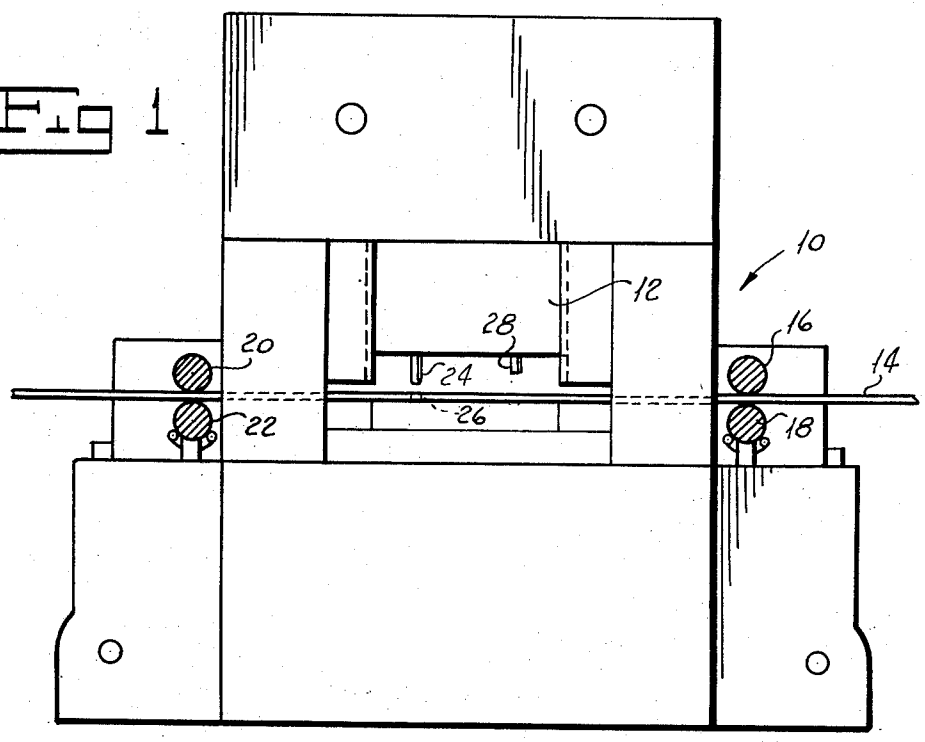
Aug. 26, 1958 J. C. DANLY ET AL 2,849,230

HYDRAULICALLY CLAMPED STOCK FEED ASSEMBLY FOR POWER PRESSES

Filed July 19, 1956 5 Sheets-Sheet 1

Fig 1



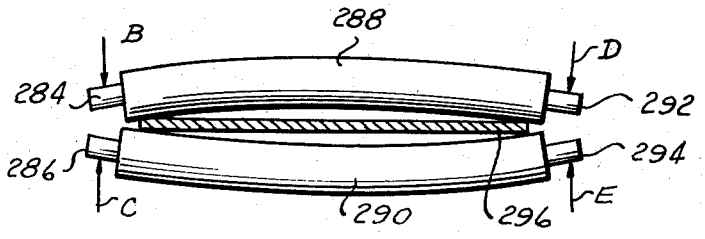


Fig 2

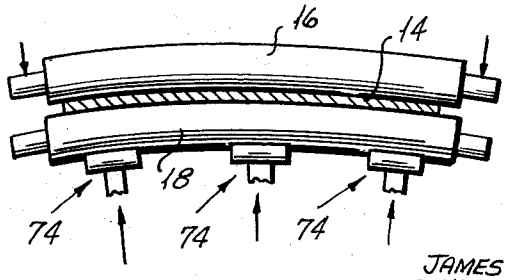


Fig 3

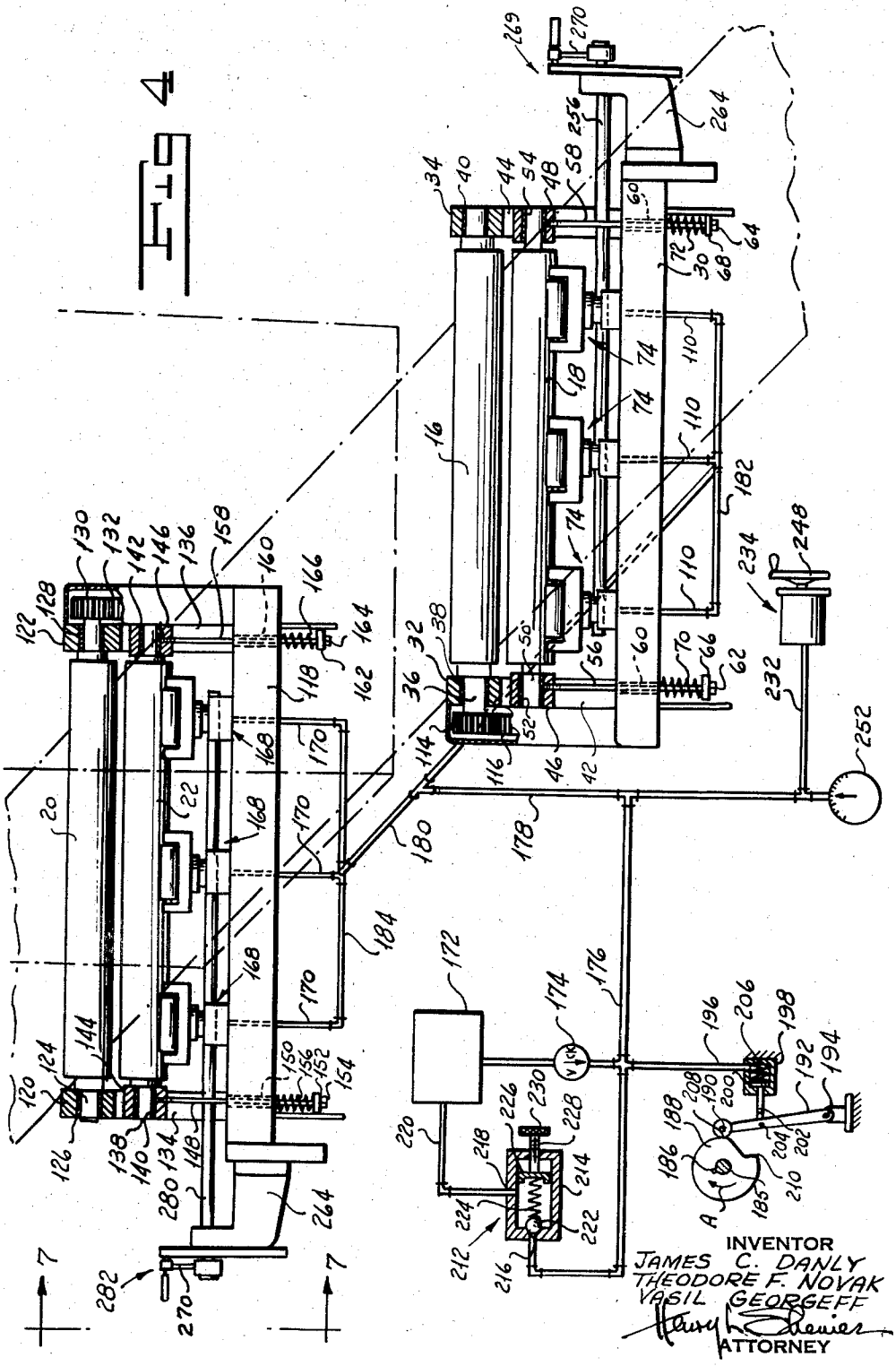
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HYDRAULICALLY CLAMPED STOCK FEED ASSEMBLY FOR POWER PRESSES

