

Sept. 1, 1953

J. WYZA

2,650,822

FORMING PRESS AUTOMATIC FEED

Filed Jan. 16, 1948

6 Sheets-Sheet 1

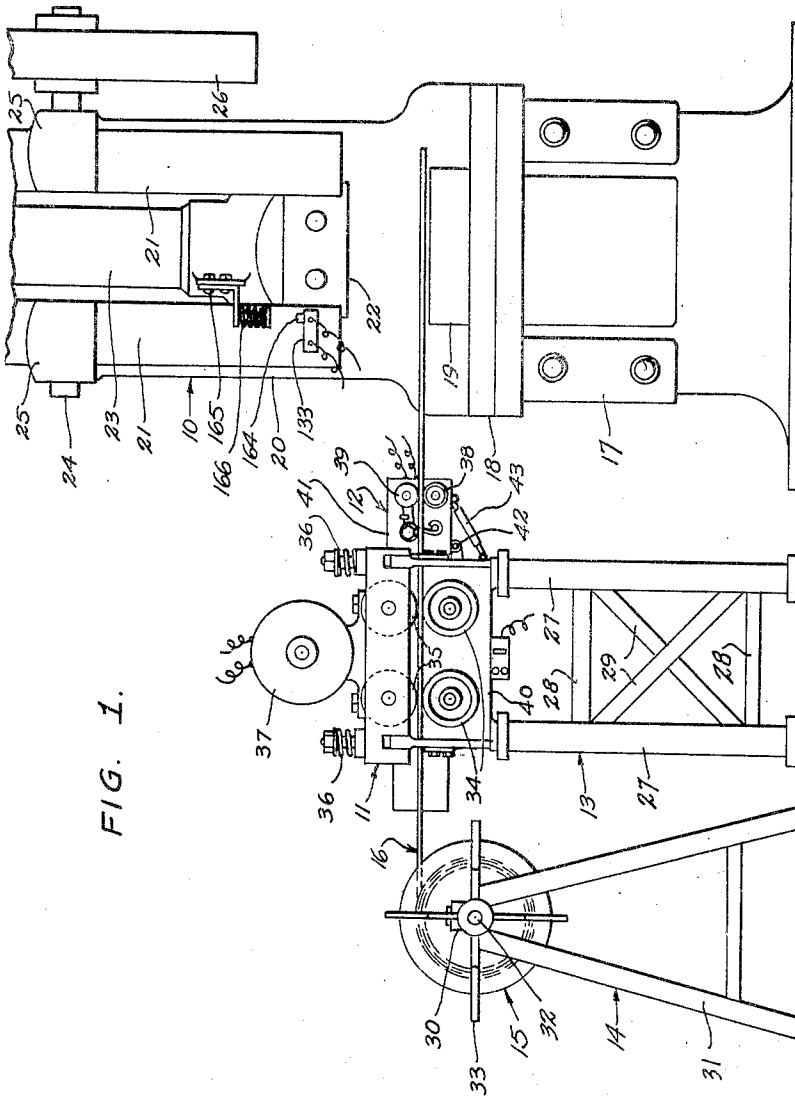


FIG. 1.

INVENTOR.
JOHN WYZA,
BY
McMurray, Berman & Davidson
ATTORNEYS,

Sept. 1, 1953

J. WYZA

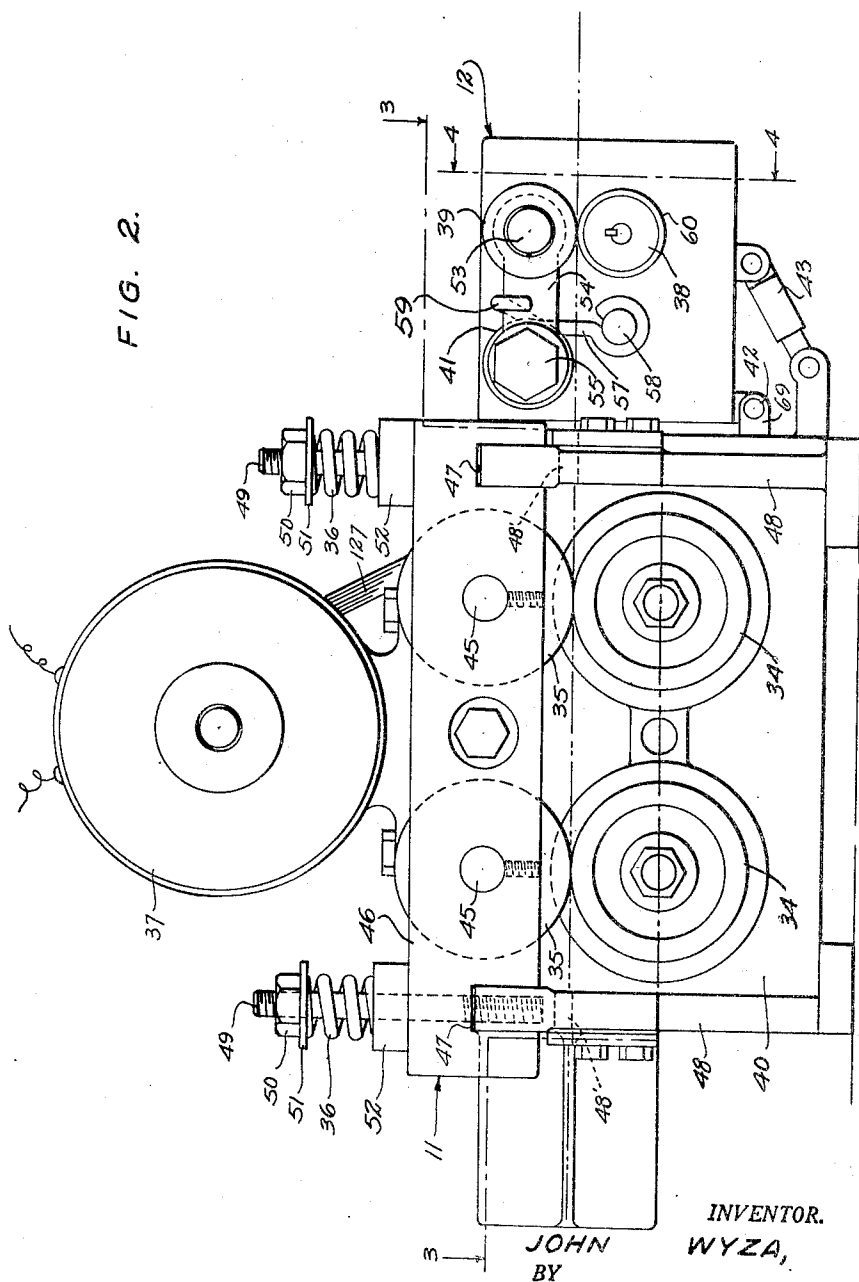
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FORMING PRESS AUTOMATIC FEED

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6 Sheets-Sheet 2

FIG. 2.



