No. 853,628. PATENTED MAY 14, 1907.

E. DUMMER.

SHEET REGISTERING DEVICE.

APPLICATION FILED AUG. 15, 1904.

2 SHEETS—SHEET 1.

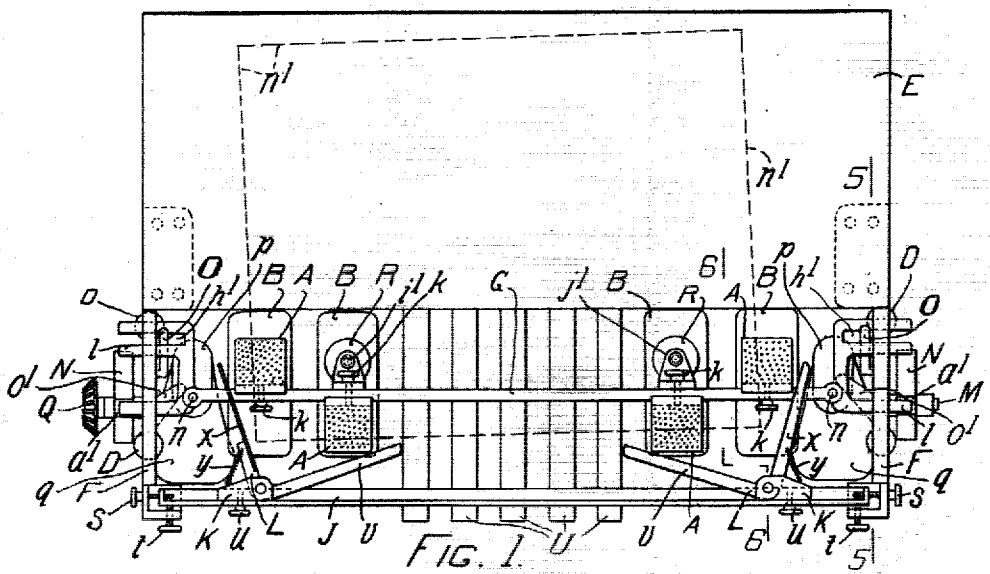


FIG. 1.

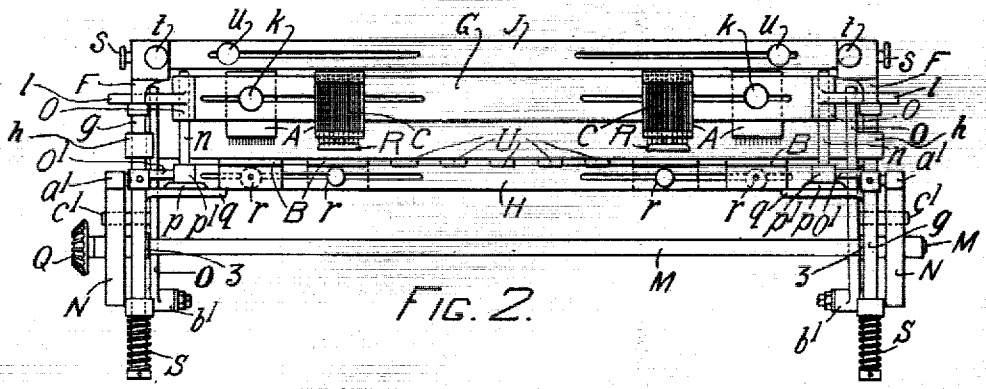


FIG. 2.

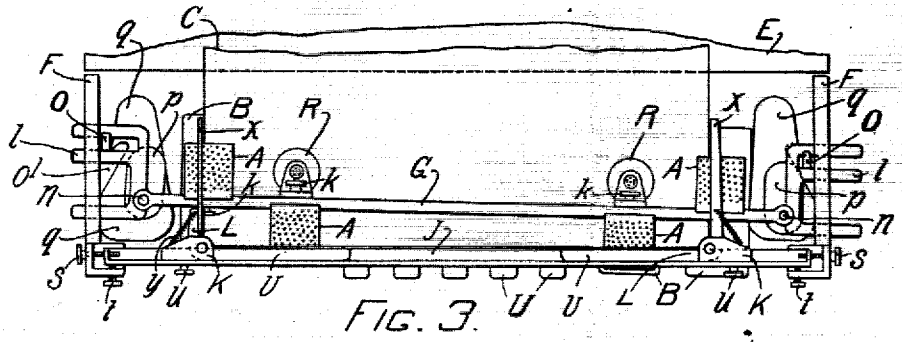


FIG. 3.

