C. A. STURTEVANT.

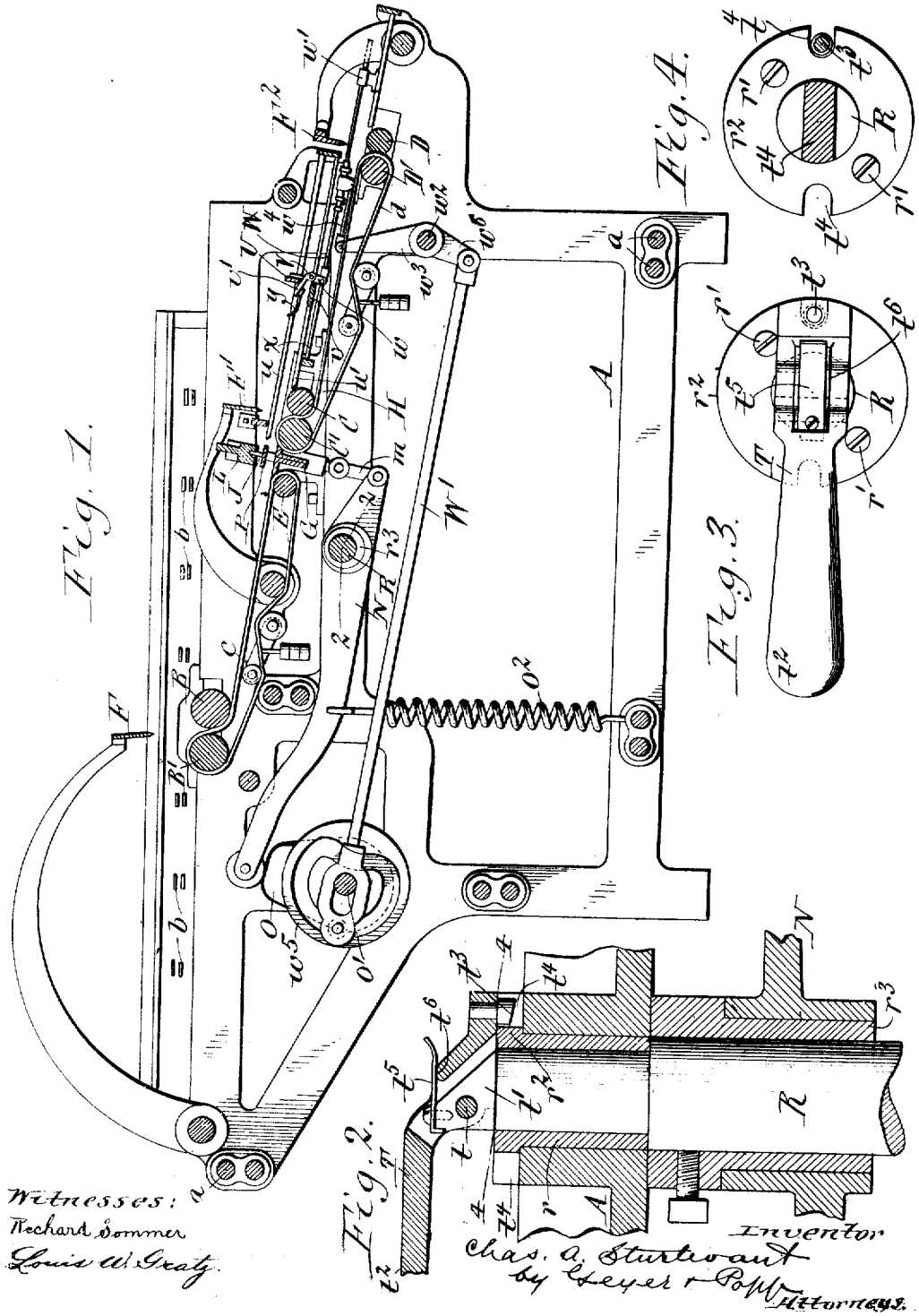
PERFORATING MECHANISM.

APPLICATION FILED JUNE 4, 1906.

