

(No Model.)

4 Sheets—Sheet 1.

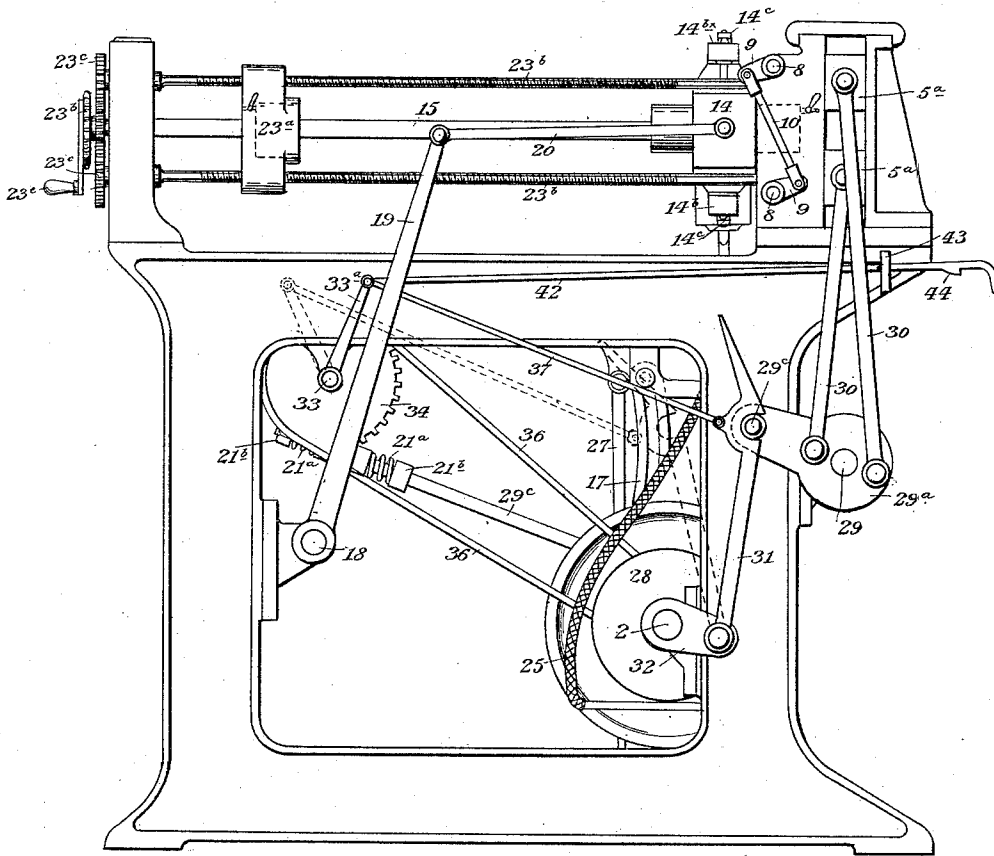
W. G. CHAPIN.

MACHINE FOR FEEDING AND CUTTING PAPER AND LIKE SHEET MATERIALS.

No. 475,931.

Patented May 31, 1892.

Fig:1.



Witnesses
John A. Rempie
 John A. Rempie

Inventor
Wm. C. Chapin
By his Attorney
Henry Comstock

(No Model.)