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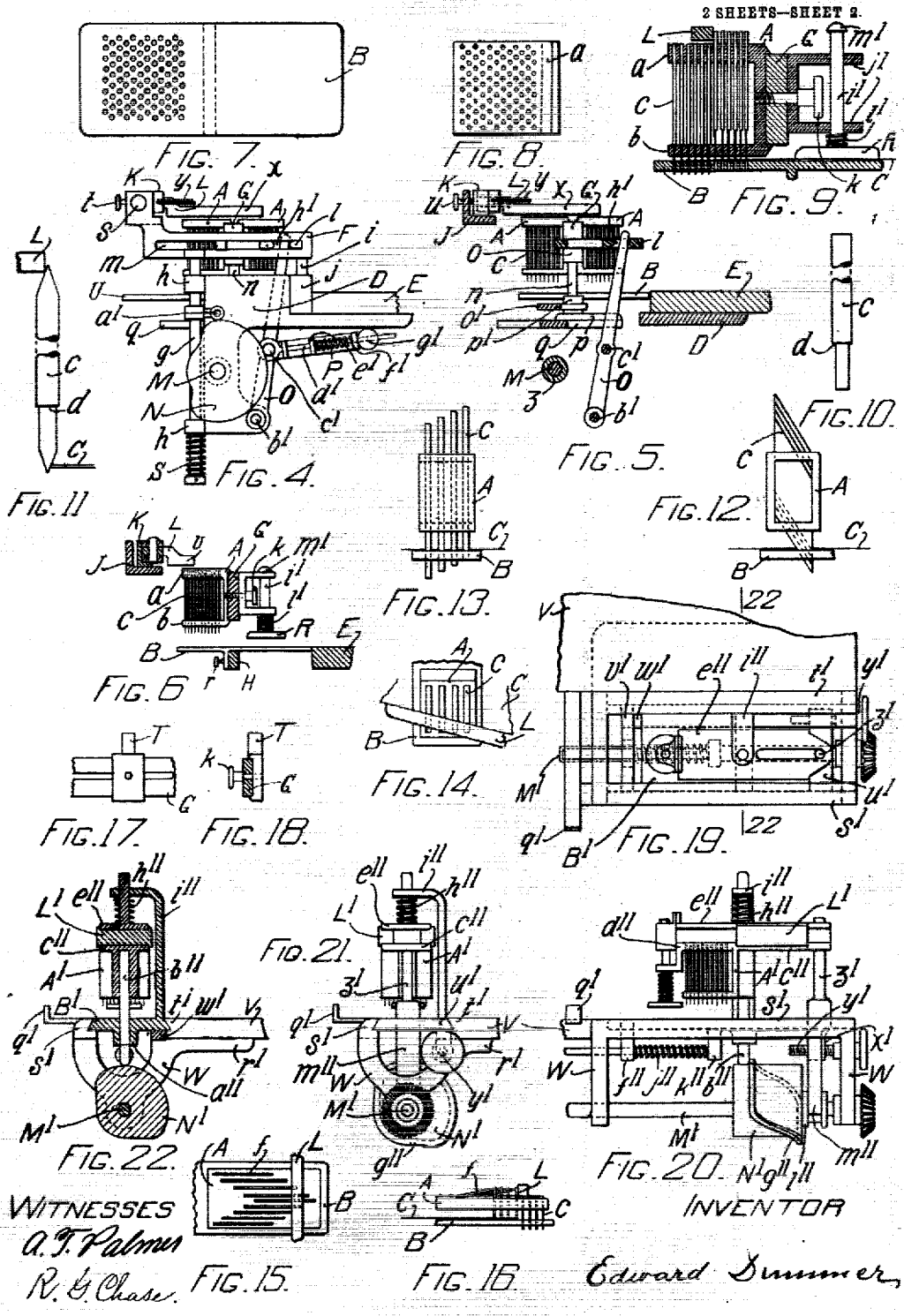
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2 SHEETS—SHEET 2.



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SHEET-REGISTERING DEVICE.

No. 853,628. Specification of Letters Patent. Patented May 14, 1907.

Application filed August 15, 1904. Serial No. 220,882.

