C. A. STURTEVANT.

REGISTERING MECHANISM FOR FOLDING MACHINES, &c.

APPLICATION FILED JUNE 8, 1906.

981,137. Patented Jan. 10, 1911.

3 SHEETS—SHEET 1.

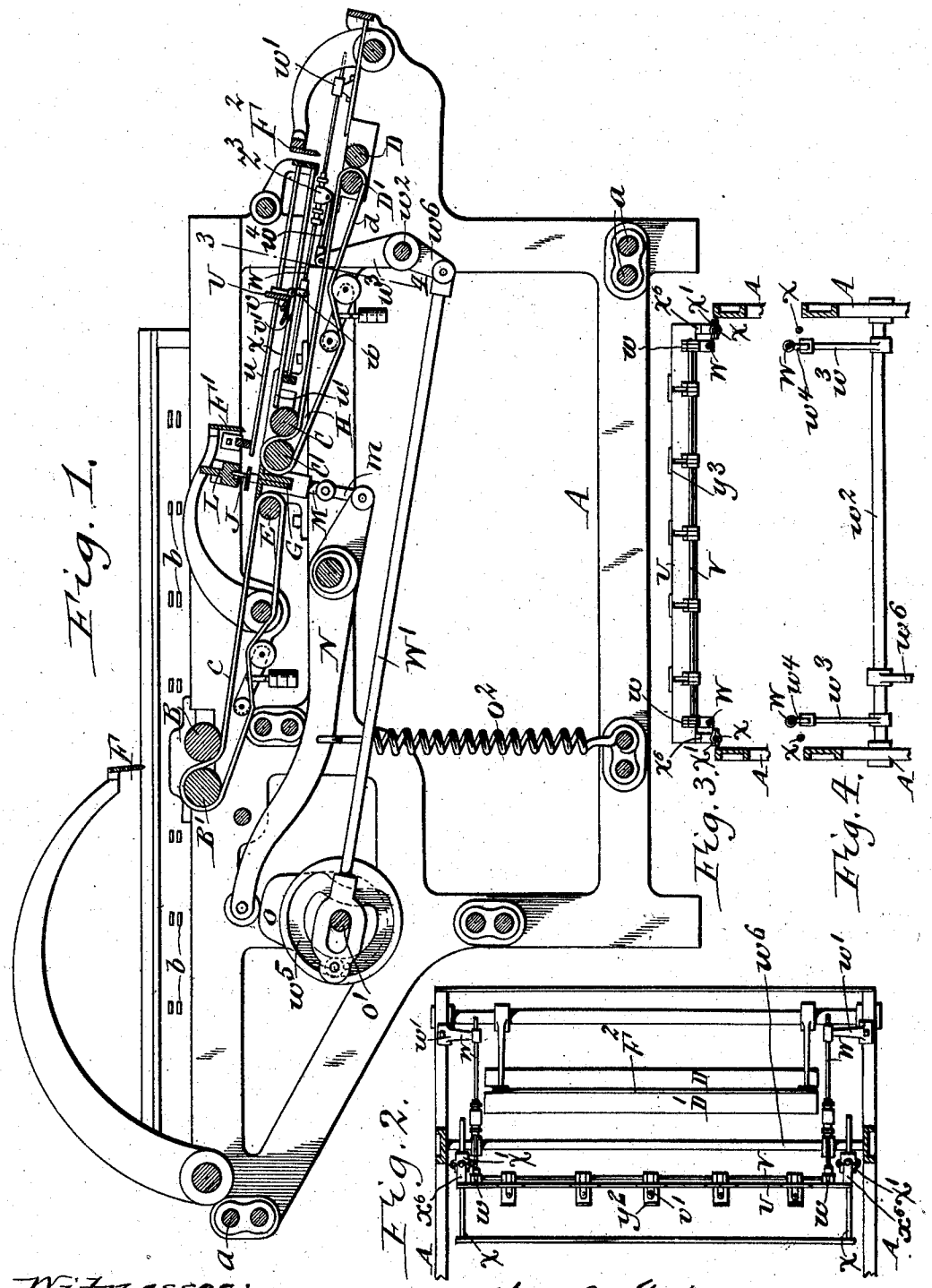

Fig. 1.

