

Nov. 27, 1923.

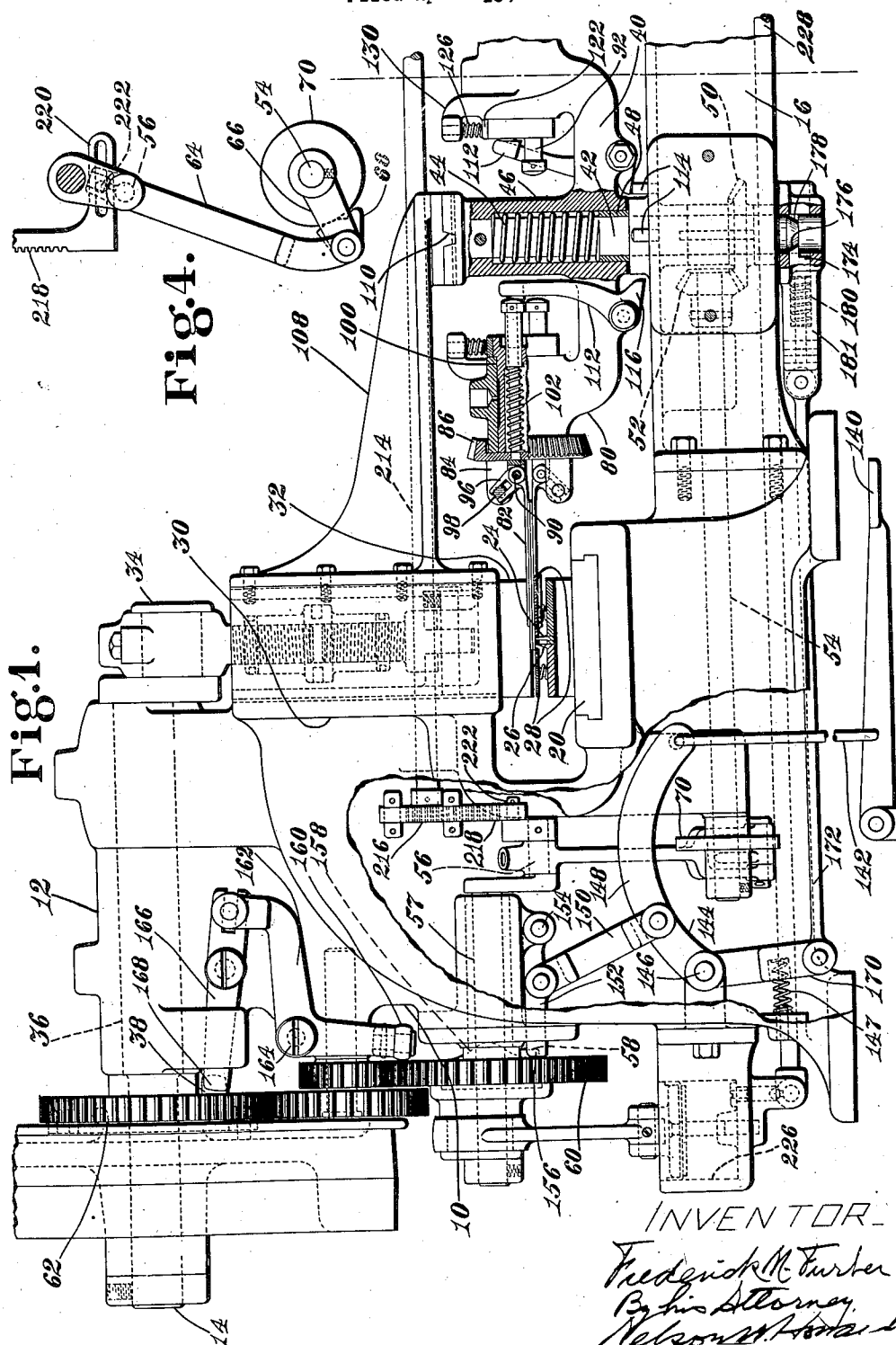
F. M. FURBER

1,475,181

PROCESS OF AND MACHINE FOR PERFORATING

Filed April 19, 1920

3 Sheets-Sheet 1



INVENTOR.
Frederick M. Furber
By his Attorney,
Nelson & Howard

Nov. 27, 1923.

F. M. FURBER

1,475,181

PROCESS OF AND MACHINE FOR PERFORATING

Filed April 19, 1920

3 Sheets-Sheet 2

Fig. 5.

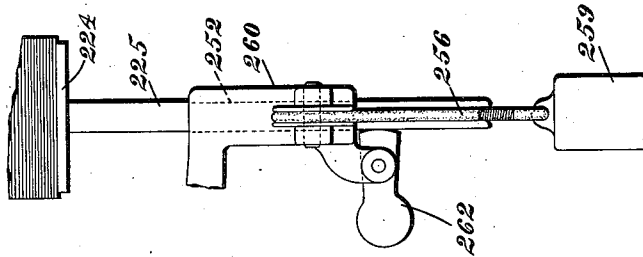


Fig. 2.