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FIG. 4



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HYDRAULICALLY CLAMPED STOCK FEED ASSEMBLY FOR POWER PRESSES

Filed July 19, 1956 5 Sheets-Sheet 3

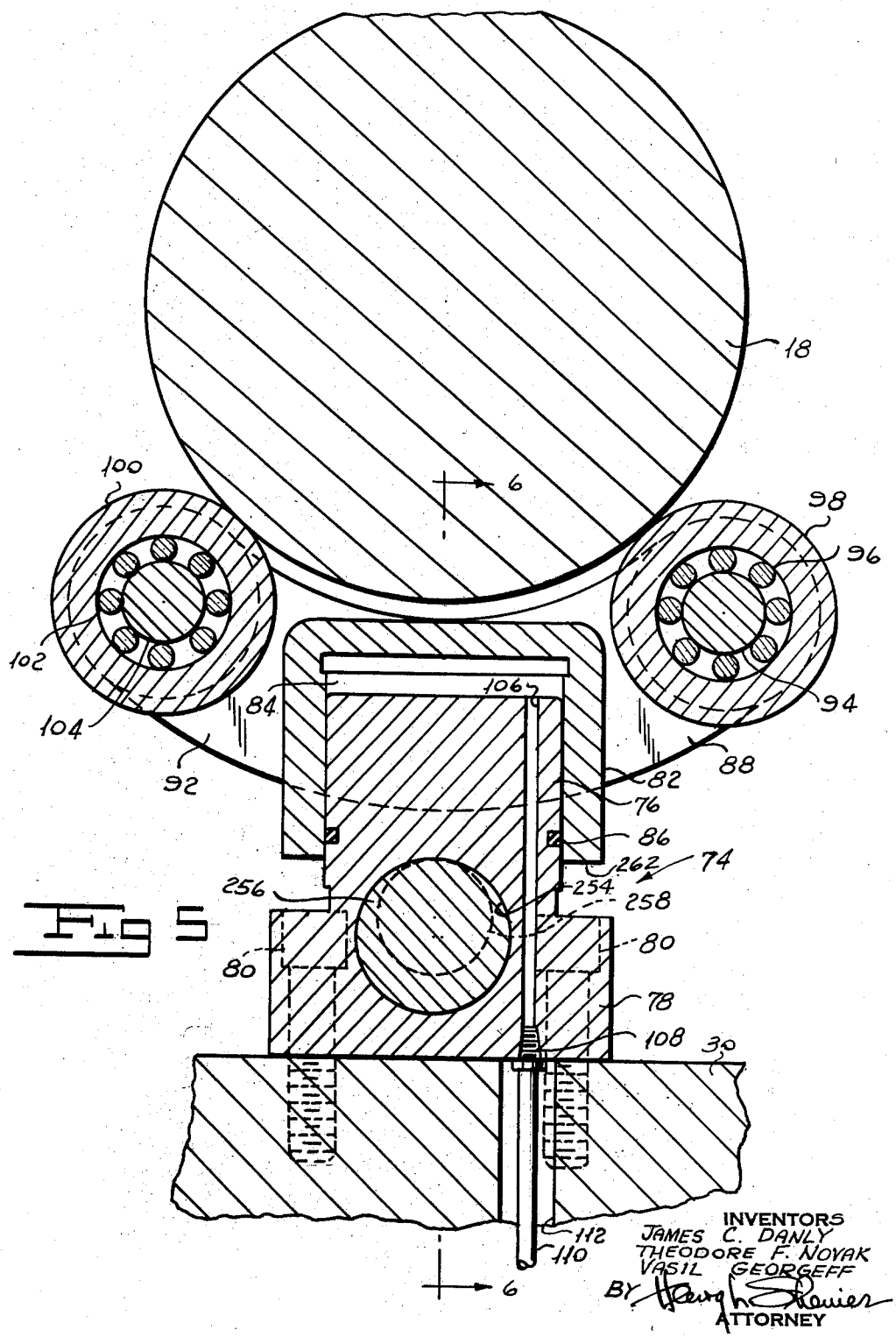


FIG 5

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HYDRAULICALLY CLAMPED STOCK FEED ASSEMBLY FOR POWER PRESSES

Filed July 19, 1956 5 Sheets-Sheet 4

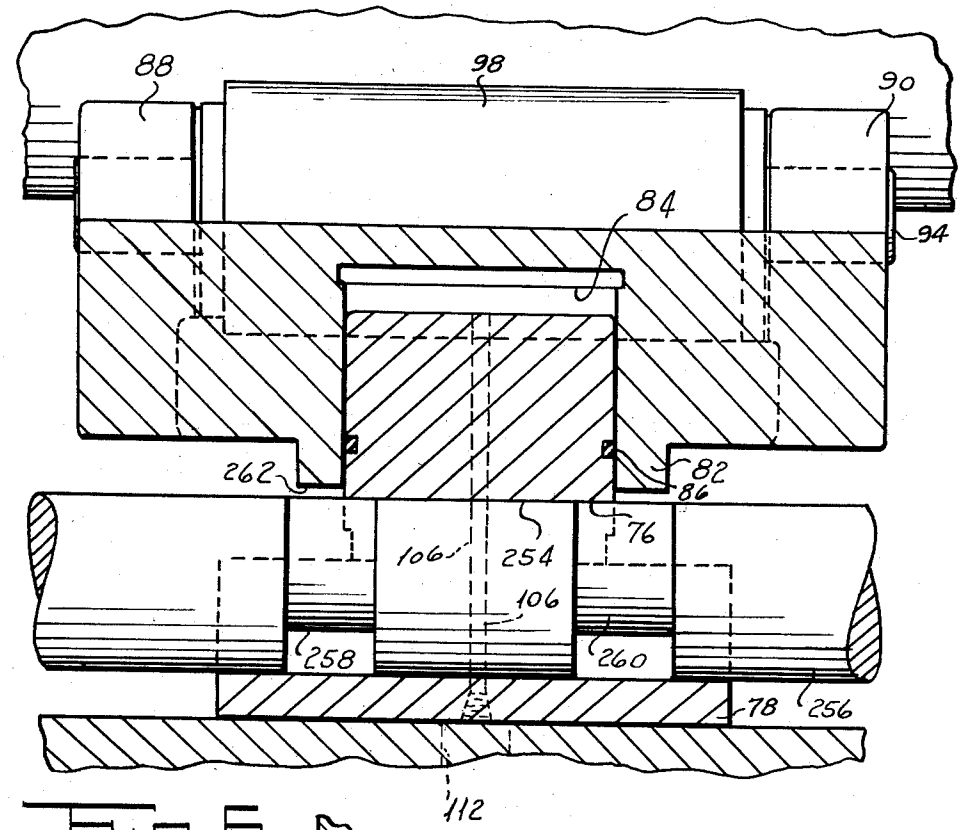


Fig 6

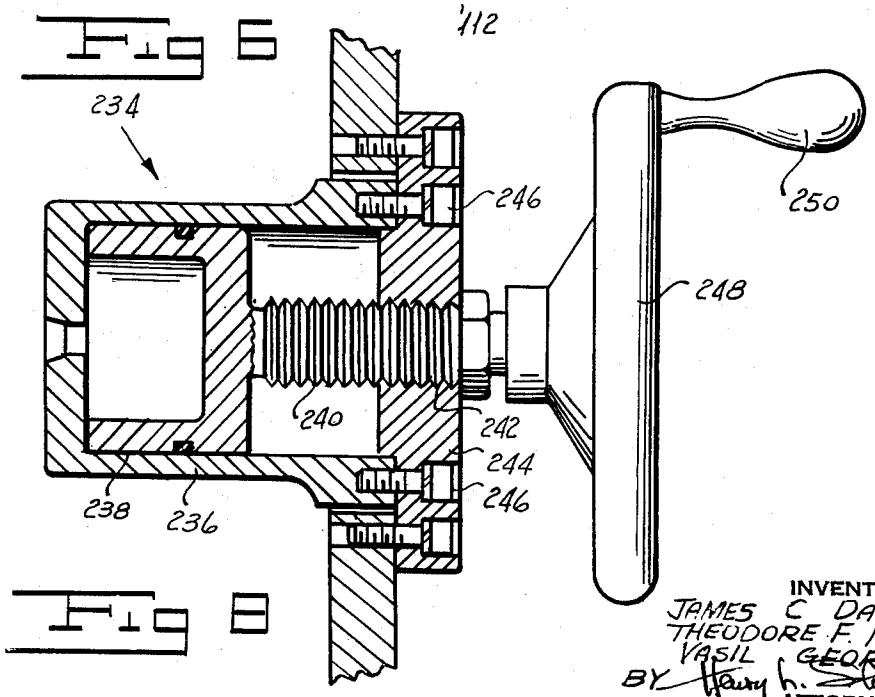


Fig 8

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HYDRAULICALLY CLAMPED STOCK FEED ASSEMBLY FOR POWER PRESSES

Filed July 19, 1956 5 Sheets-Sheet 5

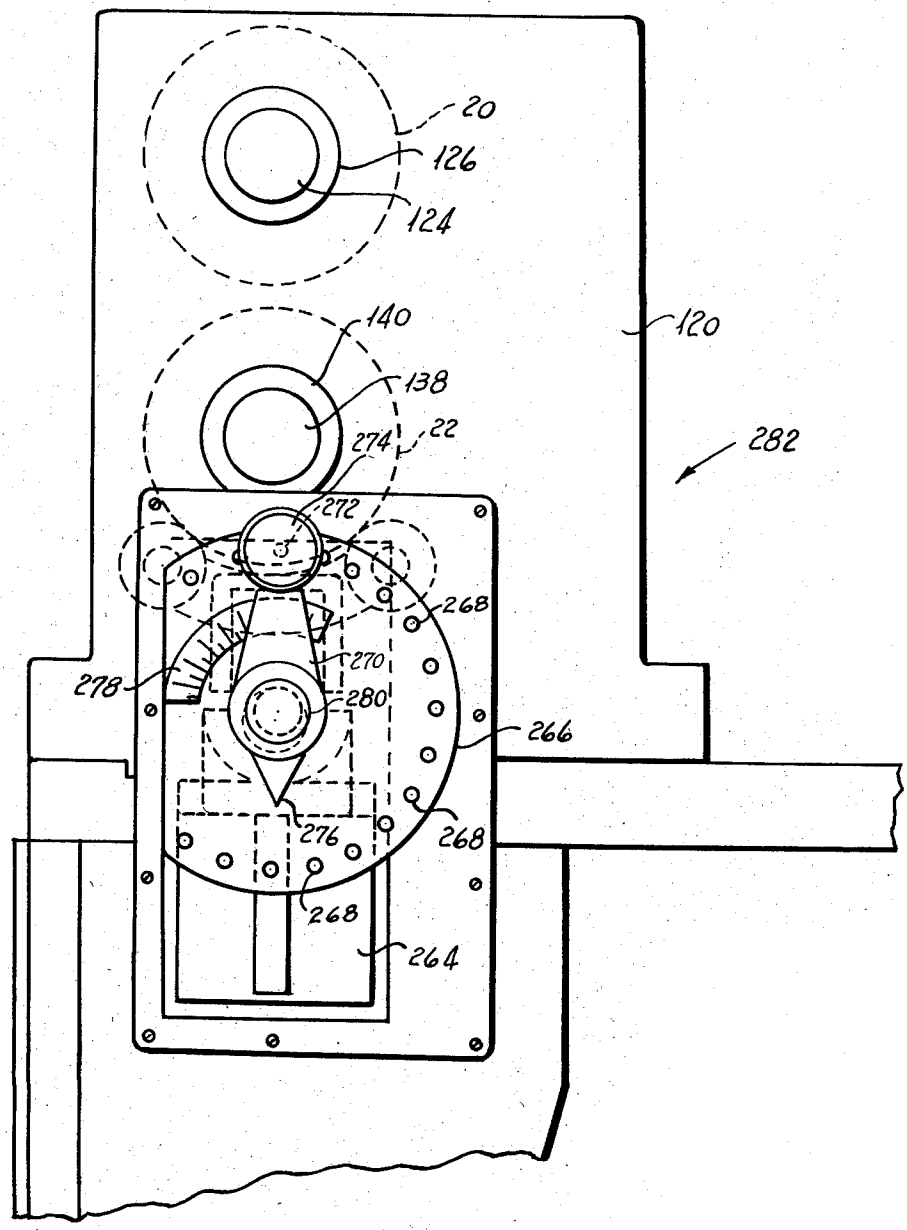


Fig 7

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United States Patent Office 2,849,230 Patented Aug. 26, 1958

2,849,230

HYDRAULICALLY CLAMPED STOCK FEED ASSEMBLY FOR POWER PRESSES

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Application July 19, 1956, Serial No. 598,805

11 Claims. (Cl. 271—2.4)

Our invention relates to an hydraulically clamped stock feed assembly for power presses and more particularly to an hydraulically clamped stock feed assembly for power presses which overcomes the disadvantages of power press stock feeds of the prior art.

In the prior art respective pairs of front and back feed rolls are employed to feed continuous sheet stock through a power press which is to perform operations on the stock. The upper feed roll of each pair is spring loaded to clamp the sheet between the upper and lower rolls during a feeding operation. With the sheet clamped, the feed rolls are driven to advance the sheet along the press bed to the approximate position it should occupy during a press operation. After the sheet has thus been approximately positioned, the upper rolls of the front and back feed rolls are simultaneously moved away from the lower rolls against the action of the spring loading means to release the sheet. As the press slide moves toward the sheet to perform an operation, a pilot pin carried by the slide engages a hole formed in the sheet during a preceding operation to shift the sheet to the precise position it is to occupy during the press operation.

