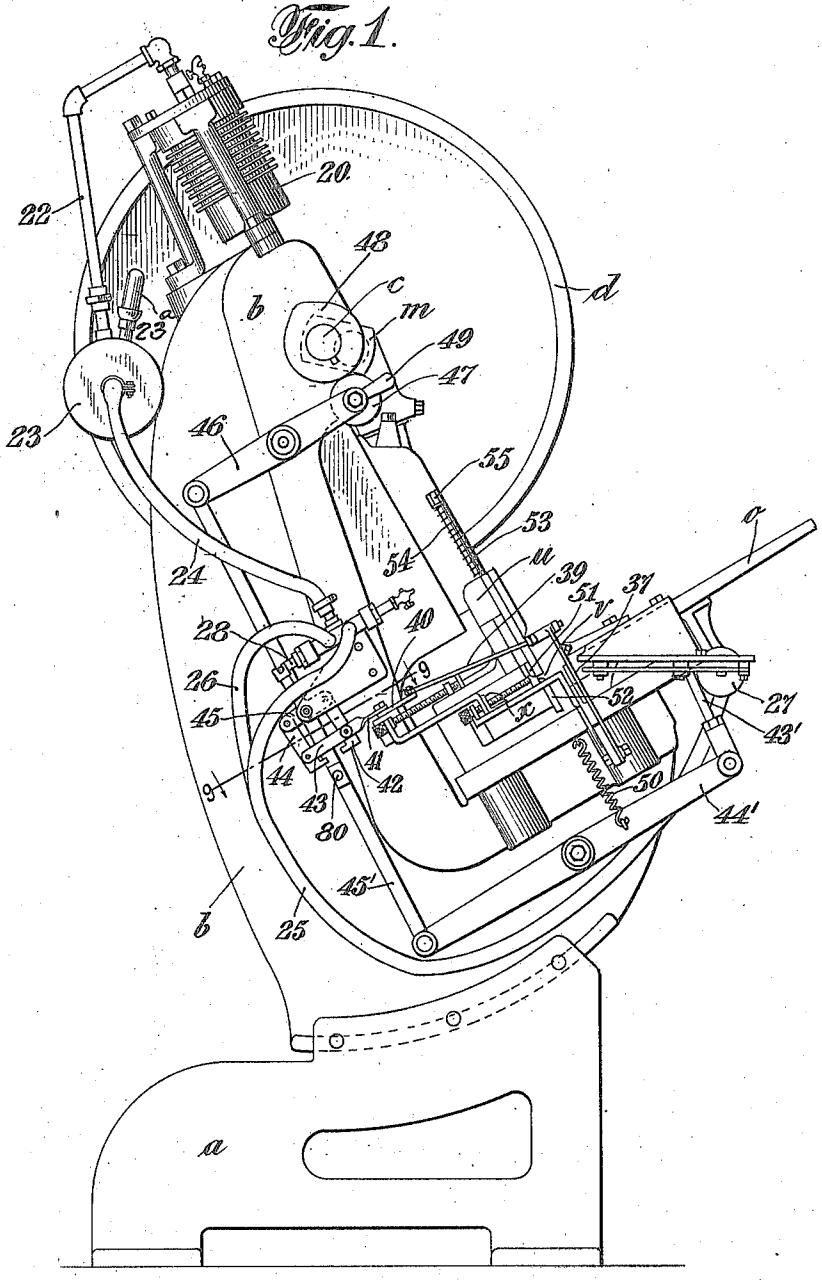
Feb. 20, 1923. 1,445,718

H. M. ROSS

MACHINE FOR OPERATING ON SHEET MATERIAL

Filed Feb. 23, 1921 4 sheets-sheet 1

Fig. 1.



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MACHINE FOR OPERATING ON SHEET MATERIAL