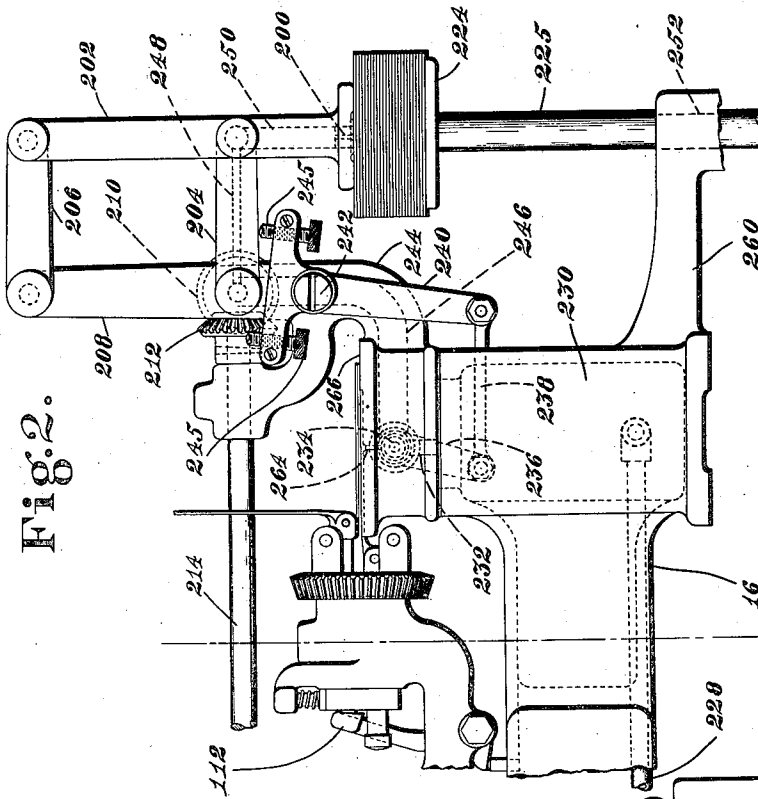
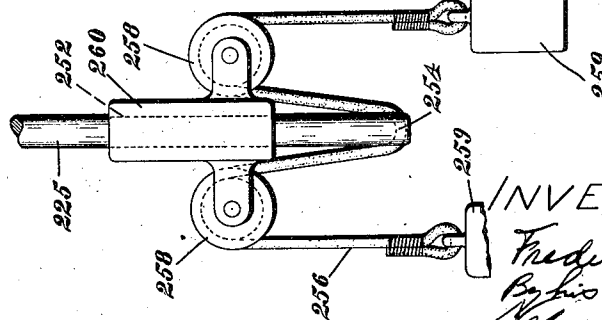


Fig. 6.



INVENTOR.
Frederick M. Furber
By his Attorney,
Walter H. Howard

Nov. 27, 1923.

F. M. FURBER

1,475,181

PROCESS OF AND MACHINE FOR PERFORATING

Filed April 19, 1920

3 Sheets-Sheet 3

Fig. 3.

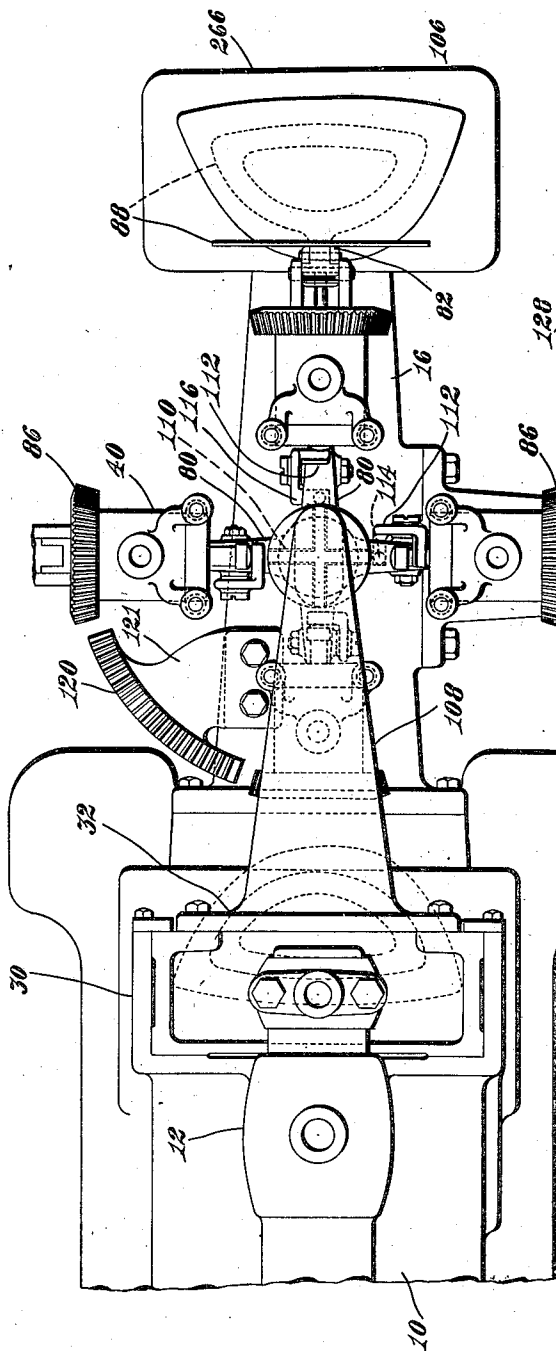


Fig. 8.

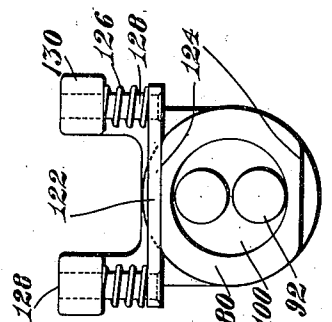
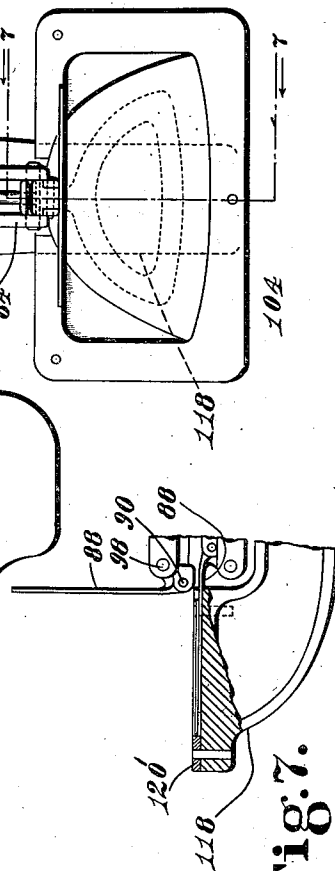


Fig. 7.



INVENTOR.
Fredrick M. Furber
By his Attorney,
Nelson M. Howard

UNITED STATES PATENT OFFICE.

FREDERICK M. FURBER, OF REVERE, MASSACHUSETTS, ASSIGNOR TO UNITED SHOE MACHINERY CORPORATION, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PROCESS OF AND MACHINE FOR PERFORATING.

Application filed April 19, 1920. Serial No. 375,021.

To all whom it may concern:

Be it known that I, FREDERICK M. FURBER, a citizen of the United States, residing at Revere, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Processes of and Machines for Perforating, of which the following description, in connection with the accompanying drawings, is a specification, like reference characters on the drawings indicating like parts in the several figures.