In the stock feed assemblies of the prior art, a complicated and cumbersome mechanical linkage extending from front to rear of the press simultaneously lifts the upper rolls against the action of the heavy loading springs to release the sheet to permit the pilot pin to position the stock exactly. In very large presses the difficulty of mechanically linking the lifting mechanisms for both the front and back feed rolls adds appreciably to the cost of the press.

The spring loading mechanisms of the prior art act on the respective ends of the roll shafts to draw the upper shaft ends toward the lower shaft ends. Owing to the large loading forces, the upper and lower rolls bow in opposite directions. As a result of this bowing, the feeding force acts only along the edges of the sheet. With this arrangement the feed rolls wear rapidly where they engage the sheet edges and a firm feeding force is not applied to the sheet.

We have invented an hydraulically clamped stock feed assembly for power presses which overcomes the disadvantages of stock feed assemblies of the prior art. In our assembly, a simple hydraulic system links mechanical means for simultaneously clamping a sheet of stock between the feed rolls. We avoid employing the expensive and cumbersome mechanical linkage used in the prior art. Our clamping means acts on the rolls to ensure that a sheet being fed is clamped across its entire width, irrespective of the magnitude of the clamping force employed. In our system we avoid the necessity of lifting a roller against heavy loading springs.

One object of our invention is to provide an hydraulically clamped stock feed assembly for power presses which overcomes the disadvantages of stock feed assemblies of the prior art.

Another object of our invention is to provide an hydraulically clamped stock feed assembly for power presses

which avoids the use of the cumbersome mechanical lifting systems employed in feed assemblies of the prior art.

A further object of our invention is to provide an hydraulically clamped stock feed assembly for power presses which ensures that a sheet of stock being fed is gripped across its entire width between feed rolls during a feeding operation.

A still further object of our invention is to provide an hydraulically clamped stock feed assembly for power presses in which the feed rolls are released without the necessity of acting against a heavy loading force.