911,548.

Patented Feb. 2, 1909.

3 SHEETS—SHEET 1.



Witnesses:
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Louis W. Gratz

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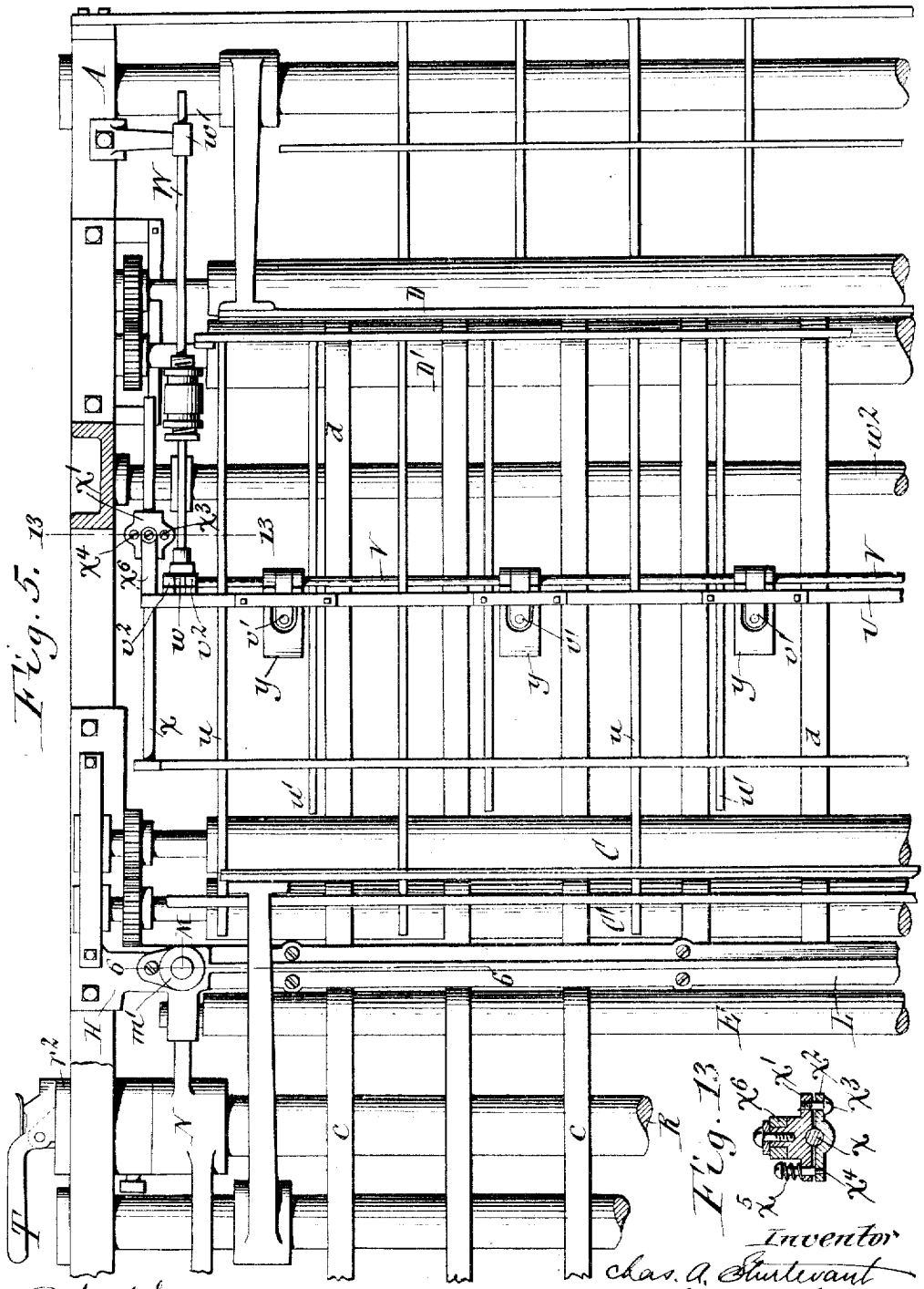


Fig. 5.