This invention relates to the cutting of stock, such, for instance, as sheet material used in the manufacture of shoes, and is herein set forth by way of illustration with particular reference to its use in the production of ornamental perforations in tips to be used as parts of shoe uppers, though, of course, the invention is in no way limited to such use.

It is an object of the invention to cut stock in such a manner as to insure clean cut edges, free from ragged or frayed portions or other defects, and this with the elimination of the various disadvantages attendant upon the use of permanent cutting beds, such for example as those of wood or metal, and at the same time without the use of backing strips of paper or the like which, since they are consumed during the operation, represent a continuous and undesirable, operating expense.

In one aspect the present invention contemplates an improved method of cutting or perforating sheet material, including the positioning of a plurality of sheets of material in a pile so that a sheet subsequently to be cut will itself serve as a cutting bed for a cutting operation performed upon other sheet material in the pile which is in contact with this cutting bed, performing a cutting operation on said other sheet material, and subsequently utilizing an adjacent piece of sheet material as a cutting bed while performing a cutting operation on the first mentioned sheet. In the disclosed exemplification of my invention, two sheets of material may be placed back to back and one cut or perforated while the other serves as a cutting bed. Thereafter the cut or perforated sheet may be replaced by a

fresh sheet, and the sheet which previously served as a cutting bed may be cut or perforated while the fresh sheet serves as a cutting bed.

In utilizing the invention in this manner it is, for many purposes, unnecessary to provide for an exceedingly nice regulation either of the position or of the depth of the cut. For instance, if the invention is utilized in perforating tips, the pieces of stock will be placed flesh side to flesh side, and such a slight penetration by the perforating tool into the flesh side of the tip which serves as a cutting bed as will insure clean cut perforations in the other tip will do no material harm, even though the perforations made later on do not exactly coincide with the above mentioned slight penetration. On the other hand, where such lack of coincidence is not permissible or where an exact regulation of the depth of cut is essential, the invention may still be utilized by paying due regard to these matters.

In one of its aspects my invention comprises a method of perforating or otherwise cutting stock in accordance with the foregoing.

In another aspect my invention provides an improved machine for cutting or perforating stock. Considered from this viewpoint, it is an object of my invention to provide a machine constructed and arranged to cut or perforate pieces of stock while utilizing other pieces of stock as the cutting bed, said last named pieces of stock being thereafter cut or perforated while fresh pieces serve as the cutting bed.

A feature of the invention consists of the provision in such a machine of novel means for presenting pairs of pieces of stock to the cutting tool with their surfaces in contact so that one piece may serve as a cutting bed while the other is cut, either with or without the provision of means to reverse the position of the pieces of stock in relation to the cutting tool to facilitate the presentation of a series of pairs to the cutting tool. By such reversal, the piece which previously acted as a cutting bed will be brought into cutting relation to the tool while the fresh piece which replaces the cut

piece will be in position then to serve as the cutting bed.

A further feature of my invention consists of the provision of a pair or a series of pairs of reversible grippers, each provided with a pair of individually pivoted mechanically operable clamping jaws to present the stock to and remove it from the cutting tool.

Other features of the invention consist of the provision of means operated in timed relation to a cutting tool to open and close the clamping jaws of the grippers at a receiving and at a discharge station, and of means, exemplified as spring held plungers, to hold said clamping jaws closed except when under the influence of said opening means.

A further feature of the invention consists of the provision of means, illustrated as a suction grapple, to transfer the cut or perforated piece of stock from the opened gripper or grippers to a suitable support on which they may be stacked.

Still another feature of the invention consists of the provision of means controlled by the operation of the cutting tool for insuring the correct presentation of the pieces of stock thereto and for preventing their movement during the cutting operation.

With the above and other objects and features in view, the invention will now be described and explained in connection with the accompanying drawings, and pointed out in the claims. It is to be noted, however, that the machine of the drawings is shown for illustrative purposes only, and that in certain aspects the invention is in no way limited thereto.

In the accompanying drawings,

Fig. 1 is a side elevation of the major portion of the machine with certain parts broken away and other parts in section;

Fig. 2 is a similar view of the remainder of the machine;

Fig. 3 is a plan view showing conveyor mechanism used to present the work to the perforating means and indicating its relation to the same;

Fig. 4 is a detail part of the driving mechanism for the conveyor;

Figs. 5 and 6 are front and side views, respectively, of counterbalance mechanism controlling the work receiving support;

Fig. 7 is a cross-section on the line 7-7 of Fig. 3; and

Fig. 8 is a detail view of an impositive latch for preventing undesired rotation of the work grippers.

The machine is provided with a main frame 10 having an upstanding portion 12 and with a main drive shaft 14. Attached to the main frame and extending to the right therefrom as viewed in Fig. 1 is a supplemental frame member 16.

The main frame is provided with a preferably removable support 20 for the cutting dies, these in the illustrated machine comprising a row of tubular punch members 24 and a pinking die 26 of such conformation, as upon the operation of the machine, to form a row of perforations parallel to the edge of a tip and at the same time to pink the edge of the tip. These dies may conveniently be provided with the usual spring supported stripper 28 to insure the easy separation of the work therefrom after each cycle of operation of the machine. In co-operative relation to the dies and carried by a suitable guideway 30 of the main frame is the co-operating tool part, in this case an adjustable plunger 32 suitably connected, as indicated in Fig. 1, to a crank member 34 of a shaft 36 arranged to be operatively connected to the main drive shaft 14, for instance by a Horton or other one-revolution clutch provided with a dog 38.

To present the work to the perforating or other cutting means the machine is provided with a rotary conveyor 40 pinned to and carried by a shaft 42 journaled in the supplemental frame member 16 and arranged for limited vertical movement therein. A spring 44 surrounding the shaft 42 and housed within a sleeve 46 of the rotary conveyor bears at its lower end against the end of a sleeve 48 carried by the frame member 16 and so tends to hold the conveyor 40 and its shaft 42 at their extreme upper position.