INVENTOR.

JOHN
WYZA,

BY

McMorrow, Bertram & Davidson
ATTORNEYS.

Sept. 1, 1953

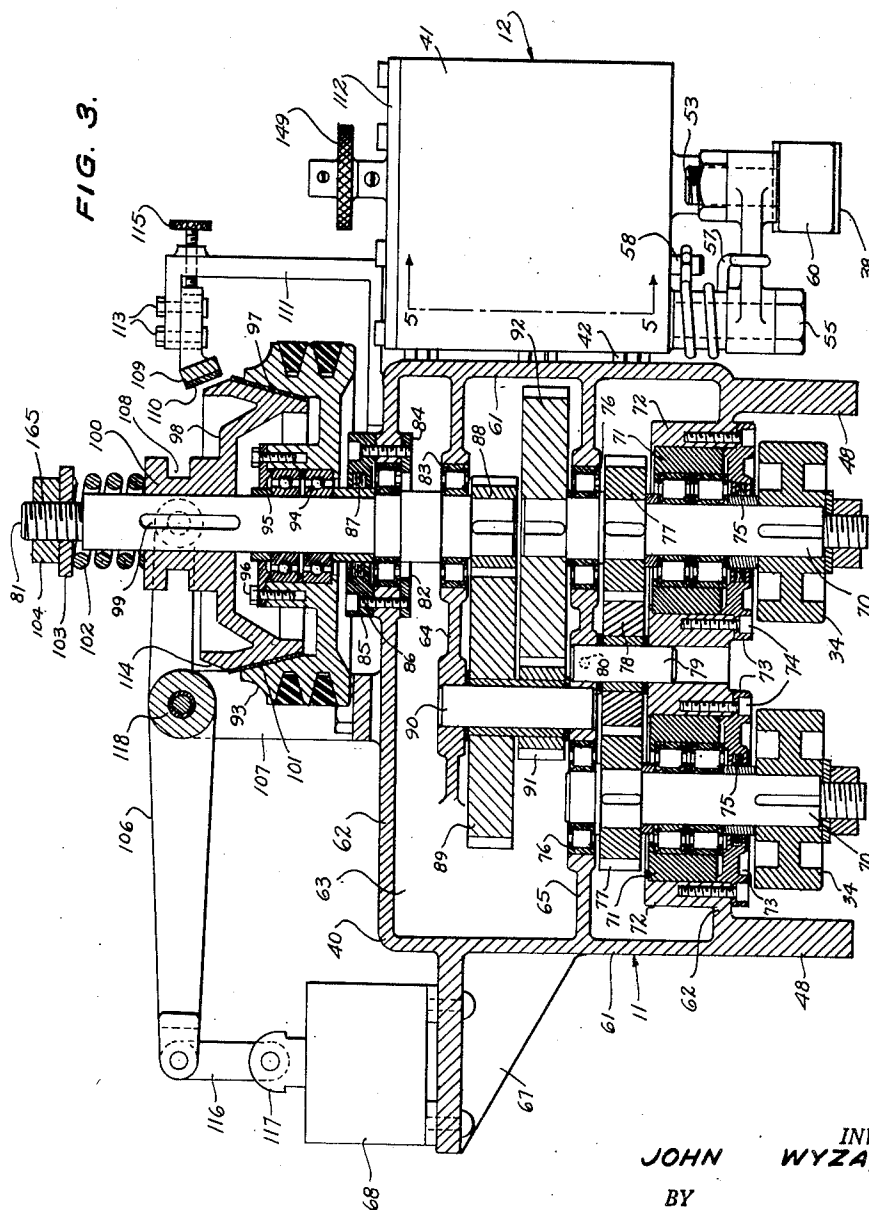
J. WYZA

2,650,822

FORMING PRESS AUTOMATIC FEED

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6 Sheets-Sheet 3



JOHN WYZA, INVENTOR.
BY

McMorrow, Berman & Davidson
ATTORNEYS.

Sept. 1, 1953

J. WYZA

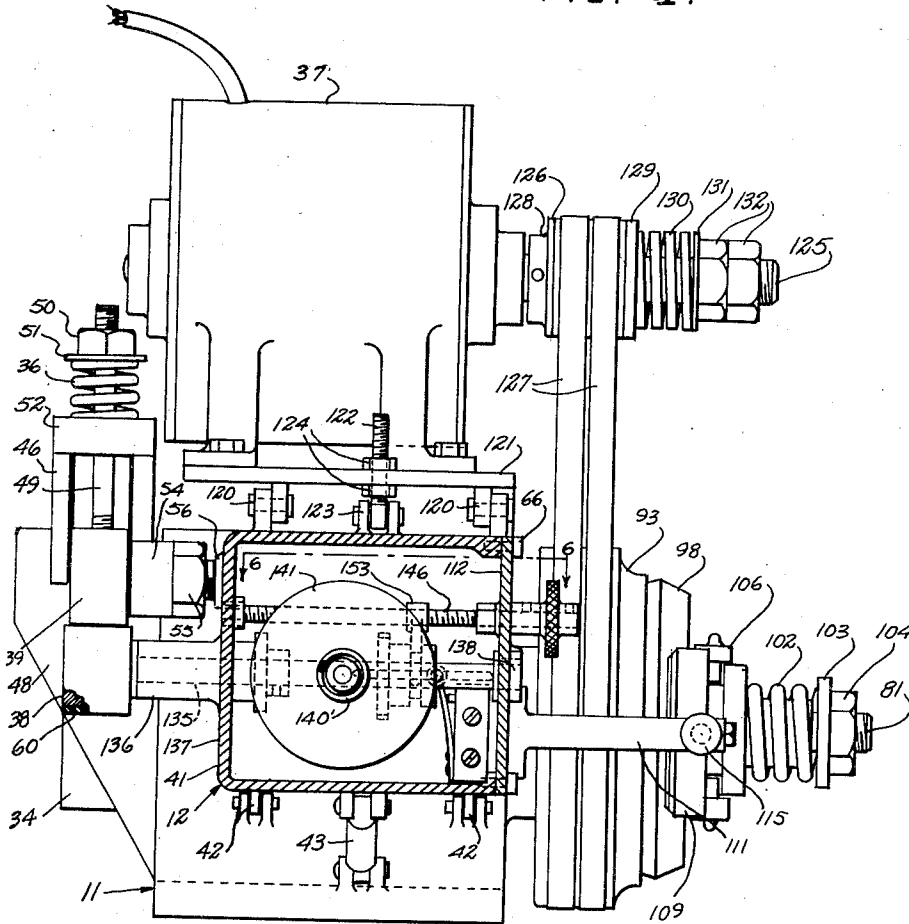
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FORMING PRESS AUTOMATIC FEED

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6 Sheets-Sheet 4

FIG. 4.



INVENTOR.
JOHN WYZA,
BY

McMorrow, Reedman & Davidson
ATTORNEYS.