Filed Feb. 23, 1921 4 sheets-sheet 2

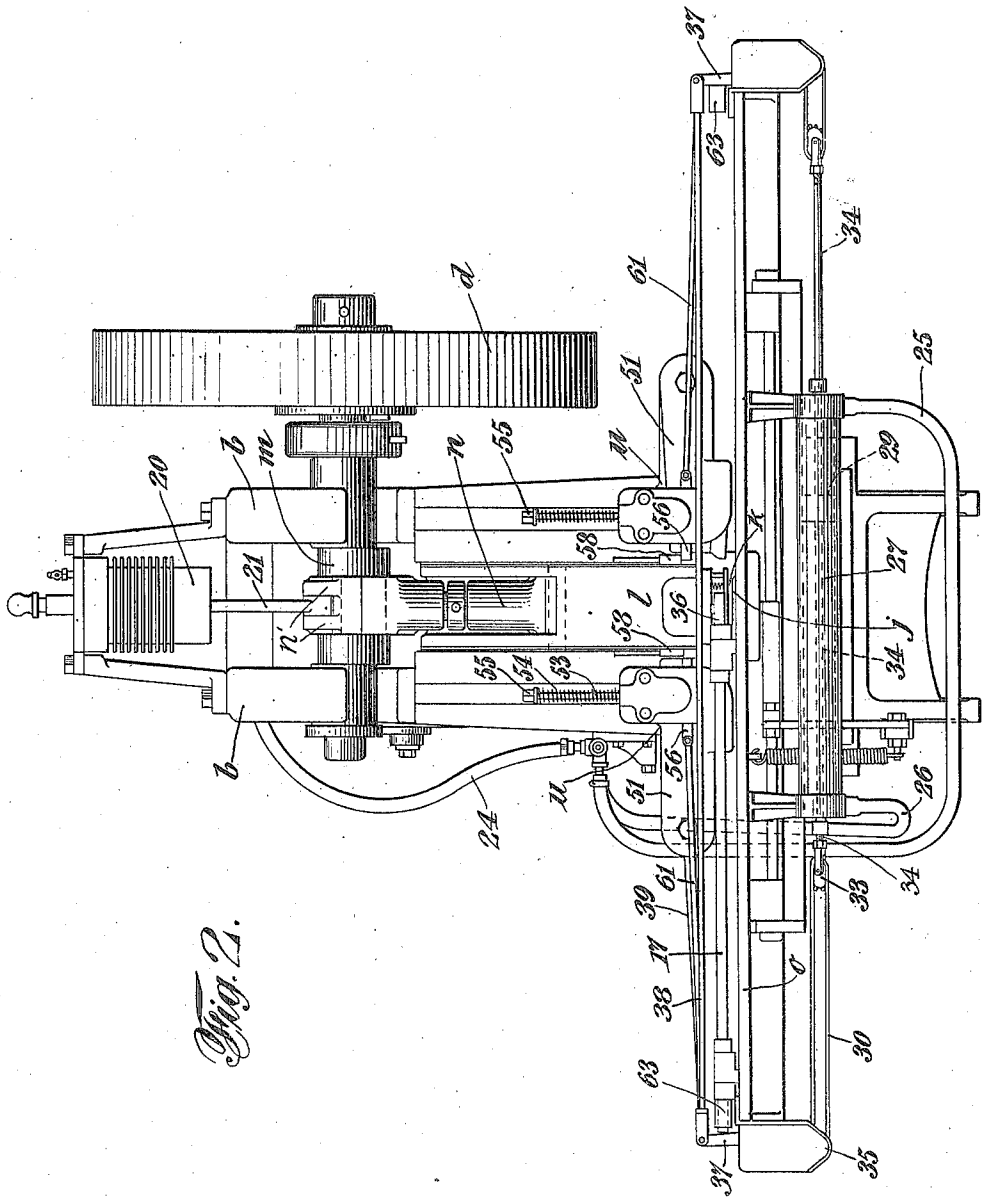

Fig. 2.

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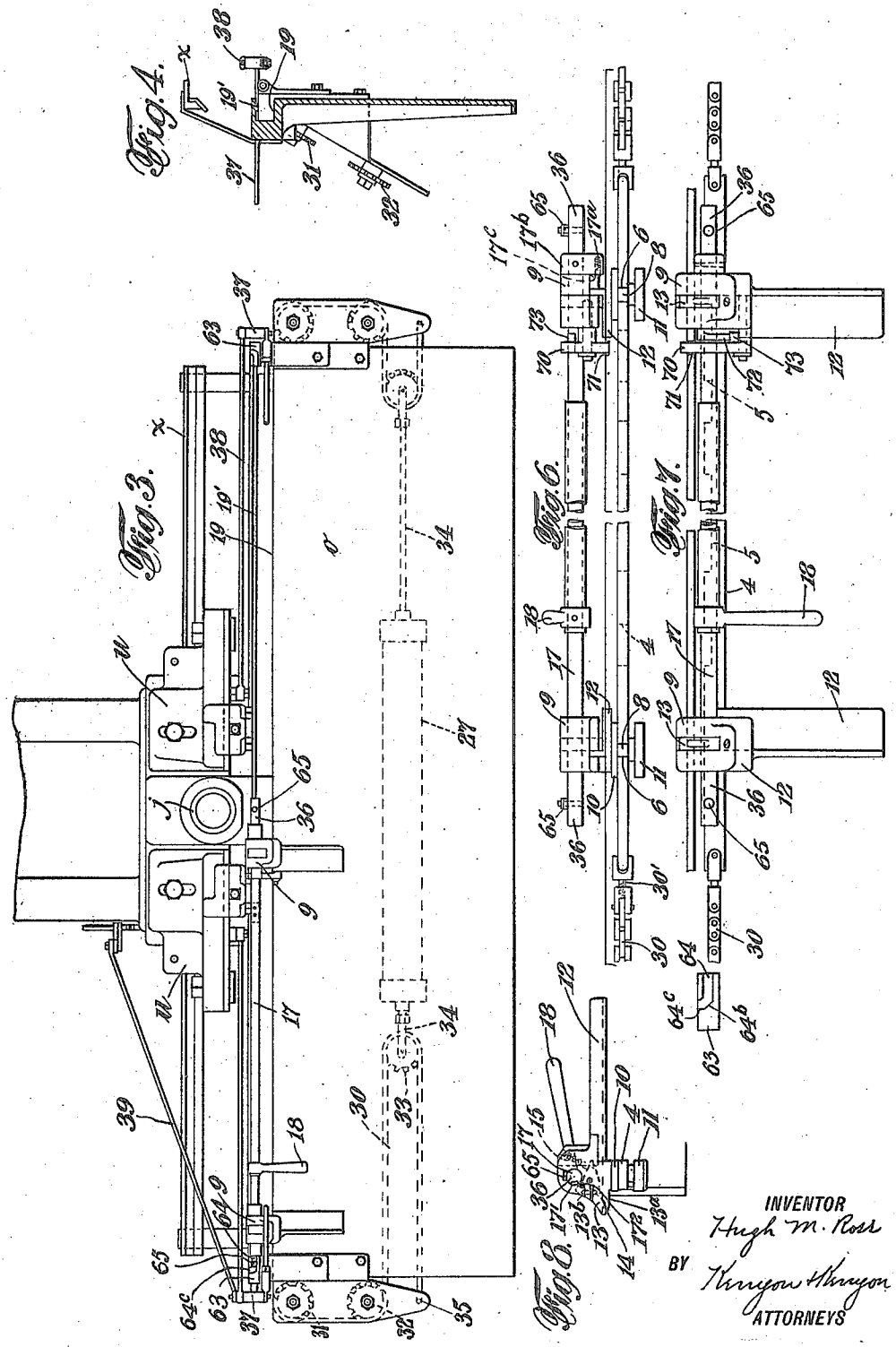
MACHINE FOR OPERATING ON SHEET MATERIAL

Filed Feb. 23, 1921 4 sheets-sheet 3



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Filed Feb. 23, 1921 4 sheets-sheet 4

Fig. 9.