4 Sheets—Sheet 2.

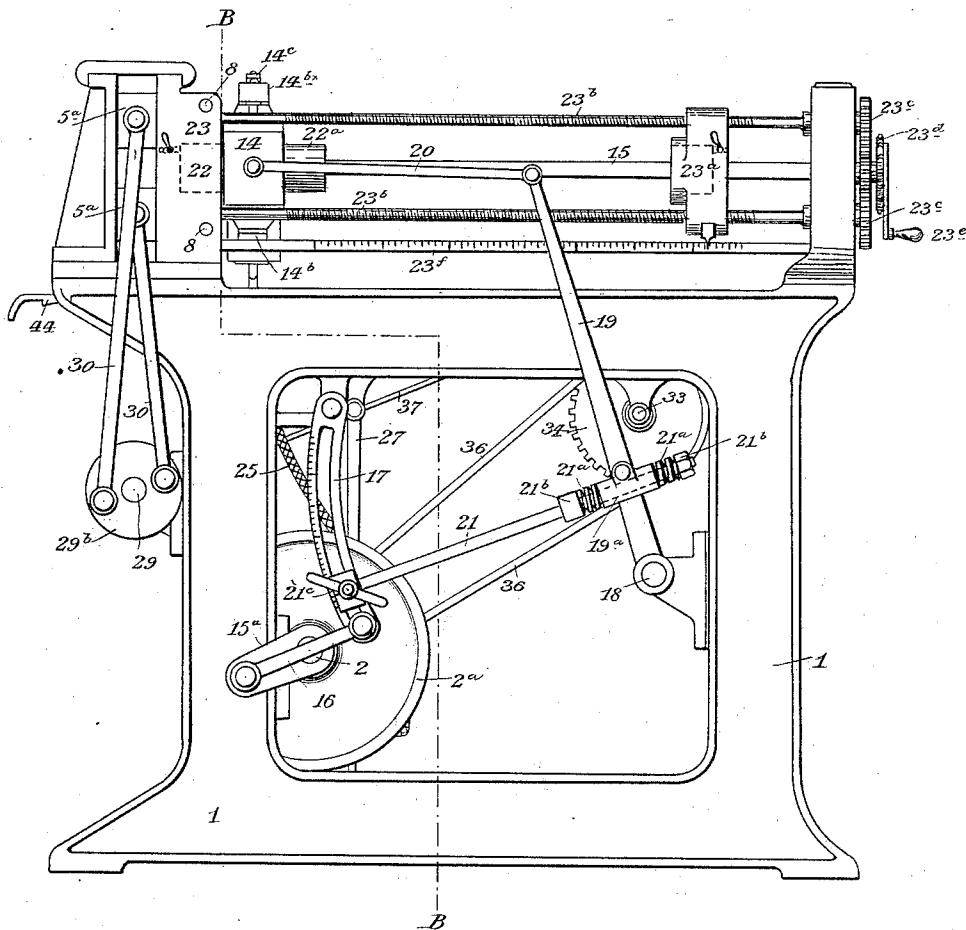
W. G. CHAPIN.

MACHINE FOR FEEDING AND CUTTING PAPER AND LIKE SHEET
MATERIALS.

No. 475,931.

Patented May 31, 1892.

Fig. 2.



Witnesses
W. G. Chapin
John A. Kennie

Inventor
Wm. G. Chapin
By his Attorney
Henry Connors

(No Model.)

4 Sheets—Sheet 3.

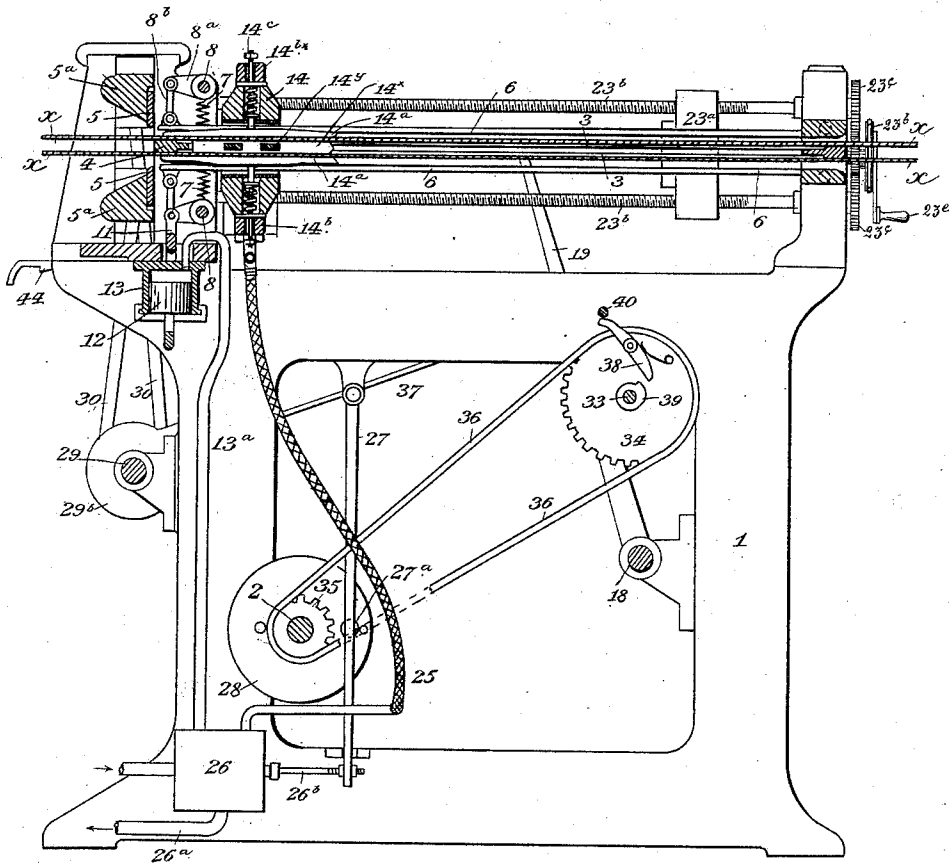
W. G. CHAPIN.