Fig. 3.

Fig. 4.

Fig. 2.

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3 SHEETS—SHEET 2.

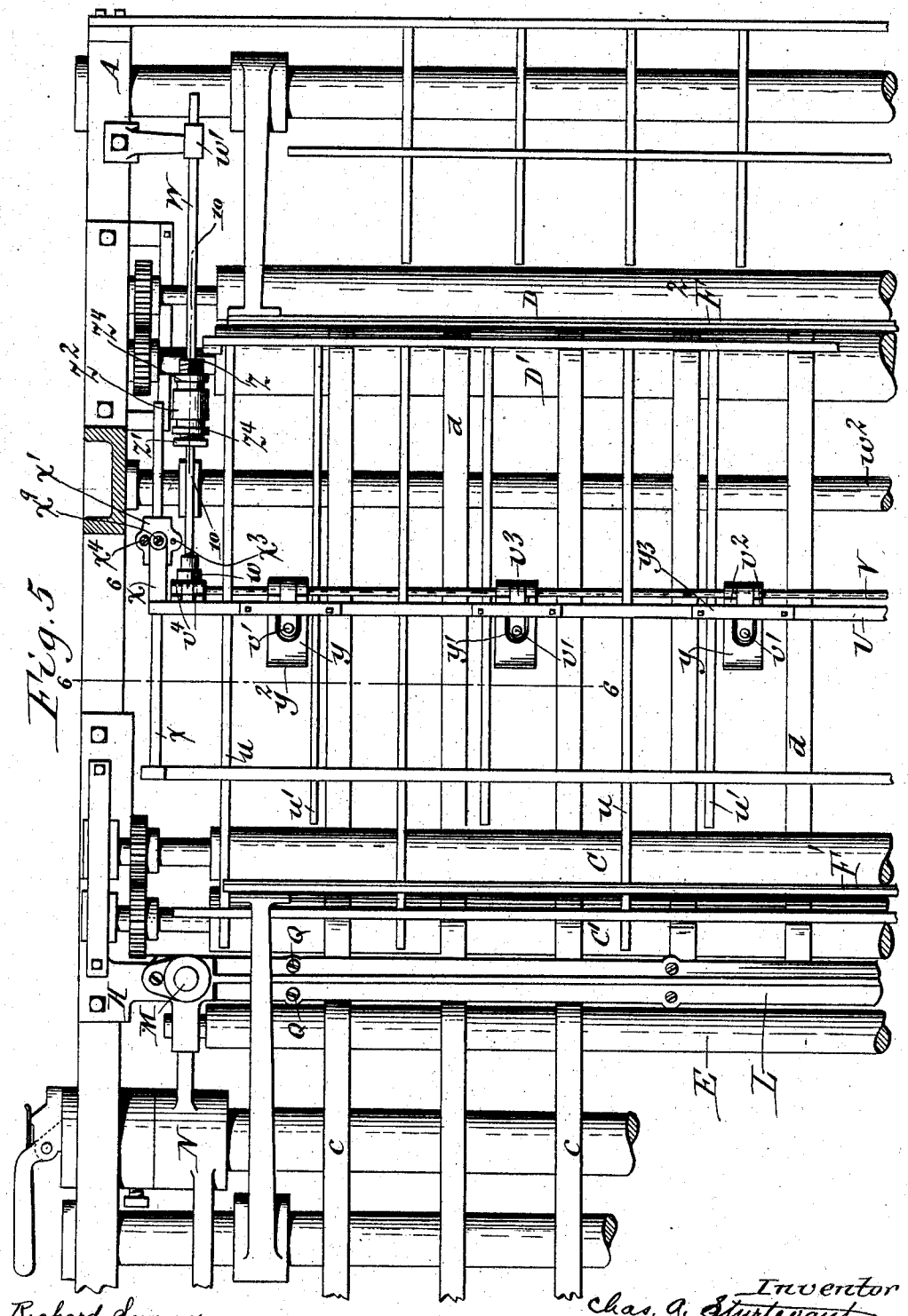

Fig. 5.