Still another object of our invention is to provide an hydraulically clamped feed assembly for power presses which may readily be adjusted to accommodate various thickness of stock.

Other and further objects of our invention will appear from the following description.

In general our invention contemplates the provision of a power press having a frame and respective pairs of front and back feed rolls, the upper roll of each of which pairs is rotatably mounted in a fixed position on the press frame. Springs normally urge the lower roll of each pair to move in a direction away from the upper roll. Hydraulic lifters directly engage the lower rolls to urge them toward their associated upper rolls against the action of gravity and the springs. We provide a common hydraulic system for actuating our lifters. The hydraulic system includes means for regulating the pressure with which the lifters move the lower rolls toward the upper rolls. Means responsive to the press operation releases the lower rolls to permit the positioning of the sheet by the press slide pilot pin. Our assembly includes adjustable means for determining the limit of movement of the lower rolls away from the upper rolls. This means permits our device to accommodate various thicknesses of stock without adding to the time required for the lifters to operate.

In the accompanying drawings which form part of the instant specification and which are to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views:

Figure 1 is a schematic view of a power press employing our hydraulically clamped stock feed assembly.

Figure 2 is a schematic view showing the action of the roll loading means employed in stock feed assemblies of the prior art.

Figure 3 is a schematic view of a pair of feed rolls of our hydraulically clamped stock feed assembly for power presses showing the clamping action of a pair of feed rolls.

Figure 4 is a schematic view of our hydraulically clamped stock feed assembly for power presses.

Figure 5 is a sectional view of a lower feed roll and one of our lifters.

Figure 6 is a sectional view of one of our hydraulic lifters taken along the line **6—6** of Figure 5.