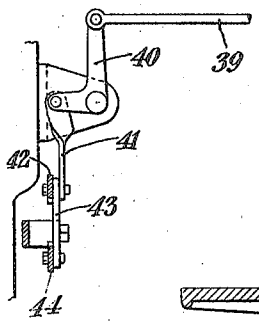


Fig. 5.

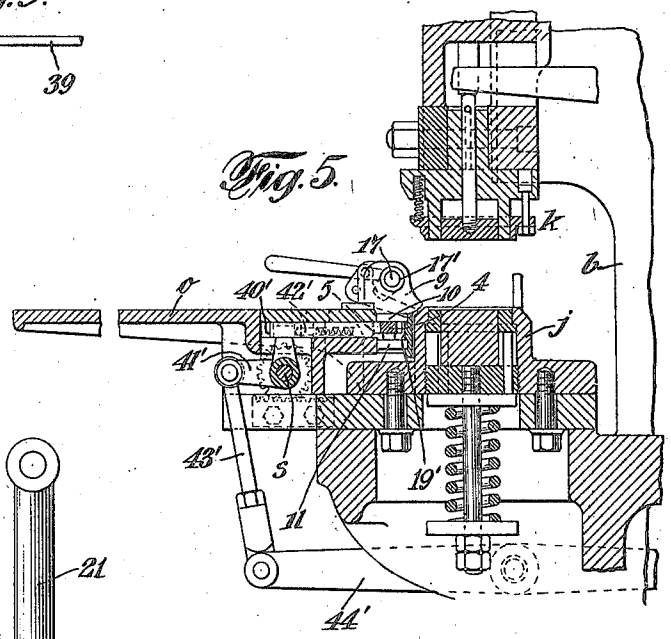


Fig. 10.

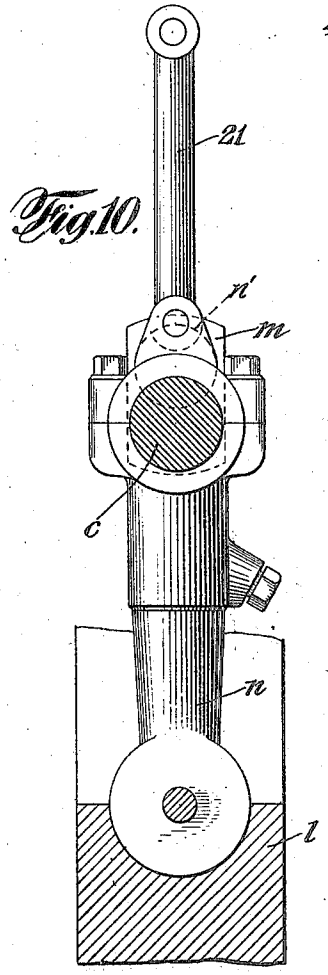
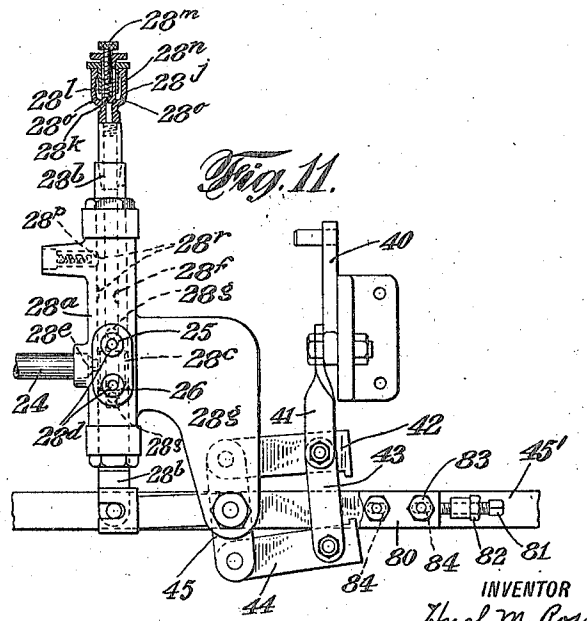


Fig. 11.



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Patented Feb. 20, 1923. 1,445,718

UNITED STATES PATENT OFFICE.

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MACHINE FOR OPERATING ON SHEET MATERIAL.

Application filed February 23, 1921. Serial No. 447,152.

To all whom it may concern:

Be it known that I, HUGH M. ROSS, a citizen of the United States, residing at Woodhaven, in the county of Queens and State of New York, have invented new and useful Improvements in Machines for Operating on Sheet Material, of which the following is a specification.

My invention relates to machines for operating on sheet material, such as shown in the United States patent to Calleson No. 1,080,047, dated December 2nd, 1913. In such machines an operation performing member, such as a die or punch, is employed to produce cuts one after another in rows or series, the rows being parallel; and as each row is formed the apertured or scrap portion of the sheet is removed, thereby allowing the sheet to be shifted transversely so as to stand within the effective reach of the die for cutting the next adjacent row of cuts. The successive rows are started from opposite edges of the sheet so that during the feeding movement in each direction a row of cuts is produced.

The principal object of this invention is to provide for machines of this or other suitable character, improved means for producing a relative shifting or feeding movement between the sheet and the die. Other objects, features and advantages of my invention will appear more fully in the following detailed description and appended claims.