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3 SHEETS—SHEET 3.

Fig. 6.

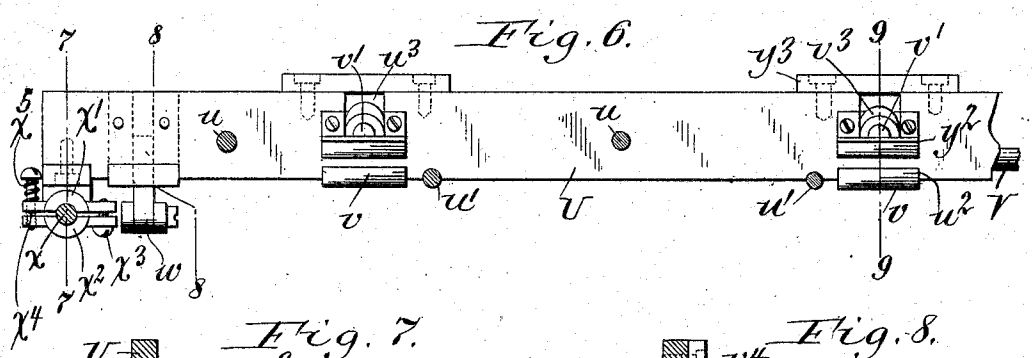


Fig. 7.

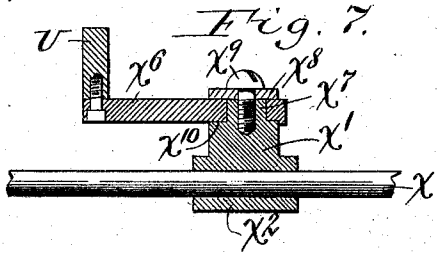


Fig. 8.

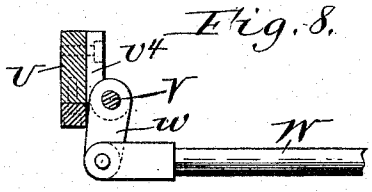


Fig. 10.

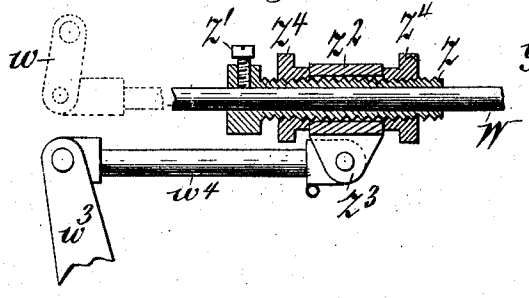


Fig. 9.

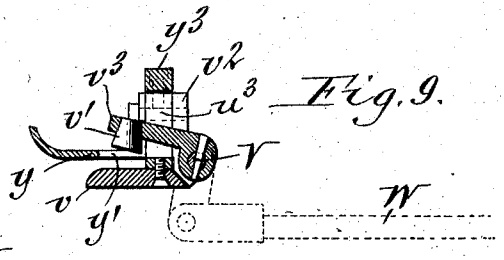


Fig. 11.

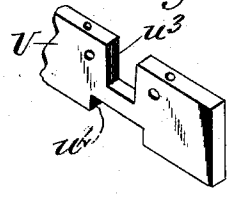


Fig. 12.

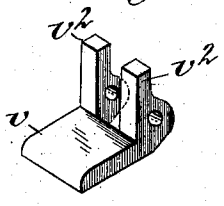


Fig. 14.