Keyed to the shaft 42 for sliding movement relatively thereto and suitably supported by the supplemental frame member 16 is a bevel gear 50 meshing with a bevel gear 52 carried by a shaft 54 suitably journaled in the main and supplemental frames. This shaft 54 is driven in timed relation to the plunger 30 in any suitable manner as by the intermittent grip device of Fig. 4 which receives its power through crank 56 from shaft 57 journaled in the main frame and connected as by a Horton clutch provided with a dog 58 to a spur gear 60 driven through a suitable train of gearing from gear 62 on the main drive shaft. The intermittent grip device referred to may consist of a connecting rod 64 journaled at one end on the crank pin 56 and connected at its other end to a lever 66 fulcrumed on the shaft 54. Carried by the end of the connecting rod 64 remote from the crank pin 56 is a clutch member 68 co-operating with a clutch disk 70 carried by shaft 54 and so arranged as to drive the shaft 54 step by step in a clockwise direction as viewed in Fig. 4. This intermittent grip device and the gears 50 and 52 are so arranged that shaft 42 and the conveyor carried thereby are moved one-quarter of a revolution for each reciprocation of the plunger 32.

The conveyor 40 is illustrated as provided

with four arms 80 each carrying a gripper 82 comprising a head 84 having a bevel gear 86 rigidly connected therewith. A pair of clamping jaws 88 are carried by each gripper head, each jaw being pivoted as at 90 to the head of a plunger 92 and being provided with a pair of fingers 96 engaging a pin 98 carried by the head 84, as shown in Fig. 1, so that upon endwise movement of the plunger 92, the jaw 88 will be swung from a horizontal to a vertical position, rotating approximately about the pin 90. Two of the plungers 92, one for each gripper jaw of each clamp, are housed within each sleeve 100, one of these sleeves having a suitable bearing in each arm 80 of the conveyor and being formed rigid with the gear 86 and head 84. A spring 102 surrounding each plunger 92 normally tends to hold the gripper jaws in approximately a horizontal position with the work clamped therebetween.

The work is thus resiliently supported for presentation to and for receiving the action of the tool parts. It will be evident, however, that upon a movement of a plunger 92 away from the shaft 42 of the conveyor, the corresponding gripper jaw will be raised and will be held so raised as long, and only as long, as the plunger is held in its displaced position.

The illustrated machine is provided with a loading station indicated at 104 and with a discharge station shown at 106 in Fig. 3 and the latter being shown more fully in elevation in Fig. 2. At these stations it is desirable to raise the upper gripper jaw so that the work may be placed in or removed from the conveyor. For this purpose the plunger 32 is provided with an arm 108 overhanging the conveyor 40 and provided at its end with a cam in the form of a cross-shaped projection 110 arranged to co-operate with a similar depression at the upper end of sleeve 46 of the conveyor so that upon the downward movement of the plunger, the conveyor will be correspondingly depressed. The projection 110 is made, as clearly shown in Fig. 1, with a taper so that, in co-operation with the depression at the upper end of sleeve 46 it serves to insure the correct presentation of the stock to the perforating means as well as to prevent undesired movement of the stock during the perforating operation.

Pivoted to each arm of the conveyor is a finger 112 so formed as to contact with the end of the uppermost plunger 92. Adjacent to the receiving and discharging stations the supplemental frame is provided with pins or other suitable projections 114 positioned to co-operate with arms 116 of fingers 112 when the respective fingers reach those positions with the result that the depression of the conveyor 40 rocks the finger 112 in such a manner as to thrust plunger 92 forward

against the action of spring 102 so as to move the upper clamping jaw to the raised position of Fig. 7. When the gripper at the receiving station is in this condition, a piece of stock can be placed by the operative in position on the lower clamping jaw, a suitable work support 118 and an edge gage 120' being there provided to facilitate the correct placing of the work.

A gear segment 120 is rigidly supported as by a bracket 121 carried by the frame member 16 in such a position as, in co-operation with the bevel gears 86, to rotate each gripper through half a revolution as it passes thereby. To prevent undesired rotation of the grippers at other times, each arm 80 of the carrier carries an impositive latch mechanism shown in detail in Fig. 8. This mechanism comprises a bar 122 pressed against one of a pair of flattened portions 124 of the sleeve 100, as by suitable springs 126. Each bar 122 is shown as provided with a pair of pins 128 movable in guides 130 carried by arms 80. The tension of springs 126 is such as to hold the bar 122 against the surfaces 124 with sufficient force to prevent any accidental rotation of the sleeve 100 and the gripper, but at the same time permits the rotation of the grippers when, during the rotation of the conveyor, a gear 86 comes into engagement with the rack 120.

Suitable mechanism, shown particularly in Figs. 2, 5 and 6, is provided for removing the finished work from the conveyor and stacking it at the discharging station, as will be more fully hereinafter described.

The illustrated machine is controlled through a treadle 140 (see Fig. 1) connected by a rod 142 to a bell crank lever 144 fulcrumed at 146 to the main frame and provided with a spring 147 tending to hold the treadle and the bell crank lever in inoperative position. Connected to a curved arm 148 of the bell crank lever is a link 150 pivoted at its other end to a lever 152, the lever being fulcrumed at 154 to the main frame and having an end 156 arranged to be moved into and out of the path of movement of the clutch dog 58 in accordance with the position of the treadle. The driven member of the clutch thus controlled by the movement of lever 156 carries a cam having a rise 158 in the path of movement of which is a roll 160 carried by a bell crank lever 162 pivoted at 164 to the main frame and connected at its other end to a lever 166 also fulcrumed on the main frame and having an end 168 extending into the path of movement of the clutch dog 38.

Pivoted to the arm 170 of bell crank lever 144 is a rod 172 carrying at its other end a spring-pressed latch member 174 having a beveled end 176 co-operating with a similar shaped groove 178 formed around the shaft

42 near its lower end. A spring 180 surrounding the stem 181 of latch member 174 tends to hold the beveled end of the latter in groove 178 so as to prevent upward movement of shaft 42 and the conveyor.

When the treadle 140 is depressed the end 156 of lever 152 is withdrawn from contact with the clutch dog 58 whereupon the clutch operatively connects shaft 57 with
 10 gear 60 so that the conveyor 40 is rotated a quarter of a revolution. The depression of the treadle also withdraws the end 176 of latch member 174 from groove 178 so that the conveyor 40 is free to rise, which it immediately does under the influence of spring
 15 44. This, of course, results in the closing of the open gripper jaws and prevents any undesired movement of the work relative to the grippers. By the time that the rotary conveyor has made a quarter revolution the rise 158 of the cam carried by the clutch controlling the rotation of shaft 57 engages the roll 160 and rocks bell crank
 20 lever 162 so as to withdraw the end of lever 166 from clutch dog 38. This renders operative the clutch connecting shaft 36 with the main drive shaft and reciprocates plunger 32 to perforate or otherwise cut the work. The downward movement of the
 30 plunger depresses the conveyor 40 so that the grippers which by the movement of the conveyor have been brought to the receiving and discharging stations are opened and the conveyor is again latched in its lower position by the engagement of latch member 174 with groove 178. Upon the release of the treadle, spring 147 ensures the return of bell crank lever 144 and the parts associated therewith into such position that
 40 the shafts 57 and 36 come to rest after each has made a single revolution.