To all whom it may concern:

Be it known that I, EDWARD DUMMER, a citizen of the United States, residing at Auburndale, in the city of Newton, county of Middlesex, and State of Massachusetts, have invented a new and useful Sheet-Registering Device, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to that class of devices by which sheets are "registered," that is; placed in the required position to be taken into the machine to be fed, printing, folding or other machine, such registration being gaged by the edge or edges of the sheet.

The object of my invention is to insure that each and every sheet shall be positively and accurately registered, whatever may be the thickness or quality of the material.

It has been customary heretofore, when registering by the edge of the sheet, to cause the edge and an abutment to meet. In such operation it is always necessary that said edge and abutment be pressed one to the other with a certain degree of force in order to secure close contact of sheet and abutment. Owing to the required rapidity of action, the edge of the sheet is apt to meet the abutment with greater force than is needful, or not quite meet the abutment. If the edge of the sheet and the abutment are pressed or thrust, one to the other, however slight the pressure or thrust may be, the edge of thin and soft paper is likely to be indented, or, being of hard or springy material, the sheet is apt to rebound, so that accurate register cannot be secured with that degree of certainty desired. My invention does away with such meeting of the edge of the sheet and an abutment. I accomplish this by means of a device—herein styled a form—which, being suitably applied to the sheet, automatically assumes a shape or bearing surface corresponding to, or in line with, the edge of the sheet. Such form being hard—metallic—may be positively guided and controlled so as to meet an abutment and be pressed and held to the same in absolute and close contact, so that the sheet, being held in suitable relation to said form, will be brought therewith into the exact position required, the edges of the sheet not meeting any obstruction. Said form is the foundation and constitutes the main feature of my invention, while the mechanism herein set forth in detail for supporting and moving the form, causing the same to meet the abutment, and holding and moving the sheet, is of minor importance as a matter of invention, because it may be varied according to the requirements of the machine to be fed, or the judgment or fancy of the constructor.

In the drawings—two sheets—Figure 1 is a plan of mechanism embodying my invention. Fig. 2 is a front elevation of the same. Fig. 3 is a plan view of so much of the parts in Fig. 1 as serves to illustrate their function in bringing a sheet to register. Fig. 4 is a side elevation of the mechanism shown in Fig. 1. Fig. 5 is a vertical section taken in direction of lines 5, 5, and Fig. 6 is a vertical section taken in direction of lines 6, 6, in Fig. 1. Figs. 7, 8 and 9 are, respectively, a plan of a sheet support under a form, a plan of a form, and a vertical section of a form, a sheet-support and a presser-foot. Fig. 10 shows a part of one of the pins of a form, and Fig. 11 illustrate a modification thereof. Figs. 12 and 13, elevations taken at right angles to each other, and Fig. 14, a plan, illustrates a modification of the form. Fig. 15, a plan, and Fig. 16, an elevation, illustrate another modification of the form. Figs. 17 and 18, elevations taken at right angles to each other, show a stud which may take the place of one of the forms, as hereinafter explained. Figs. 7, 8, 9, 10 and 11, are drawn on a larger scale than the other figures, Figs. 10 and 11 being very much enlarged. Figs. 19, 20, 21 and 22, showing respectively, a plan, a front elevation, a side elevation, and a vertical section taken in the direction of lines 22, 22, in Fig. 19, illustrate my invention as applied in what is called a "side-puller" which is for the purpose of registering a sheet at the side only, the front edge having been brought to register by other means.

Because the device herein called a form is the most important part of my present invention, and because a clearer understanding of the purpose and function of the other mechanism will thus be best seen, I will first describe said form, referring especially to Figs. 7, 8, 9 and 10, and to modifications of parts thereof illustrated by Figs. 11, 12, 13, 14, 15, and 16.

I prefer to so construct the form A as to consist of a top-plate *a*, bottom plate *b* and

pins *c*, these plates, together with the upright or back-plate which connects them, making the body of the form. The plates *a* and *b* have perforations so located with reference to each other that the pins *c*—all of the same length and parallel to each other—may move freely up and down therein. Each pin has a shoulder *d* which limits its downward movement with reference to the body of the form. As to the diameter of each pin and the number of pins it may be briefly stated that it is desirable that the pins be as small as is consistent with the necessary strength and durability, in order that there may be as many pins as possible in a form of a desirable area. Below the form A is a sheet-support B, preferably having perforations therein somewhat larger than those in the form but corresponding thereto so that the pins may drop freely therein.