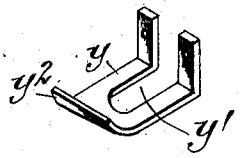
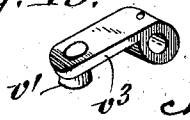


Fig. 13.



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UNITED STATES PATENT OFFICE.

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REGISTERING MECHANISM FOR FOLDING-MACHINES, &c.

981,137. Specification of Letters Patent. **Patented Jan. 10, 1911.**

Original application filed July 19, 1905, Serial No. 270,330. Divided and this application filed June 8, 1906. Serial No. 320,741.

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 Registering Mechanism for Folding-Machines, &c., of which the following is a specification.

This invention relates to a registering mechanism which is more particularly designed for use in sheet folding and perforating machines in which a line of perforations is produced 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 registering mechanism for this purpose which is comparatively simple and durable in construction and reliable in operation and which retains the sheet in correct register 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 drawings consisting of 3 sheets: Figure 1 is a vertical longitudinal section of a parallel folding machine equipped with my improved registering mechanism. Fig. 2 is a fragmentary top plan view of a folding machine, on a reduced scale, showing my improved registering mechanism applied thereto. Fig. 3 is a cross section in line 3—4, Fig. 1 looking rearward. Fig. 4 is a similar view taken on the same line looking forward. 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 cross section in line 6—6, Fig. 5. Figs. 7, 8, and 9 are vertical sections taken in lines 7—7, 8—8, and 9—9, Fig. 6 respectively. Fig. 10 is a vertical section, on an enlarged scale, taken in line 10—10, Fig. 5. Figs. 11, 12, 13 and 14 are perspective views of the gripper bar, the lower gripper jaw, the upper jaw and the gripper guard, respectively.

Similar letters of reference indicate corresponding parts 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.

Although my improved registering mechanism is applicable to various kinds of machines the same as represented in the drawings is applied to a machine whereby a plurality of parallel rows of perforations and folds are successively produced in sheets. 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 comprises a perforating die G 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 and sup-

ported in its proper position relative to the adjacent blade and folding rollers F^1, C^1 of the machine 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 rollers E and the pair of the second folding rollers C, C^1, a transverse perforating blade J arranged above the die and coöperating with the same for perforating the sheets which are fed between the same, a cross head L which carries said blade and which is raised and lowered by vertical sliding bars or rods M guided in 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 end 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.

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 blade to perforate the sheet. 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.

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 is 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 its rear end is seated in a notch u^2 formed in the under side of the gripper bar and provided with two upwardly projecting lugs v^2 which are secured to the rear side of the gripper bar. The upper gripper jaw consists of a block of rubber or other elastic material which is secured to the front end of a vertical swinging gripper arm v^3. This arm projects forwardly through a notch u^3 in the upper edge of the gripper bar and is secured at its rear end to a transverse rock shaft V which is journaled in the lugs of the lower jaw and also in bearings v^4 on the end portions of the gripper bar. This shaft connects all of the arms 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 W 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 links or arms x^6 connecting the ends of the gripper bar with the upper clamping plates, as shown in Figs. 5, 6 and 7.

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^5 begins to move the shifting rods forwardly whereby the rock arms w, gripper shaft V and gripper arms v^3 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 gripper bar and 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. 8, 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. Each of these guards is secured to the front side of the gripper bar and provided at its inner or front end with a recess y^1 through which the upper gripper jaw moves vertically while its outer or rear end y^2 is curved upwardly for directing the sheet underneath the same.

y^3 represents cleats which are secured to the upper edge of the gripper bar and connect the parts thereof on opposite sides of its notches u^3 thereby reinforcing the gripper bar and compensating for the loss of strength caused by the formation of these notches in the bar.