The means for removing the finished work at the discharge station, as shown in Fig. 2, comprises a suction grapple 200 formed at
 45 the lower end of an arm 202, the latter being carried by a pair of links 204, 206, pivoted to a standard 208. Rigidly connected to link 204 is a bevel gear 210 meshing with a similar gear 212 carried at the end of a shaft 214 suitably journaled in bearings carried by the main and supplemental frames. The end of the shaft 214 remote from the suction grapple carries a pinion 216 meshing with a rack 218 mounted for sliding movement in guides carried by the main frame and provided at its lower end with a slot-
 50 ted arm 220 the slot of which engages a crank pin 222 carried by shaft 57. The throw of crank pin 222 and the size of pinion 216 are such that during each complete rotation of shaft 57, shaft 214 makes two semi-rotations in opposite directions with the result that the suction grapple 200 is moved from the position of Fig. 2 into position to
 60 pick up a tip at the discharging station and

back again to carry it to a work support 224 carried by a plunger 225 and deposit it upon the top of the pile or stack formed thereon.

Suction for the grapple 200 may be provided in any suitable way as, for instance, by a pump 226 connected through a pipe 228 with an equalizing chamber 230 carried by or formed as part of the supplemental frame member 16. The chamber 230 is connected
 75 through a passage 232 with a valve 234 of any suitable form, the latter being provided with an arm 236 connected through a link 238 with a 3-armed lever 240 fulcrumed at 242 to a bracket 244 carried by frame member 16. The other arms of this 3-armed lever are provided each with an adjustable contact member such as a set screw 245 positioned in the path of movement of the link 204 so that as the suction grapple 200
 85 reaches its position at either end of its path of movement, the lever 240 will be rocked and will correspondingly rock the arm 236 to open or close valve 234, as the case may be. The valve is so arranged that as the suction grapple comes into contact with the tip carried by the gripper, the valve is opened and suction is applied to the grapple through suitable passageways indicated at 246, 248, 250 in Fig. 2. Thus the tip is
 95 caused to adhere to the grapple while the latter moves over and transfers the tip to the stack carried by support 224. As the tip reaches the stack, arm 236 is swung back to cut off the suction, the valve being so formed as at that time to open the passage 246 to atmospheric pressure.

Arm 202 and standard 208 are suitably offset so that the grapple 200 has a clear path of movement.

The plunger 225 is mounted for vertical movement in a suitable guideway 252 carried by frame member 16 and is provided at its lower extremity with a groove 254 receiving a cord or cable 256 passing over pulleys 258 carried by a bracket 260 supported by frame member 16, appropriate means such as a weight or weights 259 being attached to cord 256 to hold the support 224 in elevated position. A one-way catch 262
 110 engaging plunger 225 permits the support 224 to move downwardly under the influence of the pressure exerted by the suction grapple 200 in depositing a tip on the stack but prevents upward movement thereof under the influence of weights 259 so that the top of the stack is at all times maintained in position to receive a tip.

The present invention contemplates the utilization of one blank or article to be perforated or otherwise cut as a cutting bed for another similar article, that article which serves as a cutting bed being later on perforated while a fresh article is used as a cutting bed. The described machine is
 125 130

adapted for use in this manner, a pair of tips being carried back to back between the clamping jaws of the gripper to the perforating mechanism. The throw of the plunger of the latter is so adjusted that the perforating mechanism is caused to perforate the tip adjacent thereto and barely to penetrate the back of the more remote tip. Thus the more remote tip acts as a cutting bed and serves to insure perforations of a high quality and with clean cut edges similar to those obtained with a paper backing strip. During the next cycle of operation of the machine, the gripper carrying the tip which has just been perforated is rotated through 180° by the engagement of its gear 86 with rack 120 and at the conclusion of still another cycle of operation is brought to the discharging station. It will be noted that the tip at the time of its perforation by the illustrated machine is the lower one of a pile but by the time it reaches the discharge station, the pile has been reversed, so that the perforated tip is the upper one of the pile. It is thus in position to be removed by the suction grapple, the lower tip being held in position at this time by suction exerted through an opening 264 in the work support 266 of the discharge station and controlled by valve 234 in the same manner that the suction of the grapple is controlled. When, now, the treadle is depressed to start another cycle of operations, the open gripper at the discharge station is closed and that gripper moves to the receiving station with but a single tip held therein. This tip, however, is one which has previously served as a cutting bed but as yet is unperforated. It is, moreover, now in perforating position with its back or flesh side up. Thus the tip reaches the receiving station and, as the machine finishes the last mentioned cycle of operation, the gripper which is just reaching the receiving station is opened and the operative places a new tip therein with its flesh side down. Upon further operation of the machine, the gripper is closed and these two tips move on to the punching position. The tip which has previously served as a cutting bed is now perforated while the new tip performs the function of the cutting bed.

It is to be understood that in this specification the terms "tip", "flesh side", "punch", "pink", "perforate", etc., are used in an illustrative rather than in a restrictive sense, and that it is intended that these terms shall have a broad range of equivalents, limited only as may be required by the prior art, except where in any particular case the contrary is clearly apparent from the context. It is evident, of course, that the work operated upon is not necessarily a tip and that only when the article is of leather will there be a flesh side. The operation performed,

moreover, is not limited to perforating and pinking, but may be cutting of other kinds. Moreover, while the described machine is manually fed and controlled, it should be distinctly understood that this is for illustrative purposes only and that the invention and the appended claims are not to be construed as limited thereby.

Having described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. The process of cutting sheet material which comprises the steps of placing two sheets of material with their surfaces in contact, cutting through the first sheet and part way through the second, placing a third sheet in contact with the cut side of said second sheet, and cutting through said second sheet and part way through said third sheet.