Figure 7 is an end elevation of the actuating means for the stock thickness adjustment of our hydraulically clamped stock feed assembly for power presses taken along the line **7—7** of Figure 4 and drawn on an enlarged scale.

Figure 8 is a sectional view of a bleed-off valve employed in our hydraulic system to permit opening and closing of the feed rolls of our hydraulically clamped stock feed assembly for power presses at any point in the press operation.

Referring now more particularly to Figure 1 of the drawings, a power press indicated generally by the reference character **10**, with which our stock feed assembly is used, includes an inner slide **12** adapted to be vertically reciprocated on the press frame in a manner known

to the art to perform operations on a sheet 14 of stock being fed through the press. Sheet 14 passes between a pair of respective upper and lower front feed rolls 16 and 18 and a pair of respective upper and lower rear feed rolls 20 and 22. When the sheet 14 is to be fed, the respective pairs of rolls 16 and 18 and 20 and 22 are moved to clamp sheet 14 between the upper and lower rolls. This is accomplished in a manner to be described hereinafter. The feed rolls 16, 18, 20 and 22 are driven to locate sheet 14 in the approximate position it should occupy during an operation of the press. After the sheet is thus approximately located, the feed rolls are released in a manner to be described and slide 12 moves downward, as viewed in Figure 1, toward the work. In the course of this movement, a pilot pin 24 carried by slide 12 engages a hole 26 formed in the sheet during a previous operation of the press by a punch or the like 28. It will be seen that pilot pin 24 is longer than the punch 28, with the result that it engages hole 26 accurately to position sheet 14 before the punch 28, carried by slide 12, engages the work. It will be appreciated that both the front rolls 16 and 18 and the rear rolls 20 and 22 must be released together if pilot pin 24 is to position sheet 14 accurately.

Referring now to Figure 4, our hydraulically clamped stock feed assembly includes a stationary front frame member 30 provided with a pair of spaced upright bearing supports 32 and 34. We rotatably mount the shaft 36 of the front upper feed roll 16 in bushings 38 and 40 carried by the respective supports 32 and 34. Respective guideways 42 and 44 formed in the supports 32 and 34 guide bearing blocks 46 and 48. We rotatably mount the shaft 50 of the lower front feed roll 18 in respective bushings 52 and 54 carried by blocks 46 and 48. We thread repective pairs of elongated studs 56 and 58 into the undersides of blocks 46 and 48. These studs extend through suitable openings 60 in frame member 30. Respective pairs of nuts 62 and 64 on the ends of the pairs of studs 56 and 58 retain respective washers 66 and 68 on the studs. Respective pairs of springs 70 and 72 on the shanks of the pairs of studs 56 and 58 bear between washers 66 and washers 68 and the underside of member 30. From the foregoing, it will be apparent that the springs 70 and 72 act to move the lower roll 18 away from the upper roll 16.

We provide hydraulic lifters, indicated generally by the reference character 74, for moving the lower roll 18 upwardly against the action of springs 70 and 72 to clamp a sheet of work being fed between rolls 16 and 18.

Referring now to Figures 4 to 6, each of these lifters 74 includes a piston 76, the base 78 of which is secured to the upper surface of member 30 by means such as bolts 80. A respective cylinder 82 cooperates with each of the pistons 76 to provide a space 84 into which fluid under pressure may be admitted to cause relative movement between the piston 76 and its associated cylinder 82. A seal 86 prevents escape of fluid from the chamber 84. We form each of the cylinders 82 with a first pair of spaced arms 88 and 90 extending perpendicularly in one direction from the axis of the lower feed roll 18. A second pair of spaced arms, one arm 92 of which is shown, is formed on each of the cylinders 82. The pair of arms including the arm 92 extends in the opposite direction from the pair of arms 88 and 90. A shaft 94 is supported between the arms 88 and 90. Bearing elements 96 rotatably mount a roller 98 on shaft 94. We mount a second roller 100 on bearing elements 102 disposed between roller 100 and a shaft 104 extending between the pair of arms including arm 92. The disposition of the respective rollers 98 and 100 is such that these rollers engage the lower feed roll 18 of the front feed rolls. Springs 70 and 72 normally urge lower roll 18 to seat it on the respective rollers 98 and 100 carried by the hydraulic lifters 74.

We form each of the pistons 76 with a bore 106 through which fluid under pressure is admitted to the corresponding chamber 84. A plurality of fittings 108 connect respective fluid feed pipes 110 to the bores 106. Pipes 110 pass through bores 112 in frame member 30. When fluid under pressure is supplied, in a manner to be described, to the pipes 110, it passes through the pipes and through the bores 106 into the chambers 84 to move cylinders 82 and the lower feed roll 18 supported by the cylinders upwardly against the action of springs 70 and 72 to clamp a sheet 14 of material being fed between the lower roll 18 and the upper roll 16.

Referring again to Figure 4, shaft 36 carries for rotation with it a gear 114 which is driven by a gear 116 to advance the sheet being fed. Gear 116 is intermittently driven in a manner known to the art to feed the sheet 14 a predetermined distance into the press.

The rear feed roll support frame includes a member 118 and a pair of respective upright supports 120 and 122. We rotatably mount the shaft 124 of the rear upper feed roll 20 in respective bushings 126 and 128 carried in supports 120 and 122. A gear 130 carried by shaft 124 for rotation with it is driven by a gear 132 to drive shaft 124 in synchronism with shaft 36, in a manner known to the art, to advance a sheet being fed.

We form the supports 120 and 122 with respective slots or guideways 134 and 136. We rotatably mount the shaft 138 of the lower feed roll 22 in bushings 140 and 142 carried by support blocks 144 and 146 disposed in guideways 134 and 136. We thread a first pair of respective studs 148 in the underside of block 144. Studs 148 pass through openings 150 in member 118. Washers 152 are retained on studs 148 by nuts 154. Springs 156 carried by the shanks of studs 148 bear between the washers 152 and the underside of member 118.

We thread a second pair of respective studs 158 into the underside of block 146. Studs 158 pass through openings 160 in member 118. Washers 162 held on studs 158 by nuts 164 retain springs 166 on the shanks of the studs. Springs 166 bear between washers 162 and the underside of member 118. From the foregoing it will be seen that springs 156 and 166 normally urge the lower roll 22 to move in a direction away from the upper roll 20.