MACHINE FOR FEEDING AND CUTTING PAPER AND LIKE SHEET
MATERIALS.

No. 475,931.

Patented May 31, 1892.

Fig. 3.



Witnesses
J. S. Chapin
John A. Kenne.

Inventor
Wm G. Chapin
By his Attorney
Henry Bonnell

(No Model.)

4 Sheets—Sheet 4.

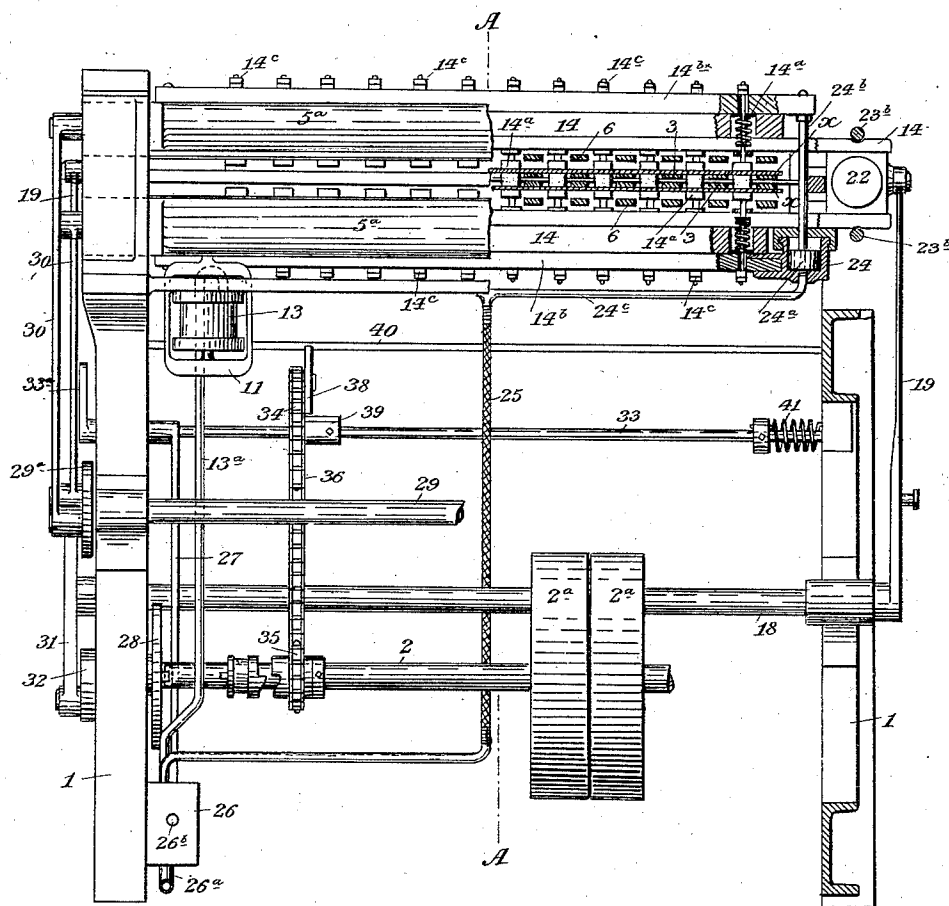
W. G. CHAPIN.

MACHINE FOR FEEDING AND CUTTING PAPER AND LIKE SHEET
MATERIALS.

No. 475,931.

Patented May 31, 1892.

Fig: 4.



Witnesses
Healy
 John A. Rennie

Inventor
Wm. C. Chapin
By his Attorney
Henry Conner

UNITED STATES PATENT OFFICE.

WILLIAM G. CHAPIN, OF BROOKLYN, NEW YORK.

MACHINE FOR FEEDING AND CUTTING PAPER AND LIKE SHEET MATERIALS.

SPECIFICATION forming part of Letters Patent No. 475,931, dated May 31, 1892.