Sept. 1, 1953

J. WYZA

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FORMING PRESS AUTOMATIC FEED

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6 Sheets-Sheet 5

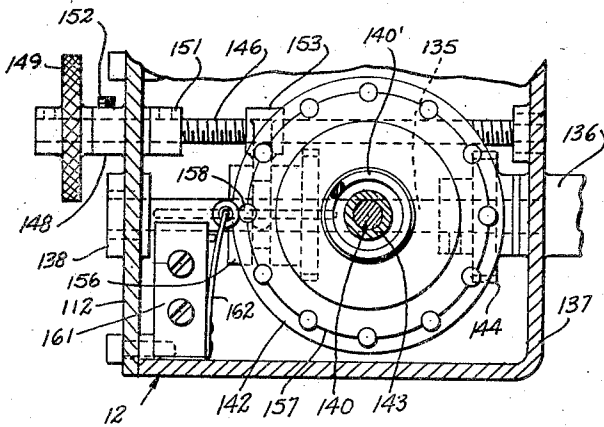


FIG. 5.

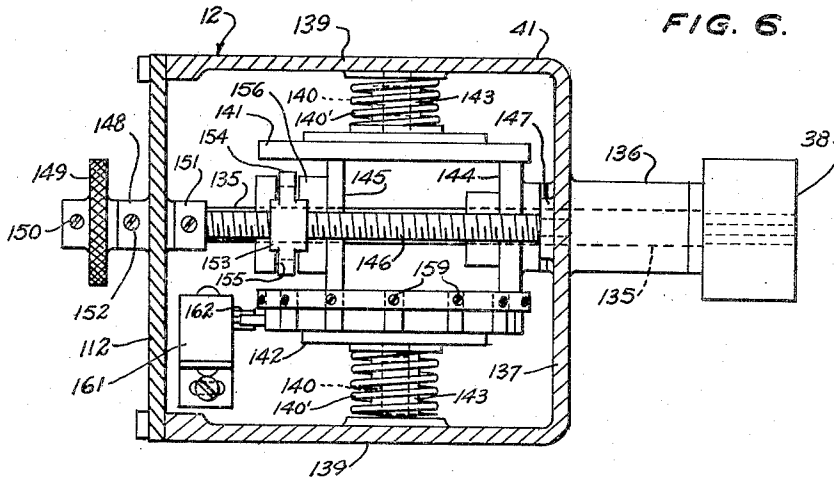


FIG. 6.

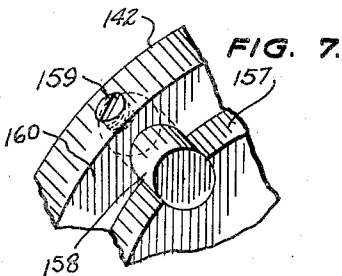


FIG. 7.

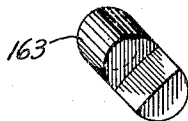


FIG. 8.

INVENTOR.
JOHN WYZA,
BY
M. M. Mors, Berman & Davidson
ATTORNEYS.

Sept. 1, 1953

J. WYZA

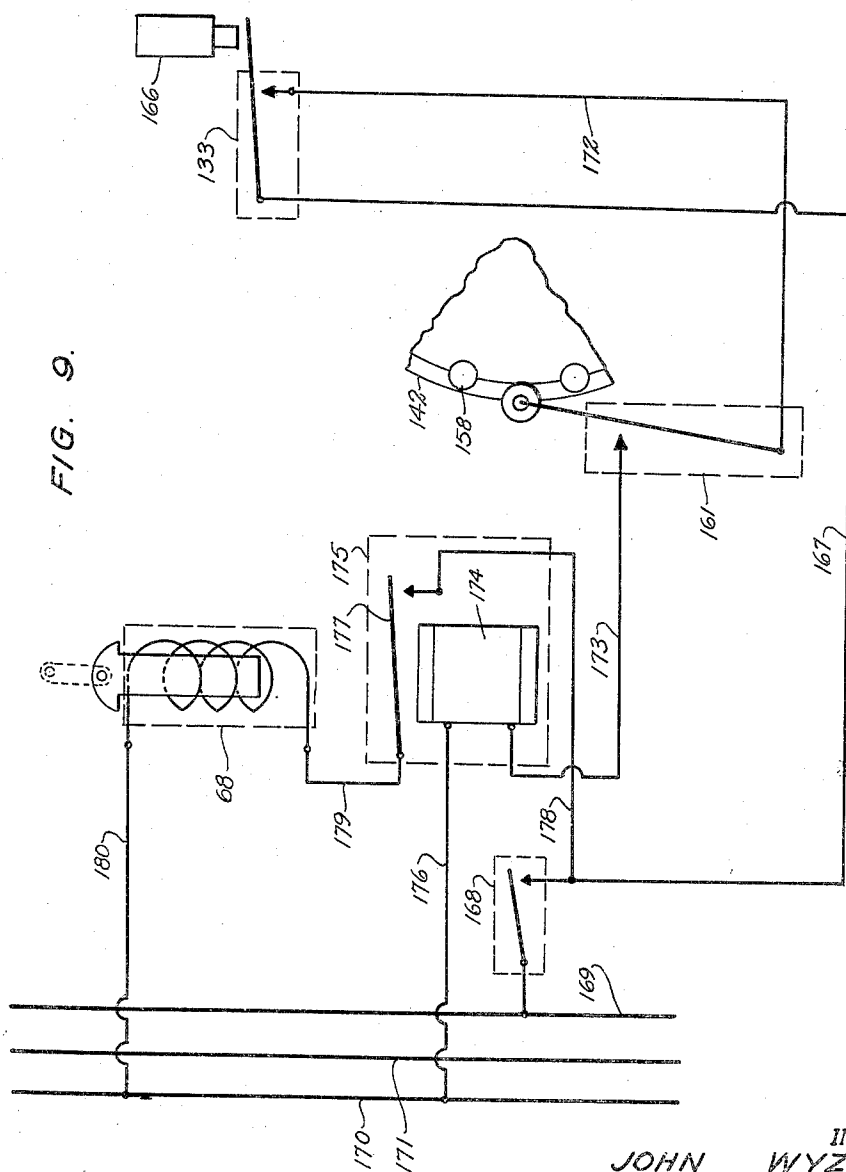
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6 Sheets-Sheet 6

FIG. 9.



INVENTOR.
JOHN WYZA,
BY
McMurray, Berman & Davidson
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,650,822

FORMING PRESS AUTOMATIC FEED

John Wyza, New Castle, Pa., assignor, by
mesne assignments, to Frank Leonard,
New Castle, Pa.

Application January 16, 1948, Serial No. 2,736

10 Claims. (Cl. 271—2.4)

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This invention relates to improvements in automatic feed devices for forming presses and similar machines, and more particularly to a feed device for automatically advancing a strip of stock such as strip stock, wire or bar stock, to a forming press and for accurately metering the length of stock fed to the press for each operation thereof in accordance with predetermined lengths of stock required for various press-formed articles.