Fig. 13.

Witnesses.

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3 SHEETS—SHEET 3.

Fig. 6.

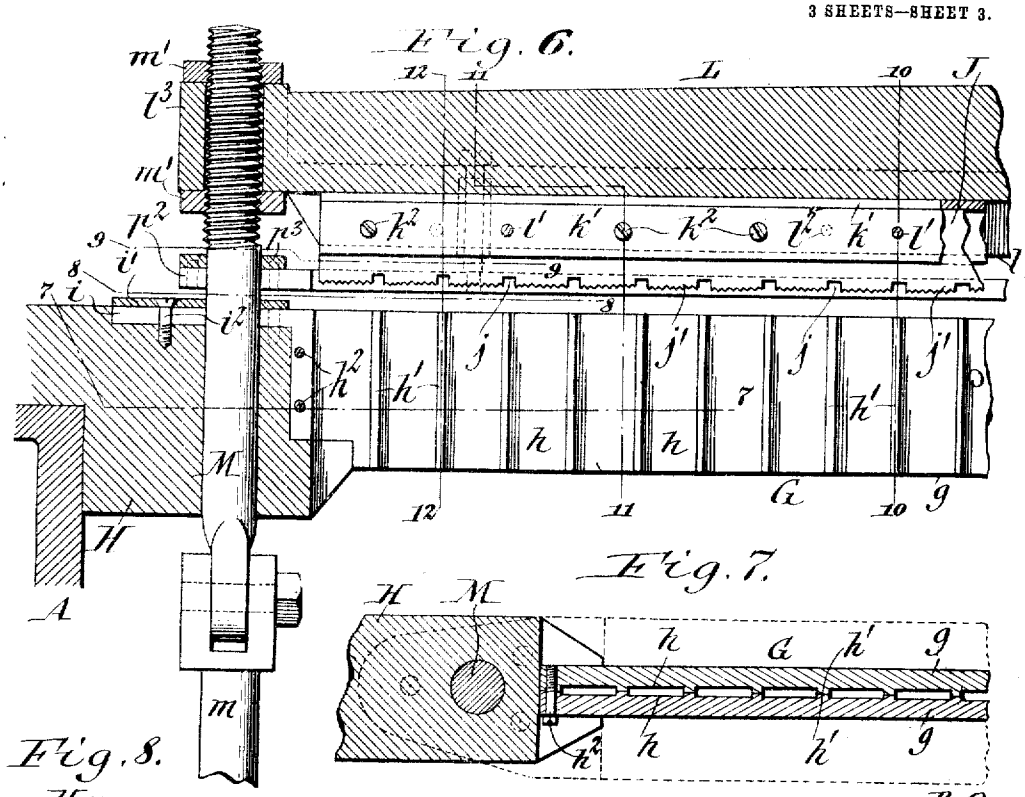


Fig. 7.

Fig. 8.

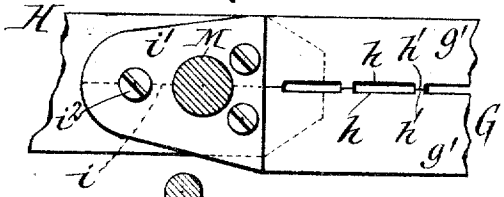
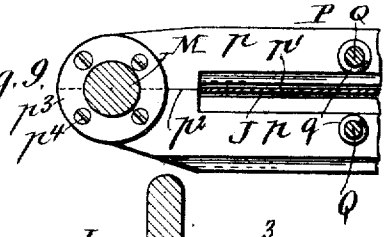


Fig. 9.



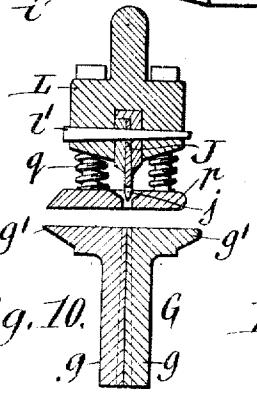


Fig. 10.

