said printer, said pinion having teeth on only a portion of its circumference to permit said rack to pass said pinion on its reverse stroke.

10. A mechanism for feeding work into a printer comprising, a horizontal support for said work, a first means for pushing said work on said support into said printer, preliminary side register means at either side of said support and remote from said printer, said preliminary side register means including a fixed abutment along one side of said support and a resilient abutment at the other side of said support to urge said sheets against said fixed abutment, and final side register means, operable by the movement of said first means, for positively holding said sheet in proper side register as it moves into said printer.

11. A mechanism for feeding metallic sheets along a path of travel from a preliminary feeder into a rotary printing cylinder, comprising in combination, a support, a drive means for moving said sheets horizontally on said support through a first section of said path of travel at less than the peripheral speed of said printing cylinder, feed means for receiving said sheets from said drive means and moving said sheets through a second section of said path of travel into engagement with said printer at the peripheral speed of said cylinder, a pair of opposing grippers, means urging said grippers toward each other and engaging side edges of said sheets therebetween during said second section of said path of travel, and means coordinating said drive means, said feed means and said grippers with said printer cylinder for synchronized operation.

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