Our rear feed roll assembly includes a plurality of hydraulic lifters indicated generally by the reference character 168. These lifters 168 are identical with the lifters 74 and are bolted or are secured by other convenient means to the member 118. Respective fluid feed pipes 170 are arranged to supply fluid under pressure to the chambers of the lifters 168. The rollers 98 and 100 of the lifters 168 are disposed to support the lower feed roll 22 of the rear feed rolls. When fluid under pressure is supplied, in a manner to be described, to the pipes 170, lifters 168 move the roll 22 against the action of springs 156 and 166 upwardly toward roll 20 to clamp a sheet 14 being fed between the rolls 22 and 20.

Still referring to Figure 4, our fluid pressure system includes a reservoir 172 which contains a supply of a suitable fluid, such as oil or the like. A check valve 174 permits fluid to flow from the tank or reservoir 172 to a fluid supply pipe 176. A pipe 178 connects supply pipe 176 to a pipe 180 which conveys fluid to respective manifold pipes 182 and 184 which supply fluid to the pipes 110 connected to lifters 74 and to the pipes 170 connected to lifters 168. We provide means for displacing the fluid in the system in synchronism with operation of the press to move lower rolls 18 and 22 simultaneously to clamping position when the sheet 14 being fed is to be advanced, and to release the lower rolls when a press operation is to be performed. A shaft 185 carried a cam 188 for rotation with it by means of a key 186. A cam follower 190 carried by the free end of an arm 192 engages the surface of cam 188. A pin, or the like, 194 pivotally supports arm 192 on the press frame. A pipe 196 connects the pipe 176 to a stationary cylinder 198. A piston

200 disposed within cylinder 198 has a rod 202 which pivotally engages a pin 204 on the arm 192. A spring 206 in cylinder 198 normally urges piston 200 to the left, as viewed in Figure 4, to urge follower 190 into engagement with the surface of cam 188. When, under the action of the press drive, shaft 185 rotates in the direction of arrow A, a high point 208 on cam 188 pivots arm 192 in a clockwise direction, as viewed in Figure 4, to move piston 200 to the right against the action of spring 206. This action displaces the fluid in the system to drive the fluid, such as oil, into the chambers 84 of all of the lifters 74 and 168. Under the influence of this fluid all the cylinders 82 move upwardly to lift lower rolls 18 and 22 to clamp the sheet 14 between the upper and lower rolls of the front and rear feed rolls. Gears 114 and 130 are driven to advance the sheet. During the period of advance of the sheet, cam 188 continues to rotate and is so shaped that it continues to depress piston 200 beyond the position to which it is moved when the high point 208 of cam 188 engages follower 190, thus providing an additional supply of fluid to replace losses due to leakage.

It is a recognized fact in the art that no hydraulic system is completely leakproof. Some fluid will escape from our system during the feeding operation. In order to maintain the clamping pressure of our feed rolls substantially constant during a feeding operation, we must replace or otherwise account for fluid which escapes. We form the segment of cam 188 between the high point 208 and the end 210 of the high surface, with a gradually increasing radius. Thus, as the cam rotates in the direction of the arrow A, piston 200 is gradually moved further to the right to account for oil which leaks from the system and to maintain the clamping pressure of the feed rolls.

When cam 188 has rotated to a point where the end 210 of the high surface passes follower 190, spring 206 moves piston 200 to the left, as viewed in Figure 4, to relieve the hydraulic pressure and to permit springs 70 and 72 and springs 156 and 166 to move the lower rolls 18 and 22 away from the upper rolls to unclamp the sheet of stock being fed. In this condition of the system, fluid may flow from tank 172 through check valve 174 into the system to replace oil lost by leakage during the feeding operation just completed.

In order that the clamping pressure shall not exceed a predetermined desired pressure, we connect an adjustable relief valve indicated generally by the reference character 212 between pipe 176 and tank 172. We connect an opening 216 in the end of housing 214 of valve 212 to pipe 176. A pipe 220 connects an opening 218 in the housing side to tank 172. Opening 216 is formed to provide a seat for a ball 222 disposed within housing 214. A spring 224 bears between the ball 222 and an adjusting member 226. Member 226 includes a shaft 228 threaded in the end of housing 214 remote from opening 216. The pressure with which spring 224 retains ball 222 in its seat may be adjusted by turning a knurled knob 230 formed on shaft 228. This pressure is adjusted to a predetermined pressure. If the pressure within the system exceeds this predetermined pressure, oil moves ball 222 away from its seat against the action of spring 224 and flows back into tank 172 through pipe 220. It will be appreciated that this adjustable relief valve affords a means for regulating the pressure in the system to ensure that sheets of stock of different thicknesses are clamped with the same pressure.

From the foregoing, it will be seen that a sheet 14 being fed is clamped during the period of time when roller 190 rides on the high portion of the surface of cam 188. The sheet is released when the follower 190 rides on the low portion of this surface. We provide means for manually releasing the sheet 14 by relieving the clamping pressure of the lower rolls 18 and 22.

Referring to Figures 4 and 8, a pipe 232 connects the pipe 178 to a manually operable bleed-off valve indicated generally by the reference character 234. Pipe 232 conducts fluid under pressure to the interior of the housing 236 of valve 234. A piston 238 disposed within housing 236 is formed with a threaded rod 240 disposed in a threaded bore 242 in a plate 244 secured over the open end of housing 236 by bolts 246. A hand wheel 248 formed with a knob 250 provides a means by which rod 240 may be turned to move piston 238 within housing 236. In normal operation of the system, piston 238 is in its extreme left-hand position within housing 236, as viewed in Figure 8. When follower 190 is on the high portion of cam 188 so that rolls 18 and 22 are in clamping position and it is desired to release the sheet 14, wheel 248 is turned to shift piston 238 to the right, as viewed in Figure 8, to permit more fluid to flow into housing 236. When this is done, the springs 70, 72, 156, and 166 move rolls 18 and 22 away from the rolls 16 and 20 to force fluid into housing 236. The system may again be rendered operative by turning wheel 248 to move piston 238 to the left, as viewed in Figure 8, to return the oil in housing 236 to the system. For convenience we connect a pressure gauge 252 to pipe 178 to indicate the pressure in the system.