If a sheet C be placed on the sheet-support so that a part of the edge of the sheet will be under the form, within the area comprised by the pins thereof, and the body of the form be dropped down toward the sheet support, some of the pins will meet and rest on the sheet, the remainder extending below the surface of the sheet and into the sheet-support as far as the shoulders *d* will permit. Those pins resting on the sheet will extend above the others and some of them will present sides substantially or quite in line with the edge of the sheet. Against these pins and above the other pins an abutment L may be brought to bear and the pressure between these pins and the abutment may be as great and be maintained as long as desired, without of course any effect on the edge of the sheet.

Because the pins of the form may be of quite small diameter and many in number, quite close register may be obtained when each pin is of the shape shown in Fig. 10, but, to still further diminish any slight variation that may arise on account of the thickness of the pin, the ends may be made tapering as illustrated in Fig. 11. By making the pins rectangular and tapering oppositely as shown in Figs. 12, 13 and 14 the line of bearing of the abutment against the pins may be absolutely over the edge of the sheet because the abutment L, suitably located opposite the tapering parts of the upper ends of the pins, will meet said parts in a line directly over the line at which the edge of the sheet meets the opposite, tapering parts of the lower ends of the pins as will appear from the drawing without further explanation. In the latter case the number of pins may be much smaller, even one of broad surface being sufficient for some applications.

The modification of form illustrated by Figs. 15 and 16 is simply introducing springs *f* to cause movement of the pins with reference to the body of the form, instead of having the pins act by gravity. Such use of springs would probably be desirable only in exceptional cases.

The mechanism shown for operating the forms and bringing both the front and side edges of the sheet to register will now be described, referring to Figs. 1 to 10, inclusive, and to modifications illustrated by Figs. 17 and 18.

Two stationary and like sides D, D, are here shown as fastened to the feed-board E of a printing machine. Supports F, F, one above each stand D, are movable up and down, each being guided by a rod *g* secured to each support and sliding in bearings *h* on the corresponding stand, and further maintained in position by a stud *i* fastened to the support and sliding in bearing *j* on the stand. To a transverse piece G is fastened the forms A, A, A, A,—two for the front-edge, and one for each side-edge of the sheet—by means of screws *k*, each of which screws into the back of the form and can be moved in and along slots in piece G so as to adjust each form in the direction of the length of the piece G. This transverse piece is movable in any direction in a plane, being shaped at the ends *l* to slide in slots *m* in the supports F, F. Another transverse piece H is connected with the piece G by means of studs *n* fixed rigidly thereto and extending upward through bearings *o* on the piece G, which bearings slide on the studs when the transverse piece G moves up and down. The transverse piece H bears and slides simultaneously in a plane and in like manner with the piece G, having foot-pieces *p* which slide on ledges *q* secured to the stands D, D. To the piece H are secured the sheet-supports B, each being adjustable on the piece H and secured by means of a screw *r* under a form. A cross bar J is supported at the ends by the stands D, D, being secured thereto and adjustable endwise by screws *s*, and adjustable forward and backward by screws *t*. On the cross-bar are blocks K, secured thereon and adjustable lengthwise of the bar by means of screws *u*. To each of the blocks is pivoted an abutment L. Each of these abutments have two arms, *v* and *x*, which (on the supposition that the edges at the sides of the sheet are at right angles to the front edge) present faces at right angles to each other. Each abutment is held normally by a spring *y* so that the arms thereof are in position shown in Fig. 1. When the abutments are forced to their register position as shown in Fig. 3 the front arms *v* bear longitudinally against the bar J. On the supposition that the sheet is to be registered sidewise by the right hand edge the side arm *x* of the right hand abutment is rigid with the arm *v*, while the arm *x* of the left hand abutment is elastic with reference to the arm *v*, being represented as a flat spring as to the main part thereof.