In the forming of various articles in a forming or punch press, suitable stock, usually in the form of rolled wire or strip stock, or flat bar stock is fed into one side of the press for operation of the press dies thereon.

In the past, the stock has usually been fed by hand against an adjustable fixed abutment, although it has long been recognized that this type of manufacturing operation could be greatly accelerated and performed more accurately and with much less manual labor by the provision of an automatic stock feeding device. Some attempts have been made to provide such automatic feeding devices, but these previous attempts have left a number of serious problems entirely unsolved.

One such problem concerns the provision of a positive feed without any slipping of the stock in the feed mechanism with consequent variations in the stock lengths fed to the press, another with the avoidance of over-shooting or under-shooting of the feed mechanism with consequent variations of the lengths of stock pieces fed to the press and misplacement of the pieces on the press dies, and another with the provision of accurate metering of the stock and automatic control of the length of the stock sections to any selected one of a large number of closely spaced dimensions within a wide over-all range.

It is thus among the objects of the present invention to provide an improved stock-feeding device which continuously engages the stock in a manner to preclude slipping of the stock in the feeding mechanism, which is positive in operation so that the length of stock fed to the press for each operation thereof is accurately metered in accordance with a selection of the stock length desired, which can be quickly and easily adjusted to feed a length of stock for each press operation, which length is any selected one of closely spaced lengths within a wide over-all range of lengths available for selection, which will feed stock of a wide range of cross-sectional shapes and dimensions and of various materials,

2

which is adjustable in speed of operation to accommodate it to different press speeds, which can use the major portion of the separating and closing movements of the press dies for the stock-feeding operation so that there is no unduly sudden movement, jerking or impacting of the stock, and which is simple and durable in construction, easy to operate and adjust and can be applied to various types of conventional presses and similar machines without requiring any substantial modification thereof.

Other objects and advantages will become apparent from a consideration of the following description in conjunction with the accompanying drawings, wherein:

Figure 1 is a side elevation in somewhat diagrammatic form of a typical forming press, a stock-feeding and metering apparatus, illustrative of the invention, in operative association therewith, and a stock-roll support in operative association with the feeding and metering apparatus;

Figure 2 is a side elevation on an enlarged scale of the stock-feeding and metering apparatus showing the side of the apparatus at which the stock-feeding and metering rollers are provided;

Figure 3 is a longitudinal cross-section taken substantially on the line 3—3 of Figure 2;

Figure 4 is an end elevational view of the stock-feeding mechanism of the apparatus showing the stock-metering mechanism in transverse cross-section substantially on the line 4—4 of Figure 2;

Figure 5 is a transverse cross-section of a fragmentary portion of the stock-metering mechanism on a somewhat enlarged scale taken substantially on the line 5—5 of Figure 3;

Figure 6 is a longitudinal cross-section of the stock-metering mechanism taken substantially on the line 6—6 of Figure 4;

Figure 7 is a perspective view on an enlarged scale of a fragmentary portion of a switch operating disk illustrating the manner of mounting a switch operating pin therein;

Figure 8 is a perspective view of a filler element for a pin-receiving socket provided in the disk illustrated in Figure 7; and

Figure 9 is a wiring diagram of the electrical components of the stock-feeding and metering apparatus.

With continued reference to the drawings, there is illustrated in Figure 1, in somewhat diagrammatic form, a conventional forming or punch press, generally indicated at 10, a power-

3

driven stock-feeding device, generally indicated at 11, a stock-metering device carried by the stock-feeding device, generally indicated at 12, a support 13 for the stock-feeding and stock-metering devices, and a support 14 for a rotatable drum or spool 15 upon which the strip stock 16 is wound.

The press 10 has a base 17, a frame mounted on the base and including a table 18 supported on the base and carrying a bottom die 19, a standard 20, extending upwardly from the base and providing guideways 21 for the top die 22 which is connected by a link rod 23 with a crank shaft 24 journaled in bearings 25 provided by the standard 20 and driven by power-operated means such as the gear or belt wheel 26 to reciprocate the die toward and away from the bottom die.

The stock 16 is fed between the dies 19 and 22 while the dies are separated, as illustrated in Figure 1, and is held in position when the dies come together so that the dies form the stock into the desired articles.

In accordance with the present invention, a length of stock of the correct dimension is automatically advanced to a position between the dies while the dies are separated and is stopped in proper position relative to the dies when the dies close, so that the desired article will be properly and accurately formed by operation of the press 10.

The stock-feeding mechanism 11 and metering mechanism 10 are entirely separate from and independent of the press and are supported independently upon the support 14 which may conveniently comprise four tubular legs or standards 27 positioned to receive the four corners of the bottom of the stock-feeding mechanism and rigidly connected together by transverse perpendicular rounds 28 and suitable diagonal braces 29. This support 13 firmly supports the stock-feeding and metering mechanisms at the proper height and in operative position relative to the press, but these mechanisms do not depend in any way on the press for their support and no modification of the press is required for the application of the automatic feeding and metering mechanisms thereto.

The stock spool or drum 15 may be conveniently supported in journals 30 provided at the top of an A frame 31 to receive a shaft 32 provided at one end with annularly-spaced handles 33 for manually rotating the drum, when necessary.

From the drum 15 the stock 16 is fed over a pair of spaced-apart feed rollers 34 and beneath a pair of pressure rollers 35 which are respectively positioned immediately above the feed rollers and resiliently forced toward the respective feed rollers by compression springs 36. The feed rollers 34 are driven by suitable power means, such as the electric motor 37, in a manner presently to be described, although they may be driven by other means, such as a line shaft pulley or other suitable types of power devices.

After leaving the rollers of the stock-feeding mechanism 11 the stock passes over a metering roller 38, constituting an operating component of the stock-metering mechanism 12, and beneath a pressure roller 39 disposed immediately above the metering roller 38 and resiliently forced toward the metering roller.

The stock-feeding mechanism is provided with a suitable frame or housing 40, and the metering mechanism with a separate and independent frame or housing 41, which is pivotally connected

4

to the housing 40 by a separable hinged connection 42 and is held in position so that its rollers 38 and 39 are in alignment with the rollers 34 and 35 by an adjustable diagonal brace or strut 43.

Referring now to Figure 2, the two pressure rollers 35 are journaled on respective axles 45 secured in the opposite flange portions of a channel-shaped carriage 46 which is guided upon the frame 40 by having rectangular notches 47 provided in the end portions thereof which notches receive the upper-end portions of respective brackets 48 extending outwardly from the side-wall of the frame 40 at which the rollers 34 and 35 are provided. The outer edges of these brackets are preferably inclined downwardly and inwardly through the surface of the side-wall at the bottom thereof, as is clearly illustrated in Figure 4, and are provided with respective apertures 48' through which the strip of stock 16 passes.