Application filed January 10, 1891. Serial No. 377,309. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM G. CHAPIN, a citizen of the United States, residing at Brooklyn, Kings county, New York, have invented certain Improvements in Machines for Feeding and Cutting Paper and Like Sheet Materials, of which the following is a specification.

My invention relates to that class of machines designed for cutting up sheet material, such as paper, pasteboard, &c.

The objects I attain by my invention are greater accuracy and uniformity in the dimensions of the sheets cut; a saving of time in setting the machine to automatically cut sheets of different dimensions; to feed and cut advantageously flat and inflexible sheets without bending them; to feed and cut without crushing flat sheets of cellular materials; to feed and cut sheets of different thicknesses and to feed either single sheets or piles of sheets simultaneously; to feed and cut, without the necessity of stopping and adjusting the machine, a varying mixture of sheets of different thicknesses, width, and quantity; to provide a machine wherein either the knife or the feed may be instantly stopped without stopping the machine, and, finally, to produce a cutting-machine which is in part essentially double, whereby double the work may be done on the machine, the mechanisms of the sections of the machine co-operating, however, in their action.

My invention will be fully described hereinafter, and its novel features carefully defined in the claims.

In the accompanying drawings, Figure 1 is a view of the left-hand side of a machine embodying my invention, and Fig. 2 is a similar view of the right-hand side of the same. Fig. 3 is a longitudinal vertical section of same in the plane indicated by the line A A in Fig. 4. Fig. 4 is a front elevation of the machine as to the left side thereof and a transverse section as to the right side thereof, the plane of the section being mainly in the plane of the line B B in Fig. 2.

I have stated that my machine as herein represented is double—that is to say, it has two feedways through which the material to be cut passes, two distinct sets of reciprocating feeding-grippers, and two sets of cutting-knives. Most of the features of my invention

are applicable, however, to a machine having but one set of feeding and cutting mechanisms, and I do not, therefore, limit myself to this double construction.

In order to enable the construction and operation of my machine to be the better understood, I will preface the more minute description thereof with a general description.

At the front of the machine are situated the knives which effect the cutting. There is a stationary bar having two knife-edges, and there are two like movable knives, which operate in connection with said stationary knives to simultaneously cut or shear two sheets of material. This material is fed to the knives along two feedways by two sets of simultaneously-reciprocating feed-grippers. The grippers in each set are arranged abreast and move to and fro on guides. The movement back toward the rear of the machine, where the material to be cut enters, is effected with the grippers open, and the forward or feeding movement is effected with the grippers closed on and clamping the material. The reciprocating movement is imparted to the grippers through the medium of a crank on the main shaft, which vibrates a slotted link, and a pair of rocking arms, one of which is coupled to the vibrating link. This link is graduated, and by adjusting the coupling along the link the extent of movement of the feeding-grippers may be varied at will; but whatever may be the extent of the movement the grippers always move up to the same point at the end of the forward or feeding stroke, all the variation in the stroke being confined to the rear end of the travel of the grippers.

In order to neutralize the momentum of the grippers at both ends of their stroke, air-cushions are provided in the nature of dash-pots, and the pair of dash-pots which cushion the back-stroke are made adjustable to adapt them to the stroke of the grippers, and graduations are provided on a part of the machine-frame, whereby these dash-pots may be set quickly and accurately in their proper positions. The rocking arm which is coupled to the slotted link is cushioned in both directions by strong spiral springs on the coupling-link, whereby after the grippers have come to rest from the seating of the plungers or pistons in the respective dash-pots the said

springs permit the further movement of the slotted link, which is effected by compression of said springs. This compression is effected as the operating-crank is passing centers, and it allows time for the grippers to close and open while the gripper-carrier is at rest.

The two sets or groups of feeding-grippers are arranged one above and one below, and both sets are carried in a single reciprocating carrier. The grippers of both sets are opened simultaneously by some suitable mechanism; but each gripper of both sets is closed on the material by a spring and independently, whereby they are adapted to grip materials differing in thickness. The feeding-grippers and cutting-knives of the two sections of the double machine move simultaneously toward and from each other—that is, as herein situated these parts of the lower section move upward, while those of the upper section move downward.