The accompanying drawings forming a part of this specification illustrate a machine containing one embodiment of the invention. In the drawings,

Fig. 1 is a side elevation of the machine;

Fig. 2 is a front elevation thereof;

Fig. 3 is a plan view illustrating the table on which a sheet is supported while being operated upon and parts of the die mechanism, severing means and means for controlling the lateral movement of the sheet.

Fig. 4 is a cross section showing the sheet support.

Fig. 5 is a transverse sectional view taken substantially centrally of the die mechanism and showing in addition to such mechanism parts of the means for controlling the lateral movement of the sheet.

Fig. 6 is a rear elevation;

Fig. 7 is a plan, and

Fig. 8 an end elevation of a part of the sheet feeding means;

Fig. 9 is a detail view of part of the mechanism taken on line 9—9 of Fig. 1;

Fig. 10 is a view partly in side elevation and partly in section showing operating mechanism for the upper die or punch and for the plunger of a pump for supplying power to the sheet feeding means;

Fig. 11 is an elevation on a larger scale of valve mechanism for controlling the direction of the lateral movement of the sheet feeding means.

The base *a* of the machine carries a frame *b* which is tilted at a suitable angle to the vertical. In this frame is journaled the main driving shaft *c* which may be driven by a suitable means such as the pulley *d*. At the back of the bed of the frame *b* is arranged the lower member *j* (Figs. 3 and 4) of the die or punch mechanism, the upper member *k* of which (Fig. 1) is carried by the plunger *l* guided in suitable ways in the frame *b* and actuated from a crank *m* on the shaft *c* by the pitman *n*. The frame *b* is provided with the sheet support or table *o*. At each side of the die or punching mechanism there is secured to the frame a bracket *u*, these brackets being reverse counterparts of each other. Referring to Fig. 1, each bracket is formed with a forwardly opening mouth or space *v* adapted to receive the rear edge portion of the sheet to be operated upon. For limiting the rearward movement of the sheet and assuring the proper positioning thereof in a fore and aft direction relatively to the die, straight-edges *x* are employed, each of these straight edges, as shown, being formed of a strip of angle iron against one flange of which the rear edge of the sheet is adapted to bear.

When a sheet is introduced into the machine with its rear edge in contact with the straight edges, it is received by a carrier which is made to grip it and hold it firmly and to feed it lengthwise of the table *o* under the reciprocating die or punch member. Referring more particularly to Figs. 5 to 8, this carrier comprises a rack bar 4 having square cut teeth 5 along its front edge and a square recess 6 near each end thereof

in its rear edge. Each recess 6 receives a square stud 8 projecting downwardly from a forked bracket 9 and affording a support for the spaced plates 10 and 11. The said brackets 9 are formed with tables 12, and above the table each is forked in plan (see Fig. 7) so as to receive the pivoted presser or gripper 13, the table and presser having a mating projection and recess 14. Each presser or jaw is normally pressed towards the dotted line or inoperative position shown in Fig. 8 by a spring 15 and is forced into gripping relation to the table 12 so as to indent and grip the interposed sheet by the shaft 17. To this end the shaft 17 is provided with recesses 17′ (Fig. 8) and each presser is provided with a roller 17^2 which engages the periphery of the shaft and is adapted to pass into the corresponding recess 17′ when this is brought opposite the roller. Presser or gripper 13 is desirably made adjustable to take care of different thicknesses of metal. The adjustment, as shown, is accomplished by forming the presser with a lower portion 13^a which is yieldably connected to the body of the presser by slotting the presser, the lower portion being held in adjusted position with respect to the body of the presser by suitable means, such as a screw 13^b.

The rack 4 is arranged to travel in the rabbet 19 (Fig. 4) at the back of the table *o*, being held therein by the longitudinal rib 19′.

For effecting the movement of the carrier longitudinally with respect to the table *o* I have provided means driven from the main shaft *c*, whereby the power of the machine is employed to shift the carrier. The means shown include an air pump, the cylinder 20 of which is fixedly secured on the top of the frame *b* as shown in Figs. 1 and 2. The piston or plunger of the pump is connected by means of a pitman 21 with the crank *m*, the pitman 21 being desirably pivotally connected to extensions *m′* of the pitman *n*.

Referring to Fig. 1, the air compressed by the pump is delivered through a suitable connection 22 to a reservoir 23, which serves to maintain a supply of air and to deliver the air under a substantially constant pressure. From the reservoir, the air is delivered through a connection 24 and a connection 25 or 26 to one end or the other of a cylinder 27 supported by the frame *b* under the table *o* (see Figs. 2 and 3).