Stud bolts 49 are secured at their lower ends in the upper ends of the brackets 48 and extend upwardly through the carriage 46. The upper ends of these stud bolts projecting above the carriage are surrounded by the compression springs 36 and suitable nuts 50 screw threaded onto the upper ends of the stud bolts compress the springs 36 between the washers 51 and annular spacers or bosses 52 extending upwardly from the top of the carriage 46. The nuts 50 are adjustable to vary the pressure between the pressure rollers 35 and the feed rollers 34, as may be found desirable. The pressure roller 39 of the stock-metering mechanism is journaled on the pin 53 of a crank 54 one end of which is pivotally secured to the meter housing 41 by a bolt 55 extending through an aperture in the end portion of the crank and threaded into an internally-screw-threaded boss 56 provided on the housing. The pressure roller is resiliently forced toward the metering roller 38 by a looped spring 57 having at one end a hook surrounding a pin 58 fixed to the housing 41, at its opposite end a hook 59 overlying the top edge of the crank 54 and intermediate its length a loop surrounding the bolt 55, the spring being effective to exert a downwardly directed force on the pressure roller 39 to resiliently force the pressure roller toward the metering roller positioned immediately below it. The metering roller 38 is preferably provided with a peripheral band or tire 60 of resilient material, such as rubber or synthetic resin plastic, to provide a high frictional component between the periphery of this roller and the adjacent surface of the strip of stock passing between it and the pressure roller 39.

Referring to Figure 3, it will be observed that the frame or housing 40 is a four-sided, substantially rectangular member enclosing an elongated, generally rectangular space. This frame may conveniently comprise end-walls 61, side-walls 62, a bottom wall 63, and two internal ribs 64 and 65, substantially parallel to each other, and to the side-walls 62, all integrally united and preferably formed as a hollow metal casting, and a top wall 66 which is preferably separately formed and secured to the casting by suitable bolts or screws. An integral bracket 67 extends outwardly from one end-wall 61 to support an electromagnetic solenoid 58, the purpose of which will presently appear, and the lugs 69 of the hinge connection 42 for the metering mechanism project outwardly from the opposite end-wall.

Feed rollers 34 are fixed on the outer ends of respective feed roller shafts 70 which shafts are

5

journalled in precision-type double roller bearings 71 mounted in respective annular bosses 72 provided internally of the corresponding frame side-wall 62 and held in operative position in the bosses by respective bearing caps 73 which surround the shaft 70 at the outer side of the frame side-wall 62 and are secured to the frame by suitable cap screws 74. Suitable oil or grease seals 75 are carried by the caps 73 surrounding the shafts 70.

The shafts 70 extend beyond the bearings 71 and through suitable bearing bosses provided in the internal rib 65 in which they are journalled by single roller bearings 76 so that the shafts 70 are rigidly supported in the frame against lateral movement, but for substantially frictionless rotation therein.

Between the inner and outer bearings 71 and 76 the shafts 70 have synchronizing gears 77 fixed thereon and an idler gear 78 mounted on an axle 79 disposed between the gears 77, meshes with both gears 77 to operatively connect them in a manner such that the two shafts 70 rotate in the same direction at the same rotational speed. The axle 79 has one end supported in an internal frame boss provided between the bearing bosses 72 and its other end supported in a suitable apertured boss provided in the internal web 65 and may be releasably held in operative position by a suitable set screw, as indicated at 80.

A drive shaft 81 is journalled in the frame 40 by spaced-apart roller bearings 82 and 83, the bearing 82 being mounted in a boss provided in the side wall 62 opposite the bosses 72, and the bearing 83 being mounted in a boss provided in the internal rib 64. Bearing 82 is held in position in the side-wall boss by internal and external bearing caps 84 and 85 secured together and to the frame side-wall by suitable cap screws 86. A grease seal 87 is carried by the external cap 85 surrounding the shaft 81 to preclude leakage of lubricant from the housing 40. A small spur gear 88 of a four-gear, speed-reducing gear train is fixed on the inner end of the shaft 81 and meshes with a larger gear 89 journalled on a jack shaft 89, the ends of which are mounted in the internal ribs 64 and 65. A small gear 91 is journalled on the jack shaft 90 and rotationally fixed with the gear 89 and meshes with a large gear 92 mounted on the inner end of one of the feed roller shafts 70.

With the above-described arrangement, when the drive shaft 81 is rotated, the two feed roller shafts 70 will be rotated in the same direction and at the same speed relative to each other, but at a rotational speed less than the rotational speed of the drive shaft 81 by the speed-reducing ratio of the gear train including the gears 88, 89, 91 and 92.

A double V-belt pulley 93 is journalled on the shaft 81 outside of the housing 40 by a suitable anti-friction bearing, such as the double ball bearings 94. The pulley is provided with a hub in the form of an annular boss in which the bearings 94 are retained by a suitable bearing cap 95 secured to the pulley by cap screws 96. The belt pulley 93 is formed to provide in its outer side a conical clutch face 97 and a cooperating double-faced clutch cone 98 is mounted on the outer end portion of the drive shaft 98 in position to cooperate with the clutch face 97. In the arrangement illustrated, the drive shaft is provided with a longitudinal slot or with longitudinal keyways 99 and the hub 100 of the clutch cone is provided with inwardly-extending keys or pins which engage in the slots or keyways 99 to

6

restrain the clutch cone from rotation relative to the drive shaft while providing freedom of sliding movement of the clutch cone on the drive shaft longitudinally thereof. The face of the clutch cone cooperating with the clutch face 97 of the belt pulley 93 is provided with a covering 101 of friction material and the clutch cone is forced into operative engagement with the clutch face of the belt pulley by a compression spring 102 which surrounds the outer end portion of the drive shaft between the outer end of the clutch cone hub 100 and an abutment washer 103 which is secured on the outer end of the drive shaft by a nut 104 threaded onto a reduced externally-screw-threaded end portion 105 of the drive shaft.

A clutch operating throw-out fork 106 is pivotally mounted intermediate its length on the outer end of a stirrup 107 secured at its inner end to the corresponding side-wall 62 of the frame 40 and is provided at one end with a fork, the tines of which lie at opposite sides of the hub 100 of the clutch cone and carry pins engaging in an annular groove 108 provided in the clutch cone hub to move the clutch cone away from the belt pulley 93 against the force of spring 102.

A brake shoe segment 109 having a friction lining 110 thereon, is supported by an inverted L-shaped bracket 111 which extends outwardly from the side-wall 62 of the frame or housing 40 of the feeding mechanism. The brake segment is secured to the bracket by a pair of bolts 113 which pass through registering apertures in the angularly-disposed end portion of the bracket and in the web of the shoe segment, the apertures in one of these parts being elongated to provide a limited freedom of movement of the brake shoe segment toward and away from the outer cone face 114 of the double clutch cone. Adjustment of the shoe segment toward and away from the clutch cone is controlled by a manually-rotatable screw 115 threaded through an internally-screw-threaded opening in the bracket and engaged at its inner end with the web of the brake shoe segment 109.