2. The process of cutting sheet material which comprises placing two sheets of material with their surfaces in contact, performing a cutting operation upon the first sheet while utilizing the adjacent surface of the second sheet as a cutting bed to receive the thrust of the cutter, placing a third sheet of material in contact with that face of the second sheet which previously received the thrust of the cutter, and performing a cutting operation upon the second sheet while utilizing the adjacent surface of the third sheet to receive the thrust of the cutter.

3. The process of cutting sheet material which comprises successively positioning sheets of material to serve as cutting surfaces in receiving the cutting edge of a cutter, and performing cutting operations upon successive sheets of material, each of which has previously served as a cutting surface, while each in turn is positioned with that one of its surfaces which previously served as a cutting surface in contacting relation with the surface of a fresh sheet.

4. The process of perforating which consists in positioning two pieces of stock with their unfinished surfaces back to back and operating a perforating tool so as to perforate one of the pieces and slightly to penetrate the unfinished surface of the other piece which thereby acts as a backing.

5. The process of perforating which consists in positioning two pieces of stock back to back and operating a perforating tool so as to perforate one of the pieces and slightly to penetrate the other piece, then placing the slightly penetrated piece and a fresh piece back to back and operating the perforating tool to perforate the previously slightly penetrated piece and slightly to penetrate the fresh piece.

6. The process of perforating which consists in positioning two pieces of stock with

- their surfaces in contact and operating a perforating tool so as to perforate one of the pieces and slightly to penetrate the other piece, then placing a fresh piece in contact with the cut side of the slightly penetrated piece and operating the perforating tool to perforate the previously slightly penetrated piece and slightly to penetrate the fresh piece.
- 10 7. The process of cutting blanks which consists in placing a pair of blanks in surface contact, operating a cutting tool on one of them while utilizing the other as a backing and reversing said other blank for cutting while utilizing a fresh blank as a backing.
- 15 8. A machine for cutting sheet material for shoe parts having a cutting tool, means for supporting two pieces of stock with their flesh surfaces in contact and in operative relation to the cutting tool, and means for operating the cutting tool to cut all the way through one of the pieces of stock and slightly into the flesh surface of the other piece.
- 20 9. In a machine for punching shoe parts, the combination of a punch and punch block, a conveyor arranged to carry a pair of pieces of stock arranged back to back, between the punch and punch block, and means relatively to reciprocate the punch and punch block to cut one of the pieces of stock while the other piece serves as a cutting bed.
- 25 10. In a machine of the class described, the combination of a cutting tool, a gripper for holding two pieces of stock with their surfaces in contact and presenting them to the cutting tool, and means for operating the cutting tool to cut through one of the pieces of stock and slightly into the other piece.
- 30 11. In a machine of the class described, a punch, a punch block, a conveyor for carrying two contacting pieces of stock between the punch and punch block, means for relatively moving the punch and punch block to cut one of the pieces of stock while the other acts as a backing, and means for reversing the pieces of stock so that the piece that formerly served as a backing may subsequently be cut.
- 35 12. In a machine of the class described, the combination of a punch, a movable carrier for said punch, a conveyor having a gripper mounted thereon for supporting two pieces of stock with their surfaces in contact and moving them into and out of operative relation to the punch in timed relation to the movement of the punch carrier, means to move the carrier to cause the punch to operate, and means to rotate the gripper through half a revolution after its removal from operative relation to the punch to reverse the position of the pieces of stock.
- 40 13. In a machine of the class described, the combination of a punch, a conveyor having a gripper mounted thereon for presenting pairs of pieces of stock to the punch, means to operate said punch to cut through one of the pieces of stock held by said gripper, means to move said gripper from the punch, and means to rotate the gripper through half a revolution to reverse the position of the pieces of stock.
- 45 14. In a machine of the class described, the combination of an operating tool, a conveyor having a gripper mounted thereon for moving a piece of stock to and from the tool, and means to rotate the gripper through half a revolution to reverse the position of the piece of stock.
- 50 15. In a perforating machine, the combination of a punch, a conveyor having a gripper mounted thereon for moving pieces of stock to and from the punch, means to rotate the gripper through half a revolution to reverse the position of the pieces of stock, and an impositive latch tending to prevent said rotation of the gripper.
- 55 16. A machine of the class described having, in combination, a rotary conveyor having provision for movement in the line of its axis, a plurality of grippers, each having a pair of clamping jaws mounted on said conveyor for rotation about axes radially thereof, and means controlled by the movement of the conveyor in the line of its axis to move a clamping jaw of a gripper from clamping to releasing and from releasing to clamping position.
- 60 17. In a machine of the class described, the combination of a tool for operating upon pieces of stock, a support, a sleeve journaled therein, a gripper carried by the sleeve to transfer pieces of stock to and from the tool, and provided with a pair of pivoted clamping jaws, a latch arranged normally to maintain said sleeve and grippers in a determined relation to said tool, and means to rotate said sleeve and grippers through half a revolution to reverse the position of the pieces of stock.
- 65 18. In a machine of the class described, the combination of a tool for operating upon pieces of stock, a support, a sleeve journaled therein, a gripper carried by the sleeve to transfer pieces of stock to and from the tool and provided with a pair of pivoted clamping jaws, and an impositive latch arranged normally to maintain said sleeve and grippers in a determined relation to said tool.
- 70 19. In a perforating machine, the combination of a punch, a support, a sleeve journaled in said support and having a flat surface formed on a portion of its circumference, a gripper carried by said sleeve and operable to transfer pieces of stock to and from said punch, a shoe carried by said support in contacting relation with said sleeve, and means for yieldingly pressing said shoe against the flat surface of said sleeve im-

positively to hold said sleeve against rotation with respect to said support.

20. In a machine of the class described, the combination of a shaft, a conveyor supported for longitudinal and rotary movement therewith, a gripper mounted on said conveyor and provided with a movable clamping jaw, a plunger for moving said jaw, and a finger arranged to be operated by the longitudinal movement of the conveyor to press the plunger so that the latter moves said jaw from clamping position.

21. In a machine of the class described, a conveyor supported for longitudinal and rotary movement, a gripper mounted on said conveyor and provided with a movable clamping jaw, and a plunger arranged to move said jaw from clamping position upon the longitudinal movement of the conveyor.

22. In a machine of the class described, the combination of a punch provided with a reciprocable plunger, and a conveyor having a plurality of work holders for moving pieces of stock to and from punching position, said plunger and said conveyor being provided with co-operating cam surfaces to control the accurate positioning of the stock relatively to the punch.