A valve 28 controls the supply of compressed air from the connection 24 so as to enable it to be delivered either into the connection 25 or the connection 26 to thereby permit the air to be delivered on either side of the piston 29 in the cylinder 27. This valve also controls the exhaust from the cylinder 27. Referring to Fig. 11, the valve, as shown, comprises a casing 28^a in which a valve member 28^b is longitudinally movable. The latter member is provided with a peripheral groove or recess 28^c which is adapted to register with one or the other of two ports 28^d in the casing 28^a when the said member is at the end of either of its strokes, the other of said ports 28^d being then covered by the body of the said member. The compressed air conduit 24 communicates through an opening 28^e in the casing 28^a with the groove 28^c; and each of the ports 28^d communicates with one of the connections 25 and 26 leading to opposite ends of the cylinder 27. It will accordingly be seen that the fluid from the connection 24 will pass through the groove 28^c to only one of the connections 25, 26, depending upon the position (at the end of one stroke or the other) at which the valve is placed by the mechanism hereinafter described. To permit the exhaust of the air from the cylinder 27, the movable valve member 28^b is provided with a longitudinal central bore 28^f extending inwardly from one end of the said member and having transverse inlets 28^g adapted to register with that one of the ports 28^d which is shut off from communication with the air supply groove 28^c. Accordingly, while air is being supplied to one side of the piston 29, the air from the other side of said piston is permitted to exhaust through the opening 28^f. In order to obtain the desired back pressure upon the exhaust to thereby cushion to the desired extent, the feeding movement of the sheet carrying means, an exhaust valve 28^j is secured to the movable member 28^d, the exhaust valve having a movable member 28^k which is normally pressed to closed position by a spring 28^l, the pressure of which is regulated by the adjustment screw 28^m. The exhausting air moves the valve 28^k against the pressure of the spring 28^l and passes into the cup 28^n which is provided with openings 28^o to permit the escape of the air to the atmosphere. The desired back pressure is obtained by adjustment of the screw 28^m. The valve described above is not claimed per se in this application. To yieldingly hold the movable valve member in either of its operative positions I have provided the casing 28^a with a spring pressed pin or detent 28^p, the tapered inner end of which is adapted to engage in one or the other of the depressions 28^r in the said movable valve member.

A chain 30 passes from each end of the rack 4 over sprockets 31 and 32 supported by brackets upon the frame of the machine (see Fig. 3), then over a sprocket 33 mounted in the outer end of the piston rod 34 and then to an anchor 35 in the said bracket. As the chain 30 is arranged at an angle to the sheet carrying means and the rack 4, it is connected to the rack by a connection permitting relative rotation be-

tween them, such as the screw 30′ (Fig. 6). This connection also permits adjustment to render the chain taut. The yokes supporting sprockets 33 are threaded upon opposite ends of the piston rod by threads extending in opposite directions so that slack in the chain may be taken up by merely rotating the piston rod (see Fig. 2). The yokes may be secured in position by lock nuts or other suitable means.

When the piston 29 moves longitudinally of the cylinder 27 under the pressure of the air on one side thereof, the sprocket 33 moves the portion of the chain 30 to which the rack bar 4 is connected so as to move the rack bar a distance double the travel of the piston This amplification of travel is due to the chain connections, as will be readily understood. Both ends of the rack bar are connected to the piston rod in the same manner.

I have provided mechanism whereby the valve 28 is automatically shifted to reverse the movement of the piston 29 whenever the carrier for the sheet material has completed substantially a full stroke in one direction. To this end the shaft 17 of the carrier is provided at its ends with extensions 36 (see Figs. 2, 3, 6, 7 and 8) one of which is adapted to engage and shift arm 37 pivoted to the frame of the machine at the end of each stroke of the carrier. The arms 37 at opposite sides of the machine are connected by a link 38 so as to be shiftable simultaneously. Movement of the carrier at the end portion of one stroke effects the movement of both arms 37 in one direction while the movement of the carrier on the succeeding stroke moves both arms 37 in the opposite direction, and so on. The arm 37 at the left hand side of the machine (referring to Figs. 2 and 3) is connected by a link 39 (see Figs. 1, 2, 3 and 9) to one arm of a bell crank lever 40. The other arm of the lever 40 is connected by a link 41 to a pivoted arm 42 (Figs. 1, 9 and 11) which is connected by a link 43 to an arm 44 of the same shape as the arm 42 but arranged in the opposite direction. The arms 42 and 44 are hingedly supported by two arms of an inverted T-shaped lever 45, the other arm of which is connected to the valve 28.

On the rod 45′ which, as described in the next paragraph, is moved up and down once during each rotation of the power shaft c is mounted an abutment 80. Near the end of each stroke of the carrier the levers 37 are shifted in one direction or the other, thereby shifting the link 39, lever 40, links 41 and 43 and arms 42 and 44 to bring the lower end of one of these arms into the path of the abutment 80 (see Fig. 11). The abutment then lifts the said arm and shifts the lever 45 and the movable valve member 28^b, thereby directing the supply of compressed air to one side of the piston and permitting the air on the opposite side of the piston to exhaust to the atmosphere. The shifting of the valve thus automatically causes the direction of movement of the carrier to be reversed. To permit adjustment of the stroke or extent of movement of the movable valve member 28^b, the abutment 80 is adjustable on the link 45′. The adjustment, as shown, is effected by means of a screw 81 carried by the link 45′ and engaging the lower surface of the abutment. The screw 81 may be locked in place by suitable means such as the lock nut 82. The abutment is secured in adjusted position by suitable means such as bolts 83 passing through the abutment and through longitudinal slots 84 in the link 45′.

The mechanism for moving the sheet carrier described above tends, under a continuous pneumatic pressure, to move the carrier continuously throughout a complete stroke. In order to retain the sheet to permit the die mechanism to operate intermittently thereon and form the desired series of cuts during each stroke of the carrier, there is provided means for intermittently checking or retaining the carrier. Referring to Fig. 5, a pawl 40′ is slidably mounted in the frame so as to cooperate with the teeth 5 of rack 4. The pawl is slotted to receive one arm of a bell crank lever 41′ (which arm has a cushioned engagement with the pawl by virtue of a spring pin 42′ against which the arm directly bears on one side). The bell crank lever is fulcrumed on a shaft s and has its free arm connected by a link 43′ with a lever 44′ (see Fig. 1) fulcrumed in the frame b. The lever 44′ is connected by link 45′ with a lever 46, also pivoted in the frame b and carrying a roller 47 bearing upon the cam 48 on the shaft c, the free end of the lever 46 being preferably shaped as a handle 49. A spring 50 holds lever 44′ in such position that the roller 47 or lever 46 normally presses against the cam. The pawl 40′ normally retains the rack (and hence the carrier) against advance; but on each rotation of the shaft c the forward end of lever 46 is momentarily depressed by the cam 48 and the pawl is withdrawn, releasing the rack but quickly returning into engagement with it. Thus there is effected an intermittent advance of the sheet across the machine, the several increments of advance depending upon the distance between the teeth upon the rack.