The end of the clutch throw-out fork 106 opposite the fork end thereof, is pivotally connected by means of a link 116 with the outer end of the movable armature 117 of the solenoid 68.

With this arrangement, whenever the solenoid 68 is energized the armature 117 will be drawn inwardly, thereby rocking the fork 106 about its pivotal connection 118 with the outer end of stirrup 107 to move the clutch cone 98 along the drive shaft 81 away from the clutch face 97 of the belt pulley 93 and into engagement with the brake shoe segment 109. This movement of the clutch cone will disconnect the drive from the belt pulley to the drive shaft and, by braking the clutch cone, will stop the drive shaft substantially instantaneously upon energization of the solenoid. The clutch mechanism thus serves to provide substantially instantaneous starting and stopping of the stock-feeding mechanism.

As shown in Figure 4, the electric motor 37 is mounted on the top wall of the frame 40 by a pair of hinge connections 120 disposed between the top wall of the frame and one end of the motor base plate 121. Each of the hinge connections 120 may conveniently comprise a pair of oppositely-disposed apertured lugs connected one to the frame 40 and the other to the base plate 121 and pivotally connected together by respective pivot pins. A screw-threaded stem 122 connected at one end to the top wall of frame 40

by a lug connection 123 extends through an aperture in the opposite end of the motor base plate 121 and the motor base plate is secured in adjusted position along the length of stem 122 by a pair of clamp nuts 124 so that the motor shaft 125 can be moved toward and away from the drive shaft 81 and secured in adjusted position relative thereto. A double V-belt pulley 126 is secured on the motor shaft and drivingly connected by a pair of V-belts 127 with the belt pulley 93 mounted on the drive shaft 81.

In order to protect the motor 37 against overload, the belt pulley 126 is mounted on a bushing fixed to the motor shaft and having at one end a fixed annular shoulder 128 and at the opposite end a movable annular shoulder 129 which is movable lengthwise of the bushing, but held against rotation relative thereto. A compression spring 130 surrounds the motor shaft between the movable shoulder 129 and an abutment washer 131 secured on the shaft by a pair of lock nuts 132 screw threaded onto the externally-screw-threaded outer-end portion of the motor shaft. The spring 130 compresses the belt pulley 126 between the annular shoulders 128 and 129 providing a friction drive between the belt pulley and the motor shaft which is effective to rotate the pulley with the shaft under all normal conditions, but which will permit slipping of the pulley on the shaft if the load on the motor becomes so excessive as to endanger the motor.

The belt grooves in the V-belt pulleys 93 and 126 are so designed that the ratio of the pulley speed can be varied by moving the motor shaft toward or away from the drive shaft 81 by use of the nuts 124 on the threaded stem 122, to thereby vary the speed of the feeding mechanism. Where a large change of speed is necessary a belt pulley of a different size can be mounted on the motor shaft to provide the desired speed of the stock-feeding mechanism.

The motor 37 and its starting and stopping switch are preferably provided as a conventional integral unit having the switch mounted directly on the motor as the feeding mechanism is designed for continuous operation of the motor while the feeding mechanism is in operation.

Energization of the clutch-operating solenoid 68 of the stock-feeding mechanism is controlled by the stock-metering mechanism 12 and a switch 133 mounted on the press 10 and operated thereby, the metering mechanism being effective to stop the feeding mechanism whenever a predetermined length of stock has been fed to the press and the switch 133 being effective to re-start the feeding mechanism to advance the next length of stock to the press. The construction of the stock-metering mechanism is particularly illustrated in Figures 4 to 8 inclusive.

Metering roller 38 is fixed on the outer end of a metering-roller shaft 135 which is journaled in a boss 136 projecting outwardly from the corresponding side-wall 137 of the metering mechanism frame 41. The portion of the shaft 135 within the frame 41 is made non-circular or is keyed or splined and the end thereof opposite the metering roller 38 is journaled in a boss 138 provided on the removable side-wall 112 of the frame 41.

The opposite end walls of the frame 41 are provided with inwardly-extending pins 140, Figure 6, upon which are journaled a pair of disks 141 and 142 by means of respective hollow coaxial bosses 143 extending from the disks and surrounding the corresponding pins. These disks are sub-

stantially parallel to each other and are disposed one at each side of the shaft 135 substantially parallel thereto. The boss 136 is extended inwardly of the side-wall 137 of frame 41 to provide a bearing for an idler wheel 144 which rotates between the two disks 141 and 142 in contact therewith and near the outer circumferences thereof.

A friction wheel 145 is mounted on the splined or non-circular portion of the shaft 135 for longitudinal movement thereon, but against relative rotation and is also in contact with the opposed faces of the two disks 141 and 142, and is effective to drive the two disks from the shaft 135 at speeds depending upon the distance of the friction wheel 145 from the axis of rotation of the disk. This friction wheel is preferably provided with a tire or rim of resilient friction material to provide a high frictional component between the wheel and the disk faces.

Compression springs 140' are disposed respectively between the disks 141 and 142 and the adjacent end-walls of the frame to resiliently force the disks against the idler wheel 144 and friction wheel 145.

A screw shaft 146, substantially parallel to and spaced from the shaft 135, extends across the interior of the frame 41 and has its ends journaled in bosses 147 and 148 formed on the fixed side-wall 137 and removable side-wall 112 respectively of the frame. A knurled hand wheel or knob 149 is secured on the outer end of the screw shaft projecting through the side-wall 112 by suitable connecting means, such as the set screw 150 whereby the screw shaft can be manually rotated, and a collar 151 is secured on the screw shaft by similar fastening means at the inner-side of the frame wall 112 to hold the screw shaft against longitudinal movement relative to the frame. A set screw 152 is threaded into the bearing boss 148 so that the screw shaft may be locked thereby in adjusted position, when desired.

A nut 153 is threaded onto the screw shaft and provided with a fork 154, the ends of which are engaged in an annular groove 155 provided in the cylindrical hub portion 156 of the friction wheel 145 so that the friction wheel will be moved longitudinally of the shaft 135 and radially of the disks 141 and 142 upon rotation of the screw shaft 146 by the hand knob 149. This arrangement provides a manually-adjustable, variable speed drive between the shaft 135 of the metering roller 38 and the two disks 141 and 142.

One of the disks, the disk 142, as illustrated, is provided with a right-angular peripheral recess forming an annular shoulder 157 spaced inwardly of the periphery of the disk at the outer side thereof, and concentric therewith. The outer or marginal portion of the disk is provided with a plurality of angularly-spaced circular holes or apertures providing pin sockets for pins 158 selectively invertible into the pin sockets and retained therein by suitable securing means, such as the set screws 159. The holes in the disks are so located as to extend for substantially one-half their cross-sectional area inwardly of the annular shoulder 157 and they extend entirely through the annular flange 160 provided between this shoulder and the inner face of the disk.