Located transversely is a shaft M, having bearings z in the stands D, D. At each end of this shaft is a cam N. These cams are alike and are of such shape as to simultaneously by means of studs a secured to the rods g and thus to the supports F, F, allow these supports to drop, remain down for a time, and then raise them to and hold them in their first position during the remainder of a revolution of the cams. The shape of these cams is also such that they will simultaneously allow two levers O—pivoted one to each of the supports F, F, at b'—to swing forward, permit the levers to remain for a time in that position, and then swing them back to and hold them in, their first position for the remainder of the revolution of the cams. The levers O have studs c' which bear on the cams, and each lever is pressed forward by means of a spring P (shown only in Fig. 4) which is maintained in position by means of a rod d' pivoted on the stud c', having a collar e' and guided on arm f', the latter being pivoted at g' to the stands D, D. The levers O extend at their upper ends through slots h' in the transverse piece G so that by means of the levers this piece is slid backward and forward. The sliding movement of the transverse piece G with reference to the up and down motion of the supports F, F, is such that the supports drop down before the piece G slides forward, and are raised before the piece G slides backward. The cams make one revolution during the action on each sheet, the shaft M being geared with the machine to be fed, the bevel gear Q being, for instance, one element in such gearing.

There are two presser-feet R, R, each above a sheet-support B, and before action a sufficient distance above to allow a sheet to enter freely between the foot and support. Each presser-foot has a stem i' which slides up and down in bearings in stand j' which is secured to and adjustable on the transverse-piece G by means of a screw k, a spring l' pressing the foot downward as far as a shoulder m' on the stem will permit, or, when the piece G moves downward, causing the sheet to be clamped by and between the foot and sheet support.

For operation, the front forms adjustable sidewise are adjusted and secured in the position required on the transverse piece G, and the side forms are adjusted and secured on the piece G so that the distance between their centers is about equal to the width of the sheet. The cross-bar J, and abutments thereon are so adjusted and secured that when the latter are swung to their register position (as in Fig. 3) the faces of the front arms v, v, of the abutments will be exactly parallel to the line of the required register for the front edge of sheet, and the face of the side-arm x of the right hand abutment (if the side register is to be at the right hand of the sheet) so as to be parallel to the line of the required register for that edge of the sheet. Each sheet (the sheet being indicated by dotted lines n' in Fig. 1) is placed by hand, or by automatic mechanism, so that a part of the front and side edges of the sheet will be under the pins of the forms. In action the transverse piece G first drops causing the presser-feet R, R, to clamp the sheet, and allowing part of the pins of each form A to bear on the sheet and the remainder extend below the level of the sheet, thus causing the outer sides of some of the pins of each of the side forms, which extend above the plates a to be in line with the side edges of the sheet, and the front face of some of the pins of each of the front forms to be in like manner in line with the front edge of the sheet. The transverse piece G is then pressed forward so that the said sides of the pins will meet the abutments L, L, causing the latter to swing so that the forward arms thereof will be pressed against the cross-bar and the side arms of the abutments will, by bearing against the outer sides of the pins of the side forms, slide the transverse piece G and forms to one side o the other as may be to bring the outer faces of the pins of the right hand form to the line of register. The sheet C having been carried with the transverse piece and forms by means of the presser-feet R, R, and sheet supports, B, B, will be in the required register as illustrated by Fig. 3. The right hand side of the sheet will be in exact register rather than the left hand edge because of the spring-arm x which provides for any slight variation in width of sheets successively operated upon. If the left hand edge is to be brought to exact register then the abutments are to be changed each to the position of the other, as will be readily seen. Just as the sheet is seized by the grippers of the printing machine, or by the mechanism of other machine to be fed, the forms and presser-feet rise, releasing the sheet to freely pass into the machine to be fed. It will be noted that the cross-bar J and abutments L, L, rise and fall with the forms so that there is no sliding up and down to cause friction between abutments and pins. The transverse piece G, forms and presser feet then return to their first position ready for action on the next sheet, the transverse piece G being not only carried back and swung into the former transverse line, but it is moved also to its first position endwise by means of beveled guides o' which, fixed to the stands D, D, meet the projecting parts p' of the transverse piece H. Springs S are shown to insure the downward movement of the supports F, F, but these may be dispensed with in machines of such size that the weight of these supports and parts moving therewith is sufficient to cause their fall by gravity alone.

It is apparent that if only one edge of the sheet—as, for instance (referring to the above description) the front edge—is to be brought to a register line, the swinging abutments L, L, may be dispensed with, a simple bar, as the cross-bar J, serving as the abutment, being adjustable forward and backward and secured (as above set forth) in the required position.

While it is desirable to have a form at the left hand as well as the right hand edge of the sheet (so as to be readily employed for registering by the left edge of sheet) it will be noticed that but one of them (the right hand as shown) is necessary so far as forming a registering line is concerned, the pins of the left hand form providing simply something for the spring-arm of the corresponding abutment to press against. Therefore for such form may be substituted the simpler device shown in Figs. 17 and 18, in which an upright stud T takes the place of the pins and pin plates of the form, being adjusted and secured on the transverse piece by like means as shown.