For cutting away the scrap upon the forming of a series or row of cuts at the back of the sheet, each bracket u is provided with a pivoted knife 51 (Figs. 1 and 2) having shearing coaction with a fixed knife 52. A spindle 53 is pivoted to and projects upwardly from the movable knife and around it is coiled a spring 54 interposed between the top of the bracket u and nuts 55 on the

spindle 53 and acting to hold the knife normally elevated. Means are provided whereby when the carrier is traveling in either direction the relatively remote sheet severing means is acting and the other is idle. The action of each severing means is intermittent, being effected from the plunger *l*, so that each time the die mechanism operates to form a cut the severing means operates to shear or cut away some of the scrap. A sliding dog 56 (Fig. 2) is movable in a groove in the front of each knife so as to be adapted to project from the end of the knife or recede into the same. When the dog projects from the knife it stands within the path of movement of a foot 58 on the side of plunger *l*, said foot therefore depressing the knife when the plunger descends. Each of the dogs 56 is connected by a link 61 to the arm 37 on the same side of the machine. When the arms 37 are shifted, as hereinbefore described, at the end of each stroke of the carrier, one of the dogs 56 is accordingly retracted within its knife and the other is caused to project from its knife so as to render one knife operative and the other inoperative, as desired.

In order to release the sheet material from the carrier at the end of each stroke thereof to permit the sheet to fall back to its new position against the straight edge *x* the frame is provided at opposite ends with sleeves 63 having cam slots 64 (see Fig. 3), which slots are adapted to receive projections 65 upon the ends 36 of the shaft 17 and by means of the inclined slot portions 64^b to rotate said shaft and to release the pressers or grippers 13 at the desired time. The inclined portions 64^b of the slot 64 also serve, through their coaction with the corresponding pins 65 to move the pressers or grippers 13 into or out of operative position with respect to the sheet to be held. The pressers or grippers are yieldingly held in operative position by means of a spring pressed pin 17^a (see Fig. 6) carried by collar 17^b which is secured to the shaft 17. The spring pressed pin 17^a coacts with a depression 17^c in one of the brackets 9 to yieldingly hold the grippers in operative position.

My invention also includes means for automatically arresting the lateral movement of the sheet carrying means when the entire useful portion of the sheet has been operated upon. To this end a pawl 70 (Figs. 6 and 7) is pivotally mounted on one of the brackets 9. This pawl rests upon the sheet so long as a portion of the sheet remains for further cutting by the die. When, however, the total useful portion of the sheet has been operated upon, the pawl 70 is free to drop into one of the notches 71 in the frame of the machine as soon as the sheet carrying means reaches the end of its movement in either direction. To lift the pawl 70 out of the notch 71 to permit the placing of a new sheet in operative position in the machine, an arm 72 is secured upon the shaft 17 so as to be rotatable therewith upon the movement of the handle 18. This arm engages a projection 73 upon the pawl 70 to lift the pawl out of the notch 71 when the shaft 17 is rotated in the direction to release the pressers 13. In order to prevent premature movement of the sheet carrying means after the pawl 70 is disengaged from the notch 71, the slot 64 in each of the sleeves 63 is provided with a portion 64^e extending from the inner end of the inclined portion 64^b of the slot at right angles to the axis of the shaft 17. When the latter is in position to cause the pawl 70 to be held elevated by the arm 72, the projection 65 on one end of the shaft 17 is arranged in the transverse portion 64^c of the slot 64, thereby preventing feeding movement of the shaft and sheet carrying means. After the new sheet has been inserted, the handle is permitted to fall to again bring the projection 65 into the inclined portion 64^b of slot 64.

In operation, a sheet having been placed upon the table *o* so as to enter the gripping means of the carrier and to fall with its rear edge into contact with the straight edges *x* (the carrier being at one of its limits of movement) the operator starts the machine. The desired amount and pressure of air is maintained in the reservoir by the pump 20. A relief valve 23^a may be provided to prevent excessive pressure in the reservoir. The valve 28 is now in a position to permit the passage of air from the reservoir to one side of the piston 29 for causing the piston to move the carrier across the machine. At the very beginning of the movement of the carrier, the projection 65 is acted upon by the cam 64 to move the shaft 17 to cam the grippers 13 against the sheet to firmly lock the sheet in the carrier. Controlled by the pawl 40′ (Fig. 5), the carrier under the influence of the pneumatic pressure in the cylinder 27 on one side of the piston moves intermittently across the machine so that each time after the die mechanism has operated to form a cut the carrier moves one step, that is, just sufficiently to bring the sheet into position for forming the next cut. Assuming that the carrier is being advanced to the right in Fig. 2, the dog 56 of the right hand knife 51 will be projecting into the path of the corresponding foot 58 on the plunger, so that each time the plunger descends a cut is formed by the right hand shearing means, a complete sequence of such cuts resulting in the part of the sheet back of the shearing line being finally cut away. When the scrap has been entirely cleared away (the carrier now having reached its limit of movement in one direction) the sheet is automatically

released and falls again with its back edge into contact with the straight edges. The dog 56 of the right hand shearing means has just been retracted and the dog 56 of the left hand shearing means projected to the path of the corresponding foot 58 on plunger *l*. The valve 28 having also been reversed, as described above, the air is conducted to the opposite side of the piston and the carrier is moved in the opposite direction, the sheet being again automatically clamped in the carrier at the beginning of this movement. The operation of the die or punching mechanism and shearing means is the same on the return movement of the carrier as it was upon the advance movement except that a different knife is in operation; and the operation of the machine may be continued automatically to cut successive rows of cuts with the die mechanism until the entire sheet has been operated upon, when the pawl 70 drops into one of the notches 71 and the lateral movement of the sheet feeding means is automatically arrested.