A micro switch 161 is mounted in the frame 41 in position such that its operating lever 162 is contacted by pins carried by the disk 142 as the disk rotates to thereby operate the switch.

As illustrated in Figure 5, the disk is provided

with twelve pin sockets spaced at equal angular intervals therearound. With a pin in each socket the switch will be operated twelve times for each rotation of the disk; with only one pin in place, the switch will be operated only once for each revolution of the disk, and with two, three, four or six of the pins in place, spaced apart at equal angular intervals, the switch will be operated a corresponding number of times for each disk rotation.

As will later appear in connection with the description of Figure 9, the switch 161 is electrically connected with the solenoid 68 so as to stop the feeding mechanism each time the switch is contacted by a pin 158.

Filler elements 163, as particularly illustrated in Figure 8, are provided for insertion into the pin sockets which do not carry switch-operating pins. These filler elements each have a cylindrical portion fitting the portion of the pin socket contained in the flange 160 and a cut-away portion which fills the portion of the pin socket in the inner annular shoulder 157 so that the shoulder 157 will be smooth between the pins and will not tend to accidentally operate the switch 161.

Returning to Figure 1, the switch 133 is mounted on the standard 20 of the press 10 adjacent the guideway for the movable die 22 and has an upwardly-projecting operating lever 164. A bracket 165 is secured to the movable die or the die connecting link 23 and is provided with a spring plunger 166 which contacts the switch-operating lever 164 to close the switch whenever the die is within a predetermined lower portion of its range of movement or within a predetermined distance of the fixed die 19. This switch 133 is effective, when opened, to restart the stock-feeding mechanism after it has been stopped by the metering mechanism.

Referring now to Figure 9, one side of the switch 133 is connected through an electrical conduit 167 and a manually-operated switch 168 with one side 169 of a three-wire power line including the opposite side wire 170 and the center wire 171. This may be the conventional 220-volt power line provided in the usual machine shop.

An electrical conduit 172 leads from the opposite side of switch 133 to one side of switch 161 and a conduit 173 leads from switch 161 to one side of the electro-magnet 174 of an electro-magnetic relay 175, the opposite side of the electro-magnet being connected by a conduit 176 with the opposite side wire 170 of the power line. The relay 175 includes a switch 177 which is closed by the electro-magnet 174 only when both of the switches 133 and 161 are closed. One side of switch 177 is connected through an electrical conduit 178 with conduit 167 or the corresponding side of switch 168 and the opposite side of this switch 177 is connected by a conduit 179 with one side of the electro-magnetic solenoid 68, the opposite side of which is connected through an electrical conduit 180 with the side wire 170 of the power line.

The operation of the apparatus is substantially as follows:

With the manual switch 168 closed, and the motor 37 energized, and the electro-magnet 68 de-energized, the stock-feeding mechanism will be in operation advancing stock toward the press 10. When the movable die 22 has moved downwardly a predetermined distance toward the fixed die 19 the switch 133 will be closed by the spring

plunger 166. With the switch 133 closed, as soon as the predetermined length of stock has passed the metering roll 38 of the metering mechanism, a pin 158 will contact the actuating lever of switch 161 closing this switch. As soon as both of the switches 133 and 161 are closed the magnet 174 of the relay 175 is energized, closing the switch 177 which in turn energizes the solenoid 68. Upon energization the solenoid 68 moves the clutch fork 196 to disengage the clutch cone 98 from the belt pulley 93 and into engagement with the brake shoe segment 109, thereby instantaneously stopping the stock-feeding mechanism. Since the disk 142 is thus stopped with its pin 158 holding the switch 161 closed, the stock-feeding mechanism will be held inoperative until the switch 133 is again opened by upward movement of the movable die 22. As the movable die 22 moves away from the fixed die 19 a predetermined distance, the spring plunger 166 is removed from the operating lever of switch 133 permitting switch 133 to open and break the circuit energizing the solenoid 68. Upon de-energizing of the solenoid 68 compression spring 102 re-engages the clutch cone 98 with the belt pulley 93 and operation of the stock-feeding mechanism is resumed and this cycle is repeated to advance predetermined lengths of stock to the forming press in synchronism with the operation of the press dies.

The amount of stock advanced to the press for each operation thereof is controlled by adjustment of the stock-metering mechanism. The pins 158 provide a coarse adjustment for the stock-metering mechanism so that the maximum stock length within the metering capacity of the metering mechanism with only one pin in the disk 142 can be roughly divided into two, three, four, six, and twelve substantially equal parts by inserting the corresponding number of pins in the proper pin sockets in the disk. The variable speed drive between the metering roller shaft and the disk 142 provides a fine adjustment by means of which the exact desired length of stock advanced to the press for each operation can be accurately determined. With this arrangement the metering mechanism can be adjusted for the supply of stock lengths to the press ranging from approximately one-quarter of an inch to approximately twelve inches in length by increments not greater than one-twenty-fifth of an inch.

The feed rollers of the stock-feeding mechanism are continuously in engagement with the stock under pressure supplied by the pressure rollers and the metering roller is also continuously in engagement with the stock under pressure supplied by its corresponding pressure roller so that the stock is never released from the feed and pressure rollers and there is no opportunity for slippage or movement of the stock relative to the stock contacting portions of the rollers. The stock feed is thus positive and substantially invariable. The clutch and brake mechanism of the stock-feeding unit is substantially instantaneous and positive in operation, so that the advance of the stock to the press is accomplished without lag or over-run and the operation of the apparatus is entirely automatic so that the presence of an attendant is not required, except to replenish the supply of stock, or to make necessary adjustments or repairs.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are, therefore, to be considered in

11

all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are, therefore, intended to be embraced therein.

What is claimed is:

1. An automatic stock feed for advancing a strip of stock a selected distance at predetermined intervals comprising a frame, feed and pressure rollers supported on said frame for the passage of said strip of stock therebetween, continuously operating power means, means including a friction clutch drivingly connecting said power means with said feed rollers, electro-magnetic means operatively connected with said clutch effective when energized to disengage said clutch, metering means positioned to engage and measure stock passing said feed rollers and operative to periodically energize said electro-magnetic means to disengage said clutch and stop said feed, and switch means adapted to be operated by a press to which said stock is supplied to de-energize said electro-magnetic means and restart said feed.

2. An automatic stock feed for advancing a strip of stock a selected distance at predetermined intervals to a forming press comprising a frame, feed and pressure rollers supported on said frame for the passage of said strip of stock therebetween, continuously operating power means, means including a friction clutch drivingly connecting said power means with said feed rollers, electro-magnetic means operatively connected with said clutch effective when energized to disengage said clutch, metering means positioned to engage and measure stock passing said feed rollers and operative to periodically energize said electro-magnetic means to disengage said clutch and stop said feed, switch means adapted to be operated by a press to which said stock is supplied to de-energize said electro-magnetic means and restart said feed, and brake means operative between said frame and said clutch to engage said clutch and hold said feed against movement while said clutch is disengaged.