The outer sides of the two feedways are composed of strips hinged at the back or feeding end of the machine and backed by springs at their front ends adjacent to the knives, whereby, when permitted, they clamp on the material and hold it while it is being cut and while the grippers are moving back; but means are provided for automatically taking off the pressure of the springs and relieving the holders and for permitting the springs to apply the pressure at the proper times. When the feeding-grippers are clamped on the material, the holders at the knives are relieved, and when the grippers are relieved the holders are set on the material; but the construction is such that the holders are not relieved until the grippers are set, and vice versa. The knives are coupled to and moved to and fro by a rocker, and this rocker is vibrated by a crank on the main shaft through the medium of a connecting-rod having a notch in it to engage a pin on the rocker, whereby the operator may disengage the rod instantly and stop the operation of the knives. Means are also provided, as will be described, whereby the knives may be thrown out of operation in such a manner that they will only cut at each second or third feeding movement, for example.

I will now describe the construction more minutely with reference to the drawings.

1 represents a suitable frame, in which is rotatively mounted the driving-shaft 2, which may be driven from any source of power by a belt and pulleys 2^a in the usual way. 3 3 are two sets of slats forming the inner walls of the two feedways (see Figs. 3 and 4) through which the material *x x* to be cut passes. These slats are united at their front ends to a bar 4, the front edges of which form the two stationary knives. 5 5 are the two movable knives, which are fixed to knife-bars 5^a 5^a, which play in guides in the machine-frame. The outer walls of the feed ways are formed each of a set of slats 6, preferably of hard wood. These, if not sufficiently flexible otherwise, are

secured at their rear ends to a hinged transverse member of the frame of the machine and approach at their front ends close to the respective knives. These slats 6 are each backed by a spring 7, so that each may press independently upon the material; but means are provided for automatically relieving the pressure of all of the slats simultaneously. The front ends of the slats thus become holders to clamp the material while it is being cut and while the feeding-grippers are moving back to take a fresh hold.

Any mechanism may be employed for relieving the pressure of the holders; but I will describe that herein shown.

In the main frame are mounted two rockshafts 8, (see Figs. 1 and 3,) each of which has an arm 9. These arms project in opposite directions and are coupled by a link 10, whereby when one shaft 8 is rocked the other will be rocked simultaneously, but in the opposite direction. An arm on the lower shaft 8 is coupled by a yoke 11 to the stem of a piston 12 in an upright cylinder 13, which receives compressed air above the piston through a pipe 13^a. When the piston is forced down, the mechanism described relieves the holders. This is effected by providing the shafts 8 each with arms 8^a, one opposite to each slat 6, and coupling said arms to their respective slats by links 8^b. I have stated that the springs 7 press the slats 6 down independently upon the material, and this is permitted by a slight looseness or play in the couplings of the links 8^b. As the object of this independent movement of the slats is to enable them to accommodate themselves to slight variations in the thickness of the material, such movement need be very slight, and I find that a little looseness in the link-couplings will suffice to permit of this.

I will now describe the feeding-grippers. The gripper-carrier 14 is in the nature of a cross-head, which is mounted to slide to and fro on guides 15 on the frame. The mechanism for moving the carrier 14 to and fro is best illustrated in Fig. 2. On the main shaft 2 is a crank 15^a, which is coupled by a rod 16 to a slotted link 17, pivotally attached at one end to the main frame. Rotation of the crank vibrates the slotted link.

Mounted in the main frame is a rock-shaft 18, on which are fixed two upwardly-projecting arms 19, which are coupled at their upper ends to the respective ends of the gripper-carrier 14 by rods 20. On the arm 19 (seen in Fig. 2) is pivotally mounted a sleeve 19^a, and through the sleeve plays a coupling-rod 21, provided at each end of said sleeve with a cushion-spring 21^a, and an abutting collar 21^b for said spring is secured adjustably on the rod. At its other end the coupling-rod 21 is provided with a coupling-block 21^c, which is mounted in the slot in the link 17 and is provided with means for clamping it fast to the link at any point in the slot at which it may be set. The link 17 is curved, as shown,

whereby when the gripper-carrier is at the end of its forward stroke and the crank 15 is on the center the block 21^a may be set at any point in the slot of the link, and the link is graduated in order that said block may be set at the proper point without trial. The gripper-carrier will then always end its forward stroke at the same point; but the length of its stroke or travel may be varied within limits by setting the block 21^a at different points in the link.