Fingers U for supporting the sheet in part are similar to those now used in printing machines and may be adjusted and secured along the front edge of the feed board in like manner, further description thereof herein being superfluous. I note, however, that the fingers U, being in close proximity to the transverse piece H, will prevent this piece and sheet-supports fastened thereto from being lifted with the supports F, F, when the piece H, etc., are not of sufficient weight to prevent such lifting.

In view of the above description of forms and means for causing them to meet abutments and to bring the sheet into register at both the front and side edges, a brief description will be sufficient to set forth the invention as applied for bringing the sheet to register at the side when the front edge is already in register,—or, in other words, as applied in a "side-puller",—referring to Figs. 19 to 22, inclusive. The support of the body of the sheet is such as is common in the machine to be fed, here represented by the board V having gages at the front, one q' being here shown. Suitably secured in such machine, here shown fastened to the feed-board at r', are the downward extending stands W and connecting the same plates providing guides s' and t' parallel with the front edge of the feed-board. Two pieces u' and v' connected by a bar w' slide on said guides, part u' being provided with a downward extending projection x'. A screw y', screwing into the projection x', provides means for adjusting the side-puller by moving the pieces u' and v' and parts fastened thereto along the guides s' and t'. To the slide u' is fastened an upright standard z'. A slide B′ moving in the guides s' and t' and of such length as to leave sufficient space between its ends and the pieces u' and v' to permit the required movement of the form A′, is also the sheet-supporting plate under the form, being perforated for the pins as hereinbefore described. In a bearing a'' secured to the slide B′ a rod b'' slides up and down, being secured at its upper end to an extension c'', of the upper plate d'' of the form A′. This extension is slotted to allow the standard z' to extend there through and thus guide the form in its sidewise movement. The form A′ is substantially like those already described, having, however, the cover e'' which is also extended parallel with and slotted like the extension c''. Between these two extensions is the abutment L′ mounted on the standard z' to move vertically thereon, the sidewise movement of the form A′ being guided with reference to the abutment by having the abutment fitted to these extensions. The lower end of the rod b'' bears on a cam N′ which is shaped to give the necessary upward movement of the form. This cam has also a flange g'' so shaped as to give the necessary inward sidewise movement of the form. A spring h'' between a standard i''—fixed to the plate and slide B′—and the extension e'' causes the rod b'' to press on the cam and, therefore, the downward movement of the form. A spring j'' acting between a projection f''' from the piece and slide v' and a projection k'' from the plate B′ causes rod b'' to press sidewise against the flange of the cam, and therefore the form A′ to make its outward sidewise movement. The cam N′ is on a shaft M′ having bearing in the stands W, W, to revolve therewith and slidable thereon. To the cam is fastened a grooved hub l'' to receive an arm m'' from the piece and slide u' thus moving and maintaining the cam in suitable relation to the rod b'' and form A′ on adjustment by means of the screw y'.

In operation the form A′ is moved inward so as to be over the side edge of a sheet which has been placed on the support for the body of the sheet on the feed-board V so that the front edge of the sheet meets the ordinary front gages q'. The form and presser-foot then drop down onto the sheet thus clamping the sheet and allowing the pins of the form to meet the sheet or fall below, to present a bearing surface at the outer sides of some of the pins extending upward at the top of the form, which surface is in line with the required register. The form A′ then moving sidewise outwardly brings said surface of pins against the abutment L′ and the side-edge of the sheet into register. The form and presser foot (shown as like those previously described) is then raised to permit removal of the sheet, the abutment L′ moving in like manner upward to prevent friction of the same on side of the pins which press against it.

With regard to the size of the parts of the mechanism of the invention set forth relative to each other and particularly of the forms in large machines it may be well to note as follows. The work to be performed is light, being simply to move or slide a sheet into, and hold it awhile, in place, therefore said parts are mainly of only sufficient weight and strength to provide the required stability and for the necessary wear. The forms need be only of sufficient area as to be sure that (with any probable irregular previous placing of the sheet for their action) the edges to be brought into register will be well within their compass, so that for sheets, for instance one hundred times the actual area as shown in Figs. 1, 2 and 3, each form need be, perhaps, not more than five or six times the area actually shown in these figures. Furthermore, the pins of the forms need not be increased in size to the same degree as the forms as a whole, thus permitting in forms of larger size a greater number of pins, which results in closer, or greater accuracy of register, as will be readily understood.