3. Power operated means for advancing a strip of stock to a forming machine comprising a frame having end-walls, side-walls, a top wall, and a bottom wall enclosing a generally rectangular space, and spaced internal ribs extending upwardly from said bottom wall and between and generally parallel to said side-walls, anti-friction bearings mounted in one of said side-walls and the adjacent internal rib, a pair of feed roller shafts journaled in said bearings, a feed roller on the outer end of each shaft, a drive shaft journaled in said frame, gear means operatively connecting said drive shaft with said roller shafts, clutch means on said drive shaft outside said frame, power means on said frame drivingly connected with said clutch means, webs extending outwardly from said one side-wall, one adjacent each end thereof, a roller carriage guided on said webs, pressure rollers journaled in said carriage, and spring means operative between said frame and said carriage to resiliently force said pressure rollers toward said feed rollers.

4. Power operated means for advancing a strip of stock to a forming machine comprising a frame having end-walls, side-walls, a top wall and a bottom wall enclosing a generally rectangular space, and spaced internal ribs extending

12

upwardly from said bottom wall and between and generally parallel to said side-walls, anti-friction bearings mounted in one of said side-walls and the adjacent internal rib, a pair of feed roller shafts journaled in said bearings, a feed roller on the outer end of each shaft, a drive shaft journaled in said frame, gear means operatively connecting said drive shaft with said roller shafts, clutch means on said drive shaft outside said frame, power means on said frame drivingly connected with said clutch means, webs extending outwardly from said one side-wall one adjacent each end thereof, a roller carriage guided on said webs, pressure rollers journaled in said carriage, and spring means operative between said frame and said carriage to resiliently force said pressure rollers toward said feed rollers, said webs having apertures therein for the passage of stock between said feed rollers and said pressure rollers.

5. Power operated means for advancing a strip of stock to a forming machine comprising a hollow frame having spaced side-walls and a pair of internal ribs between and generally parallel to said side-walls, a pair of feed roller shafts journaled in one of said side-walls and the adjacent internal rib, a feed roller secured on the outer end of each feed-roller shaft, a synchronizing gear on the inner end of each roller shaft, an axle mounted at its ends in said one side-walls and the adjacent ribs, an idler gear on said axle meshing with both of said synchronizing gears, a drive shaft journaled in said frame, a second axle supported at its ends in said internal ribs, a drive gear fixed on said drive shaft, two inter-connected gears journaled on said second axle, the larger meshing with said drive gear, and a driven gear on one of said roller shafts meshing with the smaller gear on said second axle to provide a speed-reducing gear train between said drive shaft and said one feed-roller shaft, clutch means on said drive shaft operative to drive the same, a carriage guided on said frame, a pair of pressure rollers journaled in said carriage, and spring means operatively connected between said carriage and said frame resiliently forcing said pressure rollers toward said feed rollers.

6. Power operated means for advancing a strip of stock to a forming machine comprising a hollow frame, a pair of spaced-apart, parallel feed-roller shafts journaled in said frame, a feed roller on the outer end of each feed-roller shaft, a drive shaft journaled in said frame, shaft-driving-clutch means on the outer end of said drive shaft, a synchronizing gear train operatively connecting said feed-roller shafts for rotation in the same direction at the same speed, a speed-reducing gear train operatively connecting said drive shaft and one of said feed-roller shafts, a pressure roller carriage guided on said frame, a pair of pressure rollers journaled in said carriage, and spring means operatively connected between said frame and said carriage resiliently forcing said pressure rollers toward said feed rollers.

7. Metering means for measuring off predetermined lengths from a strip of stock comprising a supporting frame, a roller shaft journaled in said frame, a metering roller on the outer end of said shaft, a crank pivoted to said frame, a pressure roller journaled on said crank and positioned in opposition to said metering roller, an electric switch supported by said frame, an adjustable switch operating means driven by said

roller shaft operative to operate said switch in response to rotational movements of said metering roller to selected angular extents, said switch operating means including a pair of disks journaled in said frame and disposed one at each side of said roller shaft, a friction wheel longitudinally slidable on said shaft and drivingly connected therewith frictionally engaging the faces of said disks, spring means disposed between said disks and said frame resiliently forcing said disks against said friction wheel, manually-operated means carried by said frame and operatively engaging said friction wheel to move said wheel lengthwise of said roller shaft and thereby vary the speed ratio between said shaft and said disks, one of said disks having angularly-spaced pin sockets in the outer portion thereof, and pins selectively insertable in said sockets to operatively engage said switch upon rotation of said one disk relative thereto.

8. Automatic stock-feeding mechanism for advancing a strip of stock through a forming press comprising power-driven feeding mechanism, means carried by said power-driven mechanism operative to start and stop the same, metering mechanism receiving stock fed by said feeding mechanism and operative to control said starting and stopping means to stop said feeding mechanism whenever a predetermined length of stock has been advanced thereby, and electric switch means electrically connected with said starting and stopping means to re-start said feeding mechanism after it has been stopped by said stock-metering mechanism, said metering mechanism having a coarse and a fine adjustment for length of stock metered, said fine adjustment including manually-operated means accessible from the exterior of said mechanism.

9. Power-operated feeding mechanism for advancing a strip of stock to a forming press comprising a hollow frame, feed-roller shafts journaled in said frame, a feed roller on the outer end of each feed-roller shaft, a drive shaft journaled in said frame, gear means operatively connecting said drive shaft and said feed-roller shafts, clutch means on said drive shaft for driving the same, a motor adjustably mounted on said frame, variable speed drive means operatively connecting said motor and said clutch means, pressure rollers supported on said frame in opposition to said feed rollers, and spring means operatively connected between said pressure rollers and said frame resiliently forcing said pressure rollers toward said feed rollers.

10. In combination with a punch press having a frame, a lower die mounted in said frame and an upper die movably supported in said frame for reciprocatory movement toward and away from

said lower die, an automatic stock feed for advancing a strip of stock a selected distance at predetermined intervals to the forming press comprising a frame, feed and pressure rollers supported on said frame for the passage of said strip of stock therebetween, continuously operating power means driving said feed rollers independently of said press, means including a friction clutch drivingly connecting said power means with said feed rollers, electromagnetic means operatively connected with said clutch effective when energized to disengage said clutch, metering means positioned to engage and measure stock passing said feed rollers, a normally open switch periodically closed by said metering means to energize said electromagnetic means to disengage said clutch and stop said feed, a normally open switch carried by said press frame and effective when open to de-energize said electromagnetic means and restart said feed, a switch actuator carried by said upper die and engaging said normally open switch to maintain the latter closed only when said upper die is within a predetermined distance of said lower die, and a manually operated switch connected in series with said normally open switches and effective when opened to disable said metering means to periodically stop said feed and thereby provide a continuous feed operation for said automatic stock feed.

JOHN WYZA.

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