The gripper-carrier is provided at front with two pistons 22, which, when the carrier nears the end of its forward stroke, enter, respectively, two dash-pots 23, (see Fig. 2,) fixed on the machine-frame, and said carrier is provided, also, on its back with two similar pistons 22^a, which when the carrier nears the end of its backward stroke enter, respectively, two dash-pots 23^a. As the backward stroke is subject to variation, these dash-pots 23^a are mounted adjustably each on two screws 23^b, which extend from front to rear of the machine and are rotatively mounted therein. The four screws 23^b are rotated simultaneously, so as to move the rear dash-pots to and fro together and to exactly the same extent by means of gear-wheels 23^c, an endless chain 23^d, (see Fig. 2,) and a suitable operating-crank 23^e.

In order that the dash-pots 23^a may be set at the proper point with facility and without trial, a graduated bar 23^f is mounted on the machine-frame (see Fig. 2) parallel with the screws 23^b, and a pointer on the dash-pot at that side plays along said bar when the dash-pots are moved. The dash-pots are provided each with a cock-controlled air-outlet at its outer end, whereby the cushioning on the incarcerated air may be regulated at will. These dash-pots 23 and 23^a neutralize the momentum of the gripper-carrier at the ends of its strokes and arrest its motion softly and gradually. To enable this to be effected when the crank 15^a is moving at a uniform speed, as well as to provide for a cessation of motion of the gripper-carrier while said crank is passing its centers, the rod 21 is provided with the cushion-springs 21^a, before described.

I will now describe the grippers mounted in the gripper-carrier 14, premising that a gripper is arranged between each two adjacent slats of the feedway, as seen in Fig. 4, which shows a longitudinal section through a part of the gripper-carrier, taken transversely of the machine, and Fig. 3, which is a transverse section through the gripper-carrier and other parts taken longitudinally of the machine. The grippers in the upper set are arranged opposite to those in the lower set, and between them is arranged a set of bearing-plates 14^x, mounted on a pair of transverse bars 14^y, which form a part of the gripper-carrier 14. These bars play between the upper and lower sets of slats 3 3 when the gripper-carrier moves to and fro. Each gripper 14^a is in the form of a flat foot with an

upright stem, and said foot is arranged to clamp the material to be cut against its bearing-plate 14^x. The gripper-foot is comparatively narrow and elongated, and it extends lengthwise of the machine. The lower set or rank of grippers press upward, and the upper set or rank press downward. The stems of the lower set of grippers pass through holes in a relieving-bar 14^b, (see Fig. 4,) and the stems of the upper set pass through a similar relieving-bar 14^{bx}. On the outer end of each gripper-stem is a suitable head or a pair of lock-nuts 14^c. There is a spring 14^d about the stem of each gripper, which tends to keep the gripper pressed normally on the material to be fed. The grippers are simultaneously relieved by moving the lower bar 14^b downward and the upper bar 14^{bx} upward. These bars take under the heads formed on the gripper-stems by the nuts 14^c, and they thus draw the grippers away from the material being fed. This movement of the bars may be effected simultaneously by any suitable mechanism adapted to be used at will by the operator, as well as automatically. The means herein illustrated will now be described: To each end of the lower relieving-bar 14^b is secured a cylinder 24, in which plays a piston 24^a, coupled to the upper bar 14^{bx} by a rod 24^b. This device is clearly shown in Fig. 4. The device at the other side of the machine will be duplicate of that seen in Fig. 4. Compressed air is admitted to the bottoms of the two cylinders 24 from a cross-pipe 24^c, to which the air is supplied by a flexible pipe 25. The pipe 24^c is connected to the cylinders 24 and moves to and fro with the gripper-carrier 14. The pipes 13^a and 25, leading to the respective cylinders 13 and 24, communicate at their other ends with receiving-ports in a valve chamber or chest 26, situated at the base of the machine-frame, and in this chamber or chest is mounted an ordinary reciprocating slide-valve, which opens said ports alternately to the source of compressed air. When one port is opened to the compressed air, the other is opened to the exhaust, the exhausted air escaping at the pipe 26^a. The slide-valve is shifted suddenly by a device seen in Fig. 3. A lever 27 is suspended from the machine-frame by a hinge or pivot and is coupled at its free lower end to the valve-stem 26^b. On this lever is a laterally-projecting stud bearing a roller 27^a, arranged at about the level of the main shaft 2. On the latter shaft is a disk 28, from the face of which project two studs 28^a, arranged on opposite sides of the shaft and at slightly-different distances from the latter. As the disk rotates the outer stud strikes the roller 27^a a little outside of its axis, and, wiping by it, swings the lever 27 inward, or toward the valve-chest, thus shifting the valve therein quickly, and when the disk shall have made a half-revolution the other inner stud engages the roller 27^a a little inside of its axis, and, wiping past it, swings the lever 27 outward, thus again

shifting the valve. The valve will be given the proper lap to insure that either the holder or the grippers will always be clamped on the material to be cut and that one will not release its grip until the other is set. The compressed air may be furnished from any source, and when it is admitted to the cylinder 24 this cylinder and the piston 24^a move in opposite directions.