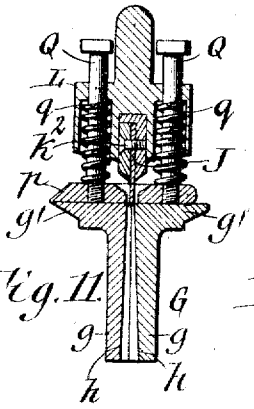


Fig. 11.

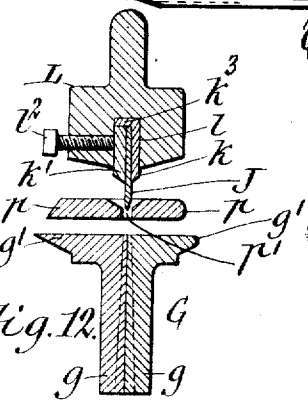


Fig. 12.

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UNITED STATES PATENT OFFICE.

CHARLES A. STURTEVANT, OF PLAINFIELD, NEW JERSEY, ASSIGNOR TO E. C. FULLER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

PERFORATING MECHANISM.

No. 911,548. Specification of Letters Patent. Patented Feb. 2, 1909.

Original application filed July 19, 1905, Serial No. 270,330. Divided and this application filed June 4, 1906. Serial No. 320,009.

To all whom it may concern:

Be it known that I, CHARLES A. STURTEVANT, a citizen of the United States, residing at Plainfield, in the county of Union and State of New Jersey, have invented a new and useful Improvement in Perforating Mechanisms, of which the following is a specification.

This invention relates to a perforating mechanism which is more particularly designed for use in sheet folding machines for producing a line of perforations in the sheet along the folding line so as to permit the air confined between the doubled sheet to escape more freely and enable the sheet to be folded in correct register.

The object of this invention is to produce a sheet perforating mechanism of this character which is comparatively simple and durable in construction and reliable in operation and which permits of obtaining a correct register of the sheets at all times.

This application is a subdivision of an application for improvements in folding machines filed by myself July 19, 1905, Serial Number 270,330.

In the accompanying drawing consisting of three sheets: Figure 1 is a vertical longitudinal section of a parallel folding machine equipped with my improved perforating mechanism. Fig. 2 is a fragmentary horizontal section, on an enlarged scale, taken in line 2—2, Fig. 1 and showing the means whereby the perforating device may be rendered operative or inoperative. Fig. 3 is a side elevation of the mechanism shown in Fig. 2. Fig. 4 is a vertical section in line 4—4, Fig. 2. Fig. 5 is a fragmentary top plan view, partly in section and on an enlarged scale of the folding machine provided with my improvements. Fig. 6 is a fragmentary vertical section of the perforating device, on an enlarged scale, taken in line 6—6, Fig. 5. Figs. 7, 8 and 9 are horizontal sections in lines 7—7, 8—8, and 9—9, Fig. 6 respectively. Figs. 10, 11 and 12 are vertical section taken in lines 10—10, 11—11, and 12—12, Fig. 6, respectively. Fig. 13 is a cross section in line 13—13, Fig. 5.

Similar letters of reference indicate corresponding part throughout the several views.

In the drawings only one side of the machine is shown but it will be understood that both sides of the machine are substantially the same. The main frame of the machine may be of any suitable construction that shown in the drawings consisting essentially of upright side pieces A and cross pieces *a* connecting the side pieces.

My improved perforating mechanism may be constructed complete by itself or it may be combined with other mechanisms which perform additional operations on the sheets.

As shown in the drawings, my improved perforating mechanism is associated with the mechanism of a machine whereby a plurality of parallel folds are produced in sheets after the same have been perforated by the mechanism embodying my invention.