23. In a machine of the class described, the combination of a punch provided with a reciprocable plunger, and a conveyor having a work holder for moving pieces of stock to and from punching position, said plunger and said conveyor being provided with means to control the accurate positioning of the stock relatively to the punch, and to prevent movement of the stock transversely of the punch during the operation of the latter.

24. In a machine of the class described, the combination of a gripper for holding two pieces of stock with their surfaces in contact, a cutting tool, means for moving the gripper to present the pieces of stock to the cutting tool, means for operating the cutting tool to cut through one of the pieces of stock and slightly into the other piece, means for rotating the gripper through half a revolution to reverse the position of the two pieces of stock, and means for removing from the gripper the piece of stock which has been cut through while leaving the other piece in the gripper.

25. In a machine of the class described, the combination of a gripper for holding two pieces of stock with their surfaces in contact, a cutting tool, means for moving the gripper to present the pieces of stock to the cutting tool, means for operating the cutting tool to cut through one of the pieces of stock and slightly into the other piece, means for rotating the gripper through half a revolution to reverse the position of the two pieces of stock, a suction grapple, and means for operating said suction grapple to transfer the piece of stock which has been

cut through from the gripper while leaving the other piece in the gripper.

26. A machine of the class described having, in combination, a main frame, a movable tool carrier mounted on said frame, means for moving said carrier, a tool arranged to be operated by the movement of said carrier, a plurality of grippers each comprising a pair of clamping jaws arranged to carry pieces of stock to and from said cutting tool and arranged so that while one gripper is presenting stock in operative relation to the cutting tool another gripper is in discharging position, and means controlled by the movement of said tool carrier for releasing one of the jaws of the last named gripper to permit the discharge of a piece of stock therefrom.

27. A machine of the class described having, in combination, a main frame, a tool carrier mounted for movement on said frame, means for operatively moving said carrier, a tool arranged to be operated by the movements of said carrier, a plurality of grippers each comprising a pair of clamping jaws arranged to carry pieces of stock to and from said cutting tool and arranged so that while one gripper is presenting stock in operative relation to the cutting tool another gripper is in discharging position, means controlled by the movement of said tool carrier for releasing one of the jaws of the last named gripper, and means for removing a piece of stock from said last named gripper.

28. A machine of the class described having, in combination, a cutting tool provided with a reciprocable plunger, a rotary conveyor, a plurality of grippers mounted on said conveyor each comprising a pair of pivoted clamping jaws, the jaws of the grippers having plungers movable to swing the jaws into and out of clamping relation, a spring for each plunger tending to hold that plunger in clamping position, a gripper loading station, a gripper unloading station, means for rotating said conveyor to present the grippers successively to the loading station, the cutting tool and the unloading station, and means controlled by the reciprocation of the plunger of said cutting tool for pressing a plunger of each gripper which at that time is at the loading station or at the unloading station against the action of its spring to swing a jaw of each said gripper out of clamping position.

29. A machine of the class described having, in combination, a cutting tool provided with a reciprocable plunger, a rotary conveyor, a plurality of grippers mounted on said conveyor for rotation about axes radial of said conveyor each comprising a pair of pivoted clamping jaws; the jaws of the grippers having plungers movable to swing the jaws into and out of clamp-

ing relation, a spring for each plunger tending to hold that plunger in clamping position, a gripper loading station, a gripper unloading station, means for rotating said conveyor to present the grippers successively to the loading station, the cutting tool and the unloading station, and means controlled by the reciprocation of the plunger of said cutting tool for pressing a plunger of each gripper which at that time is at the loading station or at the unloading station against the action of its spring to swing a jaw of each said gripper out of clamping position.

30. A machine of the class described having, in combination, a cutting tool provided with a reciprocable plunger, a rotary conveyor, a plurality of grippers, each comprising a pair of pivoted clamping jaws, mounted on said conveyor for rotation about axes radial of said conveyor, the jaws of the grippers having plungers movable to swing the jaws into and out of clamping relation, a spring for each plunger tending to hold that plunger in clamping position, a gripper loading station, a gripper unloading station, means located adjacent to the path of the conveyor between the cutting tool and one of said stations for rotating each gripper through half a revolution as it passes thereby, means for rotating said conveyor to present the grippers successively to the loading station, the cutting tool and the unloading station, and means controlled by the reciprocation of the plunger of said cutting tool for pressing a plunger of each gripper which at that time is at the loading station or at the unloading station against its spring to swing a jaw of each said gripper out of clamping position.

31. A machine of the class described having, in combination, a main frame, a plunger mounted for sliding movement with respect thereto, means for reciprocating said plunger, a cutting tool arranged opposite the plunger to be operated by the reciprocation of said plunger, a conveyor, and a plurality of grippers mounted on said conveyor, each comprising a pair of clamping jaws for carrying pieces of stock to and from said cutting tool and arranged so that while one gripper is presenting stock in operative relation to the cutting tool, another gripper is at a loading station.

32. A machine of the class described having, in combination, a main frame, a tool carrier mounted for operating movement with respect thereto, means for operating said carrier, a tool arranged to be operated by the movement of said carrier, a plurality of grippers each comprising a pair of clamping jaws for carrying pieces of stock to and from said tool and arranged so that while one gripper is presenting stock in operative relation to the tool, another gripper is at a

loading station, and means operating in timed relation to the movement of said tool carrier for releasing one of the jaws of the last named gripper at the loading station to permit the placing of a piece of stock on the other jaw thereof.

33. A machine of the class described having, in combination, a main frame, a plunger mounted for sliding movement with respect thereto, means for reciprocating said plunger, a cutting tool arranged to be operated by the reciprocation of said plunger, a plurality of grippers each comprising a pair of clamping jaws for carrying pieces of stock to and from said cutting tool and arranged so that while one gripper is presenting stock in operative relation to the cutting tool, another gripper is at a loading station, means controlled by the movement of said plunger for releasing one of the jaws of the last named gripper to permit the placing of a piece of stock on the other jaw thereof, and a gage at said loading station for positioning the stock relatively to the last named gripper jaw.