For the purpose of permitting the grippers to be adjusted to various sizes of sheets the shifting rods are adjustably connected with the links w^4 preferably by the following means: z, Figs. 5 and 10 represents an adjusting sleeve mounted on each shifting rod and having an external screw thread and a set screw z^1 whereby the same is secured to the rod. z^2 represents a coupling sleeve which has a smooth bore engaging with the adjusting sleeve and a depending lug z^3 to which the front end of the adjacent link w^4 is pivotally connected. At opposite ends of the coupling sleeve, jam or screw, nuts z^4 are mounted on the adjusting sleeve. In adjusting the grippers from one sized sheet to another the set screws z^1 of the adjusting sleeves are loosened. The shifting rods are now moved lengthwise through the adjusting sleeve until the grippers are approximately in the position which they should occupy then the said screws z^1 are tightened, thereby effecting a coarse adjustment of the grippers. An accurate adjustment of the grippers is now produced by loosening one of the jam-nuts z^4 and tightening the other adjacent to the adjusting sleeve, whereby the shifting rods are moved lengthwise through the coupling sleeve until the grippers are in position for correctly registering the sleeve.

In order to prevent the gripper bar and connecting parts from becoming cramped if both ends of the gripper bar are not adjusted simultaneously the arms x^6 of the gripper bar are connected with the upper clamping plates by a swivel connection consisting preferably of a vertical stud or wrist x^7 arranged on each upper clamping plate and a washer x^8 secured to the upper end of the wrist by a screw x^9. The rear end of each arm x^6 is pivoted horizontally

on said wrist and is confined against vertical movement thereon between the shoulder x^{10} at the base of the wrist and the washer on the upper end thereof. If the gripper bar while adjusting the same is not maintained exactly at right angles to the path of the sheet the arms x^6 will turn horizontally on the clamping plates and thus prevent binding of these parts.

I claim as my invention:

1. A registering mechanism comprising a gage bar, arranged in front of the path of the sheets, a lower gripper jaw fixed on said bar, an upper gripper jaw movable toward and from the lower jaw, a rock shaft journaled on said bar and carrying said upper jaw, a rock arm secured to said shaft, a shifting rod connected with said rock arm, an adjusting sleeve connected with said rod, a coupling sleeve mounted on the adjusting sleeve, screw nuts arranged on the adjusting sleeve at opposite ends of the coupling sleeve, a rock lever, and a link connecting said rock lever with said coupling sleeve, substantially as set forth.

2. A registering mechanism comprising a gage bar arranged transversely in front of the path of the sheets, a plurality of grippers mounted on the gage bar, each comprising a lower fixed jaw and an upper movable jaw, a rock shaft journaled on the gage bar and connected with said upper gripper jaws, rock arms depending from opposite ends of said rock shaft, shifting rods connected with said rock arms, rock levers connected with said shifting rods, friction rods arranged lengthwise of the path of the sheets, a pair of clamping plates embracing each friction rod, and an arm or link connecting one member of each pair of clamping plates with said gage bar, substantially as set forth.

3. A registering mechanism comprising a gage bar arranged transversely in front of the path of the sheets, grippers mounted on said bar, means for reciprocating said bar and jaws lengthwise of the path of the sheets, and a holding or retarding device for said bar comprising longitudinal friction rods, a pair of clamping plates engaging frictionally with each rod, and a swivel connection between one plate of each pair and said bar, substantially as set forth.

4. A registering mechanism comprising a gage bar arranged transversely in front of the path of the sheets, grippers mounted on said bar, means for reciprocating said bar and grippers lengthwise of the path of the sheets and a holding or retarding device for said bar comprising longitudinal friction rods, a pair of clamping plates engaging frictionally with each rod, and a swivel connection between one plate of each pair and said bar consisting essentially of a stud arranged on said plate, a washer secured to said stud and an arm or link secured to said bar and pivoted on said stud, substantially as set forth.

Witness my hand this 31st day of May, 1906.

CHARLES A. STURTEVANT.

Witnesses:

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C. H. BIERLEIN.