The essential parts of the folding machine shown in the drawings consist of a pair of first rollers B, B^1 which produce the first fold in the sheet, a pair of second rollers C, C^1 arranged in front of the first pair and adapted to produce a second fold in the sheet, and a third pair of rollers D, D^1 arranged in front of the second pair and adapted to produce a third fold in the sheet. The sheets are carried to the first rollers by tapes *b*. As the sheets issue from the first pair of rollers the same are carried to the second pair of rollers by means of tapes *c* which pass with their receiving portions around the rear member B^1 of the first pair and around a delivery roller E. The sheets upon issuing from the second pair of rollers are carried to the third pair by means of tapes *d* which pass with their receiving portions around the rear member C^1 of the second pair and with their delivery portions around the third rear member D^1 of the third pair. These three pairs of folding rollers are arranged transversely in the machine and the sheets are fed downwardly between the same by oscillating folding blades, F, F^1, F^2 which are arranged parallel with these rollers and coöperate therewith in a well known manner.

The perforating device shown in the drawings is adapted to perforate the sheets preparatory to producing the second fold in the same so as to permit a free escape of the air from between the folds of the sheets while producing these subsequent folds in the same. This perforating device is best shown in Figs. 10–12 and is constructed as follows: G represents the perforating die which is

arranged horizontally and transversely in the machine in the space between the delivery rollers E of the tapes c, and the rear member C^1 of the second pair of folding rollers. This die is composed of two vertical bars g, g which are arranged transversely side by side and provided at their upper ends with flanges g^1, g^1 which project laterally in opposite directions. The opposing vertical sides of the two die bars are provided with two horizontal series of vertical recesses or grooves h which extend from the upper to the lower edges of the bars and are separated by intervening ribs or solid portions h^1 which alternate with the grooves. The two bars of the die are connected by screws h^2 passing their end portions or by any other suitable means so that the grooves and ribs of one pair register with those of the other and thereby form a row of vertical perforations or openings which are parallel with the folding rollers and blades.

The die may be supported in its proper position relative to the adjacent blade and folding rollers F, C^1 of the machine in any suitable manner but preferably by means of brackets H, mounted on the adjacent part of the main frame, which brackets also serve to support the bearings of the delivery roller E and the pair of the second folding rollers C, C^1. For this purpose the ends of the die bars are constructed at their outer ends to form divided eyes or perforated lugs i which rest upon the brackets and are secured thereto by means of coupling plates or caps i^1 resting on the eyes or ears and screws i^2 passing through said ears, coupling plates or caps and into the brackets. The top of the die is in line or nearly so with the top of the delivery roller E and the rear member of the second pair of folding rollers, as shown in Fig. 1.

Above the die is arranged the transverse perforating blade J which coöperates with the die for perforating the sheets which are fed between the same. The perforating blade is preferably constructed of a number of comparatively short sections each of which is provided at its lower edge with a plurality of deep notches j which are adapted to receive the ribs of the die and with a plurality of teeth j^1 which alternate with said notches and which are constructed to enter the openings of the die. The blade sections are secured end to end in a holder so that they together form practically one continuous piece. This blade holder consists of two clamping or holding plates k, k^1 which are secured to opposite sides of the blade along the upper longitudinal edge thereof by means of screws k^2. One of said plates is preferably provided at its upper edge with a horizontal flange k^3 which extends over the upper edge of the perforating blade and the other holding plate, as shown in Figs. 9 and 12. The blade holder is arranged with its upper part in a horizontal groove l formed in the underside of a vertically movable cross head L the holder and blade being secured in this groove by means of taper pins l^1 passing through corresponding openings in the cross head, blade holder and blade and also by means of set screws l^2 arranged in the cross head and bearing against the outer side of one of the plates of the perforating blade holder, as shown in Figs. 10 and 12. The cross head may be raised or lowered together with the parts mounted thereon by any suitable mechanism that shown in the drawings consisting of vertical sliding bars or rods M guided in the eyes i and the brackets H and supporting the cross head at their upper ends, rock levers N having their front arms connected by links m with the lower ends of the slide rods, rotary cams o arranged on the main driving shaft o^1 and engaging with the rear arms of the rock levers N and springs o^2 connecting the rock levers with the main frame. The cams o operate to lower the head and the perforating blade mounted thereon and the springs o^2 operate to lift these parts.