34. A machine of the class described having, in combination, a main frame, a plunger mounted for sliding movement with respect thereto, means for reciprocating said plunger, a cutting tool arranged to be operated by the reciprocation of said plunger, a plurality of grippers each comprising a pair of clamping jaws for carrying pieces of stock to and from said cutting tool and arranged so that while one gripper is presenting stock in operative relation to the cutting tool another gripper is in discharging position, means controlled by the movement of said plunger for releasing one of the jaws of the last named gripper, and a suction grapple for removing a piece of stock from said last named gripper.

35. In a machine of the class described, a relatively movable punch block and punch, a conveyor having fixed and movable jaws for gripping the work, means for actuating the conveyor to carry the work between the punch and punch block, and means operated by the relative movement of said punch block and punch for actuating said movable jaws.

36. In a perforating machine, the combination of an operating tool, a movable carrier therefor, a conveyor arranged to feed pieces of stock to and from the tool, a support for pieces of stock, a grapple, and mechanism arranged to move the tool carrier and to operate the grapple in timed relation therewith to transfer pieces of stock from the conveyor to the support.

37. In a machine of the class described, the combination of a perforating tool, a conveyor for carrying pieces of stock into and out of perforating position, a support for a pile of pieces of stock, and a suction

grapple arranged to transfer the pieces of stock from the conveyor to the support.

38. In a machine of the class described, the combination of a perforating tool, a conveyor, a gripper mounted thereon for carrying pieces of stock to and from the perforating tool, a support for a pile of pieces of stock, and means to transfer the pieces of stock from the gripper of the conveyor to the support.

39. In a machine of the class described, the combination of a perforating tool, a conveyor, a gripper mounted thereon for carrying pieces of stock to and from the perforating tool, a support for a pile of pieces of stock, and a suction grapple arranged to transfer the pieces of stock from the gripper of the conveyor to the support.

40. In a machine of the class described, the combination of a plunger, a support carried thereby, a one-way latch permitting the plunger to move downwardly but restraining it from upward movement, means tending to move the plunger upward against the resistance of said latch, a punch, and means to transfer stock from the punch to said support.

41. In a machine of the class described, the combination of a plunger, a support carried thereby, a one-way latch permitting the plunger to move downwardly but restraining it from upward movement, means tending to move the plunger upward against the resistance of said latch, a punch, and a grapple to transfer stock which has been operated upon by said punch to said support.

42. In a machine of the class described, the combination of a plunger, a support carried thereby, means tending to move the plunger upward, a punch, and a grapple to transfer stock which has been operated upon by said punch to said support.

43. In a machine of the class described, the combination of a suction grapple, a valve for controlling the suction of said grapple, means for moving said grapple to transfer stock carried thereby from one position to another, a lever for opening and closing said valve, and a member in the path of movement of a part moving with said grapple and operatively connected to said lever to open and close said valve in accordance with the position of said grapple.

44. In a machine of the class described, the combination of a conveyor for carrying pieces of stock in pairs from an operating mechanism to a discharge station, and suction mechanism operating on both sides of the pair of pieces to separate one of them from the other.

45. In a machine of the class described, mechanism for separating a pair of blanks held in surface contact comprising a suction device operating to hold one of the blanks against a support and a movable

suction device to carry the other blank away from the first.

46. The process of perforating which consists in placing a pair of blanks with their surfaces in contact, punching one blank while utilizing the second blank as a backing, reversing said second blank and then punching it.

47. The process of cutting sheet material, which consists in placing a plurality of sheets of material in a pile, and performing cutting operations upon the endmost sheets of the pile while utilizing as a cutting bed for each cutting operation the sheet adjacent to the end sheet upon which that cutting operation is being performed.

48. The process of cutting sheet material which comprises the steps of placing a plurality of sheets of material in a pile, cutting through one of the outside sheets of the pile while using the adjacent sheet as a cutting bed to receive the thrust of the cutter and subsequently cutting through the other outside sheet and using an adjacent sheet as a cutting bed.

49. The process of operating upon a plurality of sheets of material arranged in a pile which consists in presenting the pile of said sheets to an operating tool, causing said tool to operate upon one or more of the sheets and then reversing the pile of sheets for a further operation.

50. The process of operating upon a plurality of sheets of material arranged in a pile which consists in presenting said pile to an operating tool, causing said tool to operate on one or more of said sheets, removing from said pile the sheet or sheets which have been operated on by the tool, placing a sheet or sheets in the position occupied by those which have been removed, and returning the pile to the operating tool in position for the tool to operate upon a sheet constituting part of the original pile which was not operated upon by the said tool in the first operation.

51. The process of perforating which consists in positioning two pieces of stock back to back, operating a perforating tool to perforate one of said pieces while utilizing the other piece as a cutting bed, replacing the perforated piece with a fresh piece and presenting said pieces to the tool for operation upon that piece which first served as a cutting bed while the fresh piece now serves as a cutting bed.

52. In a machine of the class described, a relatively movable punch block and punch, a conveyor having relatively movable jaws for gripping the work, means for actuating the conveyor to carry the work between the punch and punch block, and means operated by the relative movement of the punch block and punch for causing relative movement of certain coacting jaws of said conveyor.

53. In a machine of the class described, a work conveyor movable to bring the work to a plurality of stations, a pair of work holding gripper jaws, means for movably supporting said gripper jaws on said conveyor constructed and arranged to allow movement of the gripper jaws toward and away from each other and to permit the position of said jaws to be interchanged so as to reverse the position of the work held by the jaws.

54. In a machine of the class described, a plurality of operating stations, a conveyor constructed and arranged to carry the work from one station to another, a pair of co-operating gripper jaws pivoted to said conveyor for movement toward and away from work held therebetween and means arranged to open one of said jaws at one station and another of said jaws at another station.

55. In a machine of the class described, a plurality of operating stations, a conveyor

constructed and arranged to carry the work from one station to another, a gripper head rotatably mounted on said conveyor, a pair of co-operating gripper jaws pivotally mounted on said head for movement toward and away from work held therebetween means for rotating said head to interchange the position of the work, and means for opening a jaw to receive or release the work.

56. In a machine of the class described, co-operating tool parts, and means for presenting work to said tool parts comprising a pair of co-operating gripper jaws pivotally mounted for movement toward and away from work held therebetween, and resilient means urging each jaw toward the other whereby the work is resiliently supported for receiving the action of the tool parts.

In testimony whereof I have signed my name to this specification.

FREDERICK M. FURBER.