Referring again to Figures 4 to 7, each of the pistons 76 of the lifters 74 is formed with a bore 254 through which a shaft 256 passes. We form each of the shaft portions at a lifter 74 with a pair of spaced eccentrics 258 and 260. These eccentrics 258 and 260 determine the bottom limit position of the cylinders 82. As has been explained hereinabove, when the hydraulic system is in a condition in which fluid pressure is permitted to flow out of the chambers 84 of the lifters 74, springs 70 and 72 move roll 18 and the roll supporting cylinders 82 downwardly. The arrangement of our lifters is such that the bottom position of each of the cylinders 82 is determined by the eccentrics 258 and 260. As can be seen by reference to Figure 6, when fluid is permitted to flow out of a chamber 84 of a lifter 74, the cylinder 82 moves downwardly until its underside 262 engages the eccentrics 258 and 260. As shaft 256 is rotated about its axis, eccentrics 258 and 260 rotate about this axis to change the bottom limit position of the cylinder 82 of a lifter 74.

We provide means for positioning shaft 256 about its axis to move the eccentrics 258 and 260 to regulate the bottom limit position of cylinders 82. In this manner we are able to maintain constant the length of the working stroke of the cylinders for sheets of stock of various thicknesses. We thus eliminate waste motion which otherwise would exist where thin sheets were being fed. The rear feed roll assembly, including feed rolls 20 and 22, includes a shaft 280 similar to the shaft 256 and formed with eccentric portions 258 and 260 for determining the bottom limit position of the rear lower feed roll 22. We provide respective assemblies indicated generally by the reference characters 269 and 282 for positioning shafts 256 and 280 to determine the bottom limit positions of rolls 18 and 22. Referring to Figure 7, we have shown the details of the assembly 282. The assembly 269 is similar to the assembly 282, and so will not be described in detail.

Referring to Figures 4 and 7, shaft 280 extends outboard through a bracket 264 carried by frame member 118. Bracket 264 carries a plate 266 provided with a plurality of locating holes 268 arranged in a circle about shaft 280. The outboard end of shaft 280 carries for rotation with it a crank 270, one end of which supports a spring loaded locating pin 272 formed with a knob 274. Eccentrics 258 and 260 may be positioned as desired by lifting the locating pin 272 out of a hole 268 and rotating crank 270 to the proper position and permitting the pin 272 to drop into the hole 268 in that position. For convenience in determining the position of the eccentrics, crank 270 is provided with a

pointer 276 which cooperates with a scale 278 calibrated in terms of stock thickness, or the like.

In operation of our hydraulically clamped stock feed assembly, where a new sheet of stock is to be fed to the press, the cranks or detent arms 270 of the respective assemblies 269 and 282 first are rotated to a position corresponding to the full open position of the front feed rolls 16 and 18 and of the rear feed rolls 20 and 22. It will be understood that the valve 234 is in its full open position to bleed off oil from the system. Springs 70 and 72 and 156 and 166 urge the respective lower feed rolls 18 and 22 to their furthest position away from rolls 16 and 20. The cylinders 82 of the respective units 74 and 169 rest on eccentrics 258 and 260 which are then in their lowest position, owing to the fact that the arms 270 are in the full open position. The sheet of stock is then introduced between the front feed rolls 16 and 18. To initiate the feeding action, the valve 234 is closed to return oil to the system to render the system operative. The crank arm 270 of the assembly 269 is rotated to position eccentrics 258 and 260 associated with lifters 74 to determine the bottom limit position of cylinder 82 of these units. This bottom limit position corresponds with the thickness of stock being fed.

After these front feed rolls 16 and 18 have been closed to clamp a sheet of stock between them, the press is run and gear 114 drives upper feed roll 16 or lower feed roll or both to advance the sheet through the press. This feeding motion of the sheet is continued until the sheet of stock enters between the rear feed rolls 20 and 22. Conveniently at this point the press is stopped in a manner known to the art so that rolls 16 and 20 no longer are driven. In order to close the rear feed rolls 20 and 22, the valve 234 first is opened to release the stock from the feed rolls. This permits the sheet being fed to be properly positioned with respect to the rear feed rolls 20 and 22. Valve 234 is again closed and lower feed rolls 18 and 22 move up toward upper feed rolls 16 and 20. It will be remembered that the bottom limit position of roll 18 already has been regulated for the thickness of stock being fed. The arm 270 of the unit 282 is rotated to regulate the bottom limit position of roll 22 in accordance with the thickness of the stock being fed. The sheet of stock is now ready to be operated upon by the press and can be fed automatically by our system through the press.

In normal operation of our system shaft 185 drives cam 188 properly to synchronize the clamping and feed operations of the front and rear feed rolls with the press slide movement. When an operation is to be performed by the press slide, roller 190 engages the low portion of cam 188, with the result that piston 200 occupies its left-hand position as viewed in Figure 4, to permit some of the fluid within the system to enter housing 198. In this condition of the fluid system, rolls 18 and 22 are urged to their bottom limit positions determined by the positions of cranks 270. The sheet being fed is free to be accurately located by the pilot pin 24 engaging in a hole 26 previously formed in the sheet. When the press slide completes its operation, point 208 on cam 188 engages roller 190 to drive piston 200 to the right, as viewed in Figure 4, to displace the fluid in housing 198 into the system. The fluid flows into the chambers 84 of lifters 74 and 168 to raise lower rolls 18 and 22 to clamp the sheet being fed between the front and rear pairs of feed rolls. The feed rolls 16, 18, 20 and 22 are driven to advance the sheet through the press approximately to position it for the next operation of the press slide 12. When the sheet is thus approximately positioned, roller 190 passes point 210 of cam 188 and lower feed rolls 18 and 22 again are spring urged downwardly, as viewed in Figure 4, to force fluid into housing 198. The sheet 14 is again released and may be positioned for the next press operation by pilot pin 24 as slide 12 descends. It will be remembered that cam 188, between points 208 and 210 as the cam travels in the direction of the arrow A, is formed with a gradually increasing radius which accounts for fluid which may lead out of the system. Valve 212 provides a relief for the system in the event pressure exceeds a determined pressure. This valve may be actuated to ensure that the same clamping pressure is exerted on sheets of stock of different thicknesses. As has been explained hereinabove, valve 234 provides a means by which fluid may be bled off from the system to release the sheet at any point in the press operation.