10 The mechanism for imparting motion to the knives 5 is best illustrated in Figs. 1 and 4. A rock-shaft 29 is mounted in bearings on the main frame, and on the ends of this rock-shaft are fixed rockers 29^a and 29^b, to which
15 are coupled the reciprocating bars 5^a, to which the knives are secured. The coupling is effected by rods 30, which are attached to the disks on opposite sides of the shaft 29. One of the disks 29^a has an arm on it (see Fig. 1)
20 bearing a wrist-pin 29^c, and this pin is adapted to engage a bearing-notch in a connecting-rod 31, which is coupled at the other end to a short crank 32 on the shaft 2. Rotation of the crank 32 rocks the shaft 29 and through
25 the rockers thereon and the connecting-rods 30 imparts the necessary reciprocating movements to the knives. The knives may be instantly thrown out of gear while the machine is running by drawing back the rod 31 until
30 its notch is disengaged from the wrist-pin 29^c. Means are provided for effecting this disengagement at every other revolution of the main shaft, whereby there will be two feeding movements to one cutting operation and
35 the material will be cut into lengths twice that for which the feed is set. Suppose the limit of the feed is three feet. This device enables the machine to cut material into six-foot lengths. Indeed, by using gear-wheels
40 of other proportions the knives may be made to operate only after every third or fourth feeding movement.

The device is best illustrated in Figs. 1 and 3. A shaft 33 is mounted in the main frame,
45 and on it is loosely mounted a sprocket-wheel 34, driven from a sprocket-wheel 35 on the main shaft by a chain belt 36. The proportion between the wheels 34 and 35 is two to one, and consequently the former makes one
50 revolution while the latter makes two. Fixed on the shaft 33 is an arm 33^a, which is coupled to the rod 31 by a connector 37. The wheel 34 carries a spring-pawl 38, adapted to engage a shoulder on a boss 39, fixed on the
55 shaft 33, at each revolution of the wheel 34. As this wheel revolves, the pawl comes to engage the shoulder on the boss 39, and as the wheel continues to revolve the shaft 33 is turned by the pawl until the arm 33^a reaches
60 the position seen in dotted lines in Fig. 1. A tail on the pawl back of the pivot of the latter now engages and wipes under a tripping stud, rod, or projection 40 on the machine-frame and the pawl is lifted free of the
65 shoulder on the boss. When free, the shaft and arm return to their first positions, and the rod 31, which had been drawn out of en-

agement by the arm 33^a, now falls back into position to engage the wrist-pin 29^c again. To insure the return rotation of the shaft 33, a spring 41 is provided, mounted on said shaft, as clearly shown in Fig. 4.

In order that the attendant may be able to instantly stop the operation of the knives, a shifting-rod 42 is provided, coupled to the
75 arm 33^a. This rod plays through a keeper 43 on the machine-frame, and when the rod is pushed back it may be held in that position by the engagement of a shoulder 44 on the rod with some part of the keeper.

In a reciprocating feeder of the character described it is important that the momentum of the gripper-carrier and the material fed shall be gradually neutralized at the termination of the stroke, for if the carrier be
85 arrested suddenly the material is apt to be carried too far by its own momentum. Hence I employ the dash-pots or cushioning devices arranged as described. I may say here that
90 it is not very material which member of the dash-pot is mounted on the carrier. I find it most convenient to mount the cylinder or pot on the machine frame and the piston or plunger on the carrier. These cushions, together
95 with the mechanism described for actuating the gripper-carrier, insure accuracy in the feed. I prefer to make the arms 19 and rods 20 quite slender and elastic, rather than stiff and heavy. The knives 5 may be so set as to
100 produce a draw cut, if desired.

Having thus described my invention, I claim—

1. In a machine for feeding and cutting sheet material, the combination, with a reciprocating knife to sever the material and a set
105 of holders to clamp the material near the cutting-point, of a set of independently-operating grippers arranged abreast and a reciprocating carrier, in which said grippers are mounted, substantially as and for the pur-
110 poses set forth.