The lower edge of each perforating tooth j^1 is serrated or provided with numerous fine teeth like those of a saw so that the same will readily penetrate the sheets upon being depressed. Means are provided for adjusting the cross head so as to take up wear on the perforating blade and also for adjusting the same with reference to the die in setting up the machine. The preferred means for this purpose shown in the drawings consist in providing the ends of the cross head with eyes l^3 which receive the guide rods M and screw nuts m^1, arranged on the upper screw threaded ends of the guide rods and bearing against the upper and lower sides of said eyes. By loosening the screw nuts of one side of the cross head eyes and tightening the others the cross head may be raised or lowered relatively to the slide rods for adapting the perforating blade to the die. While the sheets are being fed over the die the perforating blade is elevated above the path of the sheets. After each sheet comes to rest the cross head is lowered sufficiently to cause the teeth of its blade to penetrate the sheet leaving connecting webs between those portions of the sheets opposite the notches or non-cutting portions of the perforating blade. After the perforations have been thus formed in the sheet the perforating blade is raised permitting the sheet which has just been operated upon to be carried away and replaced by another. The openings in the die are enlarged or flared from the upper or inlet ends toward the lower or outlet ends thereof, as shown in Fig. 11, whereby any small pieces of paper which

may be pushed down through these openings free themselves and drop out through the lower large end, thereby preventing these openings from becoming clogged.

For the purpose of preventing the sheet after the same has been penetrated by the perforating blade from rising with the latter a stripping device is provided which is constructed as follows: P, represents a stripper composed of two transverse bars p, p which are arranged lengthwise side by side but separated to form a longitudinal slot p^1 between the same through which the lower portion of the perforating blade projects. The ends of the stripper bars are guided to move lengthwise on the sliding rods M by constructing these ends so as to form divided guide eyes p^2 which receive said rods. These parts of each guide eye are connected by means of a coupling ring p^3 which receives the adjacent guide rod M and is secured to the eye sections p^2 by means of screws p^4 or otherwise.

The downward movement of the stripper plate relatively to the perforating blade is limited by means of stop-rods or screws Q passing loosely through the cross head on opposite sides of the perforating blade and secured at their lower threaded ends to the stripper bars while the heads at their upper ends bear against the upper side of the cross head. In its elevated position the underside of the stripper is slightly below the lower edge of the perforating blade. The stripper is yieldingly held in this position by means of springs q surrounding the supporting rods or screws and bearing at their opposite ends against the top of the stripper bars and the underside of said cross head, as shown in Fig. 11. As the cross head descends the paper resting upon the die is engaged first, by the stripper and during the continued downward movement of the cross head the stripper remains at rest on the paper while the perforating blade penetrates the paper and enters the die, whereby the paper is securely held in place during the perforating operation. During the subsequent upward movement of the cross head the stripper remains at rest on the paper until the perforating blade has been withdrawn from the paper and recedes within the slot of the stripper. After the blade has been thus removed from the paper the stripper is elevated by the cross head during the last portion of its upper movement with the perforating blade.