Referring now to Figure 2, the feed roll clamping means of the prior art exerts at corresponding ends of the shafts 284, and 286 of a pair of feed rolls 288 and 290 a pair of opposed forces indicated by arrows B and C. Similar forces indicated by arrows D and E are exerted on the other pair of corresponding ends 292 and 294 of the rolls 288 and 290. As can be seen by reference to the figure, these forces cause the rolls 288 and 290 to bow, with the result that the force with which the rolls grip a sheet 296 of material being fed is exerted only at the edges of the sheet. This requires a heavy clamping force. It renders feeding of the sheet uncertain and causes excessive roll wear at the points where the rolls engage the sheet edges.

Referring to Figure 3, we have shown the action of our hydraulic lifters, such, for example, as the lifters 74, on the front feed rolls 16 and 18. As can be seen by reference to the figure, our lifters, of which we have shown three by way of example, act directly on the surface of the lower roll 18 against the action of the springs 70 which act on the roll ends. While, under the action of our lifters 74, lower roll 18 may bow, upper roll 16 will bow in the same direction, with the result that the rolls engage the sheet 14 being fed across its entire width. This operation overcomes the disadvantage inherent in the oppositely bowing feed roll assemblies of the prior art.

It will be seen that we have accomplished the objects of our invention. We have provided an hydraulically clamped feed roll assembly for power presses which overcomes the disadvantages inherent in the feed roll assemblies of the prior art. Our assembly includes a simple hydraulic system which links the front and rear feed roll assemblies. The clamping means of our system need act only against gravity and relatively light spring pressure. Our system readily accommodates stock sheets of different thicknesses while providing means for clamping all sheets with the same pressure. Our system includes an adjustment for ensuring that time is not wasted in operating our clamping means where thin sheets are being fed. Our clamping means ensures that a sheet of stock being fed is gripped across its entire surface during a feeding operation.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of our claims. It is further obvious that various changes may be made in details within the scope of our claims without departing from the spirit of our invention. It is therefore to be understood that our invention is not to be limited to the specific details shown and described.

Having thus described our invention, what we claim is:

1. In a power press through which a sheet of stock is to be fed, a stock feed assembly including a pair of first feed rolls including an upper roll and a lower roll, means normally urging said upper and lower first feed rolls away from each other, fluid means for moving said upper and lower first feed rolls toward each other against the action of said means normally urging the rolls, a pair of second feed rolls including an upper roll and a lower roll, means normally urging said upper and lower second feed rolls away from each other, fluid means urging said upper and lower second feed rolls toward each other against the action of the means normally urg-

ing the second feed rolls away from each other and a common fluid system for supplying fluid under pressure to said fluid means.

2. A stock feed assembly as in claim 1 in which said fluid system includes a supply of fluid under pressure, means including a first check valve for connecting said supply to said fluid means, means responsive to the operation of said press for displacing the fluid in said system to actuate said fluid means to act against the respective means urging the lower first roll and the lower second roll away from the upper first roll and upper second roll.

3. A stock feed assembly as in claim 1 in which said fluid system includes a supply of fluid, a cam adapted to be driven in synchronism with the operation of the press and means actuated by said cam for displacing fluid from said supply to said fluid means.

4. A stock feed assembly as in claim 1 in which said fluid system includes a supply of fluid, a cam adapted to be driven in synchronism with the operation of said press, and means actuated by said cam for displacing fluid from said supply into said fluid means, said cam having a first portion for actuating said displacing means to supply fluid under pressure to said fluid means, a second portion having a gradually increasing radius in the direction of cam rotation and a third portion permitting fluid to flow from said fluid means.

5. A stock feed assembly as in claim 1 in which said fluid system includes a supply of fluid, means responsive to the press operation for displacing fluid from said supply to said fluid means and a bleed-off valve for relieving the pressure in the system.

6. A stock feed assembly as in claim 1 in which said fluid system includes a reservoir of fluid, a first check valve for supplying fluid from said reservoir to the system and a second adjustable check valve for permitting fluid to flow from said system to the reservoir when the system pressure exceeds a predetermined pressure.

7. In a power press through which a sheet of stock is to be fed, a stock feed assembly including an upper feed roll and a lower feed roll, means normally urging said upper and lower feed rolls away from each other, fluid means for moving said upper and lower feed rolls toward each other against the action of said means normally urging the rolls, a supply of fluid under pressure, means including a first check valve for connecting said supply to said fluid means, and means responsive to the operation of said press for displacing the fluid in said system to actuate said fluid means to act against the means urging the upper and lower feed rolls away from each other.

8. In a power press through which a sheet of stock is to be fed, a feed roll assembly including an upper and a lower feed roll, means mounting said rolls for relative movement toward each other to clamp said sheet, means normally urging said rolls away from each other and fluid means comprising rollers for engaging the surface of the lower roll for acting against said means normally urging said rolls to clamp said sheet.

9. In a power press through which a sheet of stock is to be fed, a feed roll assembly including an upper and a lower feed roll, means mounting said rolls for relative movement toward each other to clamp said sheet, means comprising a spring normally urging said lower roll away from said upper roll and fluid means comprising rollers in engagement with the surface of said lower roll for acting against said spring to clamp said sheet between said rolls.

10. In a power press through which a sheet of stock is to be fed, a feed roll assembly including a frame, an upper feed roll, means rotatably mounting said upper feed roll on said frame, a lower feed roll, means rotatably mounting said lower feed roll on said frame for movement toward and away from said upper feed roll, means including a spring for urging said lower feed roll away from said upper feed roll, fluid means for moving said lower feed roll toward said upper feed roll against the action of said spring and adjustable means for limiting the movement of said lower feed roll away from said upper feed roll.

11. In a power press through which a sheet of stock is to be fed, a feed roll assembly including a frame, an upper feed roll, means rotatably mounting said upper feed roll on said frame, a lower feed roll, means rotatably mounting said lower feed roll on said frame for movement toward and away from said upper feed roll, means including a spring for urging said lower feed roll away from said upper feed roll, a piston carried by said frame, a cylinder to which fluid under pressure may be fed to displace said cylinder with respect to said piston, a shaft formed with an eccentric, said cylinder adapted to engage said eccentric to limit the movement of said lower feed roll away from said upper feed roll and means for rotating said shaft to adjust the bottom limit position of said lower feed roll.

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