It is understood that while I have shown one embodiment of my invention I am not to be limited thereto, but that many modifications and changes may be made without departing from the spirit of my invention and the scope of the appended claims.

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

1. The combination of operation performing means, means for holding the material to be operated upon, means tending to produce a continuous relative feeding movement between said operation performing means and said holding means to permit operative positioning of successive portions of the material, means for preventing such relative movement; and automatic means for alernately rendering said preventing means inoperative and operative to permit successive increments of such feeding movement.

2. The combination of operation performing means, means for holding the material to be operated upon, means tending to produce a continuous relative feeding movement in either of two opposite directions between said operation performing means and said holding means to permit operative positioning of successive portions of the material in each of said directions, means controlling said movement producing means to reverse the same at the end of such movement in one direction, and means for alternately preventing and permitting such relative movement when said movement producing means is operating in either direction.

3. The combination of operation performing means, means for holding the material to be operated upon, means tending to produce a continuous relative feeding movement in either of two opposite directions between said operation performing means and said holding means to permit operative positioning of successive portions of the material in each of said directions, means controlling said movement producing means to reverse the same automatically at the end of such movement in one direction, and automatic means for alternately preventing and permitting such relative movement when said movement producing means is operating in either direction.

4. The combination of operation performing means, means for holding the material to be operated upon, fluid operated means tending to produce a relative feeding movement in either of two opposite directions between said operation performing means and said holding means, means controlling said movement producing means to reverse the same automatically after a predetermined extent of relative movement in one direction, and automatic means for alternately preventing and permitting such relative movement when said movement producing means is operating in either direction.

5. The combination of operation performing means, means for holding the material to be operated upon, fluid operated means tending to produce a relative feeding movement in a given direction between said operation performing means and said holding means to permit operative positioning of successive portions of the material, means preventing such relative movement, and automatic means for alternately rendering said preventing means inoperative and operative to permit successive increments of such feeding movement.

6. The combination of driving means, operation performing means driven thereby, means for holding the material to be operated upon, and means including a pump driven by said driving means for producing a relative feeding movement between said operation performing means and said holding means.

7. The combination of driving means, operation performing means driven thereby, means for holding the material to be operated upon, and means for producing a relative feeding movement between said operation performing means and said holding means including a pump driven by said driving means, a cylinder having fluid connection with said pump, and a piston in said cylinder movable by the fluid and connected to produce the relative feeding movement.

8. The combination of driving means, operation performing means driven thereby, means for holding the material to be operated upon, and means for producing a relative feeding movement between said operation performing means and said holding means including a pump driven by said driv-

ing means, a cylinder having fluid connection with said pump, a piston in said cylinder movable by the fluid, and a travel increasing connection between the piston and the relatively movable part.

9. The combination of driving means, operation performing means driven thereby, means for holding the material to be operated upon, and means including a pump driven by said driving means, a cylinder having fluid connection with said pump and a piston in said cylinder movable by the fluid for producing a relative feeding movement in opposite directions between said operation performing means and said holding means.

10. The combination of operation performing means, means for holding the material to be operated upon, and means for producing a relative feeding movement between said operation performing means and said holding means including a cylinder, a piston therein and a flexible member having a connection with said piston permitting the taking up of slack in said member.

11. The combination of operation performing means, means for holding the material to be operated upon, and means for producing a relative feeding movement between said operation performing means and said holding means including a flexible member and means for taking up slack in said member.

12. The combination of operation performing means, means for holding the material to be operated upon, and means for producing a relative feeding movement in opposite directions between said operation performing means and said holding means including a cylinder, a piston therein, a flexible power transmitting member connected to said piston, and means for taking up slack in said flexible member.

13. The combination of operation performing means, means for holding the material to be operated upon, fluid operated means tending to produce a continuous relative feeding movement between said operation performing means and said holding means to permit operative positioning of successive portions of the material, means for preventing such relative movement; and automatic means for alternately rendering said preventing means inoperative and operative to permit successive increments of such feeding movement.

14. The combination of operation performing means, driving means therefor, means for holding the material to be operated upon, and means for producing a relative feeding movement in opposite directions between said operation performing means and said holding means including a cylinder, a piston therein, a fluid pump driven by said driving means, fluid connections from said pump leading to said cylinder on opposite sides of said piston, and valve means for said connections to control the direction of the aforesaid relative feeding movement.

15. The combination of operation performing means, means for holding the material to be operated upon, fluid operated means tending to produce a continuous relative feeding movement in either of two opposite directions between said operation performing means and said holding means to permit operative positioning of successive portions of the material in each of said directions, said holding means including means for maintaining the material secured to said moving means during the relative feeding movement in each of said directions, means controlling said movement producing means to reverse the same at the end of such movement in one direction, and means for alternately preventing and permitting such relative movement when said movement producing means is operating in either direction.

16. The combination of operation performing means, means for holding the material to be operated upon, and means for producing a relative feeding movement between said operation performing means and said holding means including a cylinder, a piston therein, means for supplying fluid to and exhausting the same from said cylinder on opposite sides of said piston, valve means controlling said fluid supplying means to cause fluid to be admitted alternately on opposite sides of the piston and to be exhausted from the side of the piston opposite to that on which it is being admitted, and adjustable means for controlling the pressure of the exhaust.