In order to permit of quickly and easily throwing the perforating device out of working condition so as to avoid the formation of perforations in the sheets when getting the machine ready or for other purposes, a throw off device is provided which is preferably constructed as follows: R, represents a horizontal rock shaft which is journaled transversely at its ends in bushings r. These bushings are secured in openings in the main frame preferably by means of screws r^1 passing through external plates or flanges r^2 arranged at the outer ends thereof. Near opposite ends the rock shaft R is provided with eccentrics r^3 upon each of which one of the rock levers N is journaled. Upon turning this shaft so that the salient parts of the eccentrics are on the lower side thereof the fulcrum of the levers N will be so located that the rocking movement of the levers will cause the cross head to move the perforating blade downwardly and upwardly across the path of the sheet lying on the die. If the shaft R is turned half way around so that the salient parts of its eccentrics are on the upper side thereof then the pivot of these levers will be so shifted that the latter when rocked by the cams o and the springs o^2 will not move the blade downwardly and upwardly across the path of the sheet. Although the cross head and the parts mounted thereon continue to reciprocate while in an elevated or inoperative position the same will be without effect because the entire stroke of these parts at this time is above the path of the sheets. For conveniently turning the rock shaft and holding it in either position a hand lever T, is provided having a bifurcated central part which is pivoted transversely by a pin t on a lug t^1 projecting from one end of the shaft and provided on one side of its pivot with a handle t^2 for manipulating the lever and on the opposite side thereof with a locking tooth or lug t^3 which is adapted to engage with one or the other of two notches or recesses t^4 formed on diametrically opposite sides of the locking plate or flange r^2 on the adjacent bushing. The hand lever is yieldingly turned in the direction for holding its tooth in engagement in one of said notches by means of a spring t^5 secured at one end to the lug t^3 of the shaft while its opposite end bears against a nose t^6 on that side of the lever which carries the tooth t^3. When it is desired to turn the rock shaft in one direction or another for moving the cross head either to its operative or inoperative position the handle of the lever T is pushed inwardly sufficiently to disengage its tooth from the respective locking notch on the flange. The lever together with the shaft and the eccentrics is now turned half way around whereby the tooth of the lever is brought opposite the other notch of the bushing flange r^2 with which it is interlocked by the spring t^5 upon releasing the lever, thereby holding the shaft and the parts connected therewith in this reversed condition.

As each sheet is fed between the die and the perforating blade and over the members of the second pair of rollers the same is first arrested in position to receive the row of perforations along the line where the next

fold will take place and then the sheet while still in a correctly registered position will be grasped and moved forward until the line of perforations are brought into the path of the blade of the folding device which produces the next fold in the sheet. The preferred construction of the means for thus registering the sheet and continuing the forward movement thereof while registered is constructed as follows: U represents a gripper bar arranged transversely in the path of the sheet in front of the second pair of folding rollers. This bar is movable bodily back and forth in a direction lengthwise of the movement of the sheet. During this movement of the gripper bar the same is guided on the stationary upper and lower guide rods u, u^1 which are arranged lengthwise above and below the path of the sheets in front of the second rollers and serve to confine the sheets against displacement on the tapes d.

The vertical front side of the gripper bar serves as a gage or face against which the front edge of the sheet is registered preparatory to perforating the same and effecting the second fold therein. Upon this gripper bar are mounted gripping devices whereby the front end of the sheet is grasped and caused to move forwardly with the bar. This gripping device preferably consists of a plurality of grippers each of which comprises a lower gripper jaw v and an upper gripper jaw v^1 movable vertically toward and from the lower jaw. Each lower jaw projects forwardly from the bar, and each upper jaw is secured at its rear end to a transverse rock shaft V which is journaled in bearings v^2 on the gripper bar. This shaft connects all of the upper gripper jaws and is provided at opposite ends with depending rock arms w. To the lower end of each of these rock arms is connected the rear end of a shifting rod W which latter is guided at its front end in a bracket w^1 secured to the main frame. These shifting rods are actuated by means of a rock shaft w^2 provided with upper arms w^3 each of which is connected by a link w^4 with the respective shifting rod, and a cam rod W^1 operatively engaging at one end with a cam w^5 on the main driving shaft and connecting at its opposite end with a lower rock arm w^6 on the rock shaft w^2. Means are provided for holding or retarding the gripper bar and the parts mounted thereon frictionally against longitudinal movement relatively to the path of the sheets. The preferred means for this purpose consists of stationary friction rods x arranged lengthwise of the path of the sheets at opposite ends of the gripper bar, a pair of clamping plates x^1, x^2 bearing against the upper and lower sides of each friction rod, a screw x^3 loosely connecting said clamping plates on one side of the friction rod, a screw x^4 secured to one of said plates and passing loosely through an opening in the other plate on the opposite side of said rod, a spring x^5 surrounding said last mentioned screw between the head thereon and said last mentioned plate, and arms x^6 connecting the ends of the gripper bar with the upper clamping plates, as shown in Figs. 5 and 13.