I claim as my invention—

1. In paper-registering mechanism a form having pins and means for maintaining the pins in position laterally parallel to each other and permitting each pin to move independently endwise, substantially as and for the purpose set forth.

2. A form having pins and means for maintaining the pins in position laterally and permitting each pin to move independently endwise, in combination with a sheet-support and means for bringing said device onto the edge of a sheet of paper on the sheet-support, substantially as set forth.

3. In combination with an abutment located in position corresponding to the required line of register of the edge of a sheet of paper, a form embodying means for defining said edge, and means for causing said form and abutment to meet, substantially as and for the purpose set forth.

4. The combination of an abutment, a form embodying means for defining the edge of a sheet of paper, means for clamping the sheet, means for adjusting said abutment to the required line of register and means for causing said abutment to meet said form, substantially as and for the purpose set forth.

5. A device consisting of pins and a pin holder which maintains the pins in position laterally and allows free movement of the pins endwise, said device being in combination with an abutment an element in a sheet-registering mechanism to meet the abutment rather than the edge of the sheet itself, substantially as set forth.

6. Mechanism for registering sheets of paper, embodying in combination with the abutment and devices for clamping and moving the sheet, a form defining the edge of the sheet and means for moving said form correspondingly with the sheet, the abutment being in position to meet said form, and not to butt against said edge, substantially as set forth.

7. The combination of a support for a sheet, a clamp for the sheet, forms for the front and side edges of the sheet, mechanism for dropping said forms onto the edges of the sheet, abutments located to correspond to the required line of register of said edges, and mechanism for causing said abutment and forms to meet, substantially as set forth.

8. The combination of a form, consisting of pins and a holder which maintains the pins laterally in position and permits each pin to move up and down freely and independently of the other pins, each pin being provided with a shoulder or stop to limit its downward movement, with a sheet-support under said form having openings or perforations corresponding to said pins, a presser-foot above the sheet support, a piece or carrier movable in a plane parallel to that of the sheet and to which said form is secured, a piece or carrier movable in a plane parallel to that of the sheet and to which the sheet-support is secured, a support movable up and down for the form carrier, an abutment movable up and down with the form-carrier, and a cam located, shaped and connected to cause on its rotation said movements of pin-carrier, said support, carriers and abutment, substantially as specified.

9. The combination of several forms, sheet-supports under said forms having openings or perforations therethrough, presser-feet above the sheet-supports, a carrier to which said forms are secured and presser-feet attached, a sliding carrier to which the sheet-supports are secured, abutments, a transverse bar to which the abutments are attached, supports movable up and down, on which said form-carrier slides and to which said transverse bar is secured, and a cam so shaped, located and connected with said supports and sheet-support holders as to cause said movements thereof, substantially as set forth.

10. In combination with forms, for two edges of a sheet to be registered, a bar an abutment having two arms and pivoted to the bar, and means for causing said forms to meet said abutments, substantially as specified.

11. The combination, of forms, for two edges of a sheet to be registered, a bar an abutment having two arms and pivoted to the bar, and means for causing said forms and said bar to rise and fall simultaneously, and the forms and abutments to meet, substantially as set forth.

12. The combination of forms, abutments, a bar to which the abutments are attached, sheet-supports, presser-feet above the sheet-supports, and means for causing said forms

and abutments to rise and fall simultaneously, said forms and abutments to meet and said forms, presser-feet and sheet-supports to maintain their relative position, substantially as set forth.

13. In combination a form embodying members movable therein for defining the edge of a sheet substantially as herein described, a sheet-support under the form, a presser-foot secured to said form, and means for dropping the form and presser-foot onto said sheet-support, and sheet therebetween, substantially as set forth.

14. In combination, the form as hereinde-scribed, a sheet-support under the form, a presser-foot secured to said form, an abutment for the form, and means for causing the form and said presser-foot to move to and from the sheet-support, and for causing said form to meet said abutment, substantially as set forth.

15. In combination, two forms as herein-described, one for a front edge and the other for a side edge of a sheet, a presser-foot secured to said forms, sheet-supports under said forms, abutments at the front and side, means for causing the forms and presser-foot to move to and from said sheet-supports, and means for causing said forms to meet said abutments, substantially as set forth.

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