17. The combination of operation performing means, means for holding the material to be operated upon, means tending to produce a continuous relative feeding movement between said operation performing means and said holding means, means preventing such relative movement, and means for alternately rendering said preventing means inoperative and operative to permit operation upon successive portions of the material, said means for producing feeding movement including a cylinder, a piston therein, fluid connections to said cylinder on opposite sides of said piston, and valve means for said connections to control the direction of the aforesaid relative movement.

18. The combination of operation performing means, means for holding the material to be operated upon, means for producing a relative feeding movement in opposite directions between said operation performing means and said holding means including fluid connections, valve means for said connections, and means for operating said valve means to automatically open one connection

and close the other after a predetermined extent of said relative feeding movement, said operating means including a power driven operating member and means connected with said valve means and movable into and out of the path of said operating member.

19. The combination of operation performing means, means for holding the material to be operated upon, means for producing a relative feeding movement between said operation performing means and said holding means including a shiftable controlling member and means for shifting the same including a power driven member and means connected with said controlling member and movable into and out of the path of said power driven member.

20. The combination of operation performing means, means for holding the material to be operated upon, means for producing a relative feeding movement in opposite directions between said operation performing means and said holding means including fluid connections, valve means for said connections, means for operating said valve means to automatically open one fluid connection and close the other after a predetermined extent of said relative feeding movement, said operating means including a power driven operating member, means connected with said valve means and movable into and out of the path of said operating member, and means whereby the duration of engagement between said operating member and movable means may be varied to adjust the length of stroke of the valve.

21. The combination with a press having a reciprocating punch member and driving means for said member, of pneumatic means including a pump driven by said driving means for intermittently feeding a sheet of material relatively to said punch member to permit successive portions of the sheet to be brought into operative relation to said member.

22. The combination with a press having a crank shaft, a punch member and a pitman connecting said shaft and member, of means including a pump connected to and driven by said pitman for intermittently feeding a sheet of material relatively to said punch member to permit successive portions of the sheet to be brought into operative relation to said member.

23. The combination of a frame, a sheet holding carrier movably supported by the frame and including a rack, automatic means tending continuously to move said carrier, and means coacting with said rack for alternately checking and releasing the carrier.

24. The combination of a frame, a sheet holding carrier movably supported by the frame and including a rack, pneumatic means tending to move said carrier, and means coacting with said rack for alternately checking and releasing the carrier.

25. The combination of a frame, a sheet holding carrier movably supported thereby and including a rack, pneumatic means for moving the carrier in opposite directions, automatic means coacting with said rack for alternately checking and releasing the carrier, and automatic means for reversing the action of said pneumatic means after the carrier has moved a predetermined extent in either direction.

26. The combination of a frame, a carrier movably supported thereby and provided with means for releasably securing a sheet to the same, pneumatic means for moving the carrier in opposite directions, automatic means for alternately checking and releasing the carrier, and automatic means for releasing said securing means to permit movement of the sheet transversely to the movement of the carrier and for revising the action of said pneumatic means after the carrier has moved a predetermined extent in either direction.

27. The combination of a frame, a carrier movably supported thereby and provided with means for releasably securing a sheet to the same, fluid operated means for moving the carrier in opposite directions, automatic means for alternately checking and releasing the carrier, and automatic means for releasing said securing means to permit movement of the sheet transversely to the movement of the carrier after the carrier has moved a predetermined extent in either direction.

28. The combination of a releasable sheet holding gripper, automatic means for moving the gripper into operative and inoperative positions, and means for yieldingly latching the gripper in operative position.

29. The combination of operation performing means, means for holding the material to be operated upon, automatic means for producing a relative feeding movement between said operation performing means and said holding means, and automatic means dependent upon the amount of material unoperated upon in said holding means for arresting the relative feeding movement.

30. The combination of operation performing means, means for holding the material to be operated upon, automatic means for producing a relative feeding movement in opposite directions between said operation performing means and said holding means, and automatic means for arresting the relative feeding movement including a retaining member adapted to be held in inoperative position by the material and with respect to which the material is movable.

31. The combination of operation per-

forming means, means for holding the material to be operated upon, automatic means for producing a relative feeding movement between said operation performing means and said holding means, and automatic means for arresting the relative feeding movement, including a retaining member adapted to be held in inoperative position by the material and with respect to which the material is movable, and means for moving said retaining member to permit the placing of new material in position and for simultaneously preventing the relative feeding movement.

32. The combination of operation performing means, releasable means for holding the material to be operated upon, automatic means for producing a relative feeding movement in opposite directions between said operation performing means and said holding means, and automatic means for arresting the relative feeding movement including a retaining member adapted to be held in inoperative position by the material and with respect to which the material is movable, and means for releasing said holding means and moving said retaining member to permit the placing of new material in position and for simultaneously preventing the relative feeding movement.

33. The combination of operating performing means, means for holding the material to be operated upon and means for producing a relative feeding movement between said operation performing means and said holding means including a fluid operated member and a travel increasing connection between said member and the relatively movable part.

34. The combination of operating performing means, means for holding the material to be operated upon and means for producing a relative feeding movement between said operation performing means and said holding means including a force receiving member and a travel increasing connection between said member and the relatively movable part.

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

HUGH M. ROSS.

Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,445,718, granted February 20, 1923, upon the application of Hugh M. Ross, of Woodhaven, New York, for an improvement in "Machines for Operating on Sheet Material," an error appears in the printed specification requiring correction as follows: Page 7, line 88, claim 26, for the word "revising" read *reversing;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 20th day of March, A. D., 1923.

[SEAL.]

KARL FENNING,
Acting Commissioner of Patents.