2. In a machine for feeding and cutting sheet material, the combination, with a cutter for the material and a support for the latter while on its way to the cutting-point, of a
115 reciprocating gripper-carrier, a set of grippers mounted therein abreast and backed each by a spring, and means, substantially as described, for relieving all the grippers simultaneously, whereby said grippers act inde-
120 pendently in clamping the material and are acted upon together or jointly by the relieving mechanism.

3. In a machine for feeding and cutting sheet material, the combination, with a cutter, of a reciprocating carrier for the feeding-
125 gripper, the said gripper, means for regulating the extent of travel of the gripper, a stationary cushioning device to cushion the gripper-carrier at the end of its forward stroke,
130 and an adjustable cushioning device to cushion the said carrier at the end of its back-stroke.

4. In a machine for feeding and cutting

sheet material, the combination, with a cutter and a support for the material on its way to the cutter, of a gripper-carrier mounted in guides, the said guides, a gripper mounted in said carrier, a rocking arm 19, coupled to the gripper-carrier by a rod 20, the said rod, the slotted link 17, means, substantially as described, for uniformly vibrating said link, the rod 21, coupled adjustably to said slotted link at one end and to the rocker-arm 19 at its other end, the cushions at the coupling of said rod with said arm, and the dash-pots arranged to cushion the gripper-carrier at the termination of its stroke in both directions.

5 5. In a machine for feeding and cutting sheet material, the combination, with an intermittent feeder for the material, a reciprocating knife timed to operate with said feeder, and mechanism, substantially as described, for operating said knife, of an automatic disengaging mechanism, substantially as described, for arresting the operation of the knife at predetermined intervals, whereby the material may be cut into lengths, each of which is a multiple of the distance traveled by the feeder.

6. In a machine for feeding and cutting sheet material, provided with two parallel feedways for the material, two reciprocating cutters operating in unison, a reciprocating gripper-carrier, two sets of grippers mounted in said carrier, one set arranged to face the other, and means, substantially as described, for simultaneously closing and simultaneously relieving the grippers of both sets.

7. In a machine for cutting sheet material, the combination of the knife mounted in guides, the said guides, the rock-shaft 29, the rockers fixed thereon, the rods 30, coupling the said rockers to the knife, a shaft 2, a crank thereon, the rod 31, coupled at one end to said crank and having a notch which normally engages a wrist-pin on the rocker 29^a, the said wrist-pin, and means, substantially as described, for disengaging the notch in rod 31 from said wrist-pin, whereby the operation of the knife may be arrested without stopping the machine.

8. In a machine for feeding and cutting paper, the combination, with the reciprocating

knife, the main shaft 2, the crank 32 thereon, the notched rod 31, coupled to said crank, the rocker 29^a, coupled to the knife and provided with a wrist-pin 29^c, adapted to engage the notch in rod 31, whereby rotation of the shaft 2 reciprocates said knife, of the rock-shaft 33, the arm 33^a thereon, the connector which couples said arm to the rod 31, the wheel 34, mounted loosely on shaft 33, the wheel 35 on shaft 2, the belt connecting said wheels, and means, substantially as described, whereby the wheel 34 rocks the shaft 33 once at each revolution of said wheel.

9. In a machine for feeding paper, the combination, with the sets of slats forming the two feedways, of the reciprocating gripper-carrier provided with a set of bearing-pieces for the grippers, arranged to play between said slats, the guides on which said carrier plays, the two sets of grippers mounted in said carrier, those of one set facing those of the other, means for closing said grippers on the material to be fed, and means for relieving all of said grippers simultaneously, as set forth.

10. The combination, with the gripper-carrier, of the spring-grippers mounted therein, the relieving-bars engaging the stems of said grippers, the cylinder 24, carried by one of said bars, the piston 24^a in said cylinder and coupled to the other of said bars, and means, substantially as described, for introducing an elastic fluid into said cylinder behind said piston, substantially as and for the purposes set forth.

11. The combination, with the slats 6 and the springs behind them, of the rock-shaft 8, provided with arms coupled to the respective slats 6 and with an arm 9, the piston 12, coupled to the arm 9, the cylinder 13, in which said piston plays, and means, substantially as described, for admitting an elastic fluid to the cylinder behind said piston, as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

WM. G. CHAPIN.

Witnesses:

HENRY CONNETT,
J. D. CAPLINGER.