When the gripper bar is in its rearmost position the grippers thereon are open and prepared to receive a sheet, as represented in Figs. 1 and 5. While the parts of the registering device are in this position a sheet is fed forward by the tapes c between the die and blade of the perforating device, the rollers and blade of the second folding device and against the gage face of the gripper bar between the several pairs of gripper jaws thereon. Immediately after the sheet engages the front gage the perforating device comes into operation and produces a line of perforations in the same. At the same time the cam w^6 begins to move the shifting rods forwardly whereby the rock arms w, gripper shaft V and upper gripper jaws are moved in the direction for closing the upper gripper jaws against the lower gripper jaws and gripping the sheet between the same. The gripper bar and the parts mounted thereon are held against bodily movement while the grippers are being thus closed by the friction between the clamping plates x^1, x^2 and the friction rods x but when the grippers have been closed the continued forward pull upon the shifting rods overcomes the frictional coupling between the clamping plates and the friction rods and permits these parts together with the gripper bar and jaws to move forwardly to the end of the stroke in that direction, whereby the sheet is carried forward for shifting its row of perforations from the perforating device to the next following folding device. The instant the sheet reaches its foremost position under the action of the front registering grippers the movement of the shifting rods is reversed. During the first part of this reversed or backward movement of the shifting rods the grippers are held against bodily movement in that direction by the friction between the clamping plates x^1, x^2 and friction rods x whereby this movement of the shifting rods is caused to turn the rock arms w and gripper shaft backwardly and lift the upper gripper jaws from the sheet, thereby releasing the latter. After the sheet is released at its front edge from the front registering grippers the second folding blade F^1 descends upon the same along its line of perforations and feeds the same between the second folding rollers C, C^1 whereby the sheet is folded on the line of perforations and carried to the third folding device for producing the front fold in the same. While

effecting the second fold in the sheet its front edge is moved backwardly away from the front registering grippers. At the same time the rock arms w during their continued backward movement engage with the front side of the gripper bar, as shown in Fig. 1, causing the clamping plates x^1, x^2 to slip on the friction rods x and compelling the gripper bar and jaws to move backward with the shifting rods to the end of their stroke in this direction. When the gripper bar and jaws reach this rearmost position, as indicated in Figs. 1 and 5, these parts are ready for registering and gripping the next sheet, for which purpose they remain at rest a sufficient time to permit of feeding this sheet to the same.

For the purpose of directing the front end of the sheet underneath the gripping jaws and preventing the same from interfering with said jaws a curved guard or guide y is provided for each gripper.

I claim as my invention:

1. A perforating device comprising a die, a blade, a rock lever operatively connected with said blade, and means for adjusting the fulcrum of said lever so as to permit the same to reciprocate the blade idly, substantially as set forth.

2. A perforating device comprising a die, a blade, a rock lever operatively connected with said blade, and an eccentric upon which said lever is pivoted and whereby said lever may be shifted so that the same reciprocates the blade idly, substantially as set forth.

3. A perforating device comprising a die, a blade movable toward and from said die, a rock lever operatively connected with said blade, an eccentric upon which said lever is pivoted, and means for adjusting said eccentric and holding the same in position comprising a hand lever operatively connected with said eccentric and having a locking tooth, a locking plate having a recess, and a spring operating to turn said handle lever in the direction for engaging its tooth with said recess, substantially as set forth.

4. A perforating device comprising a die, a blade movable toward and from said die, a rock lever operatively connected with said blade, an eccentric upon which said lever is pivoted, and means for adjusting said eccentric and holding the same in position, comprising a rock shaft, an eccentric which is secured to said shaft and upon which said lever is journaled, a hand lever pivoted transversely on said shaft and provided with a locking tooth, a stationary locking plate provided on opposite sides with recesses, and a spring secured to the shaft and engaging said lever for yieldingly holding its tooth in one of said recesses, substantially as set forth.

Witness my hand this 26th day of May, 1906.

CHARLES A. STURTEVANT.

Witnesses:
E. E. Bush,
C. H. Biulein.