No. 844,809. PATENTED FEB. 19, 1907.

H. K. KING.

SHEET REGISTERING DEVICE FOR FOLDING MACHINES.

APPLICATION FILED FEB. 4, 1905.

4 SHEETS—SHEET 1.

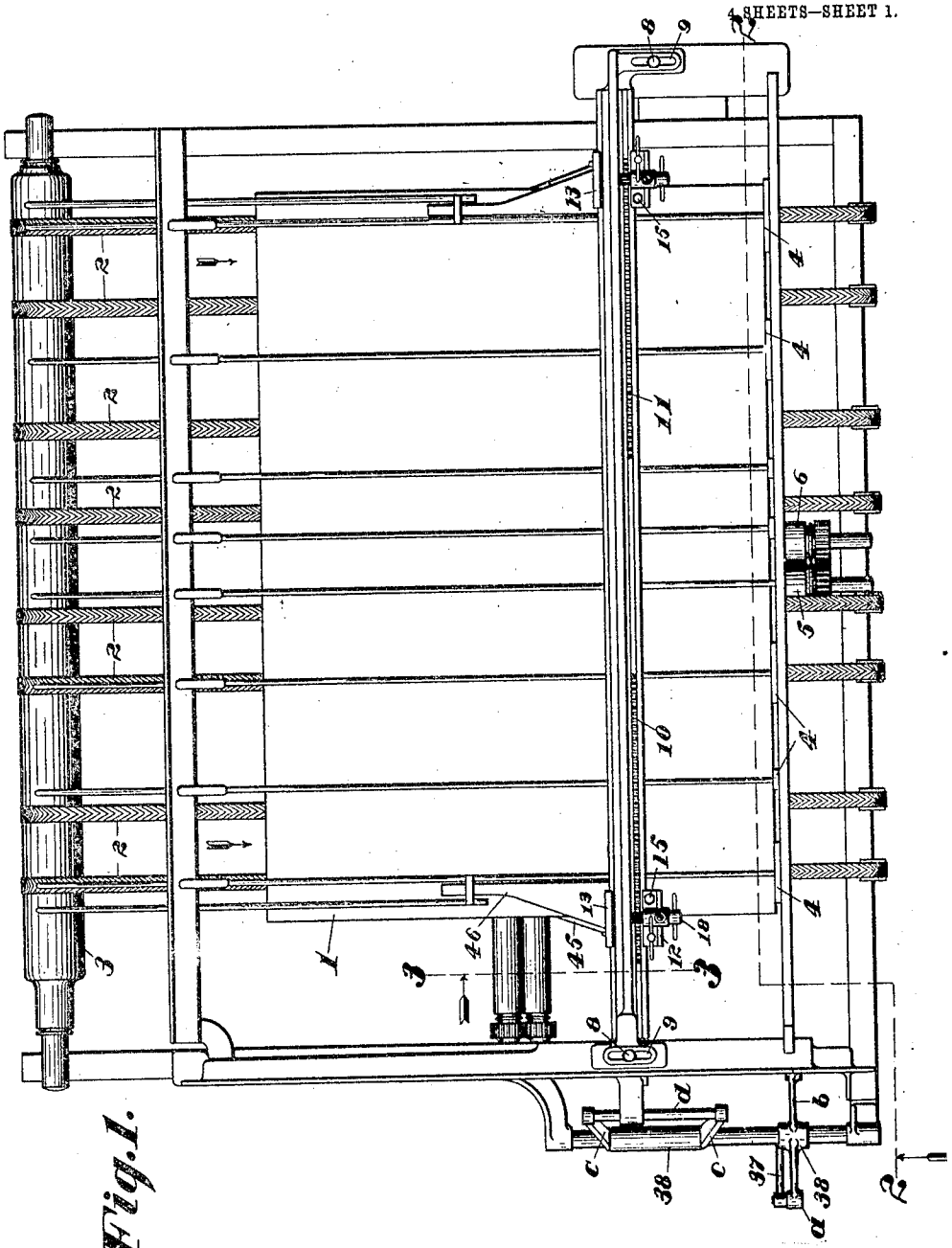

Fig. 1.

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4 SHEETS—SHEET 2.

Fig. 2.

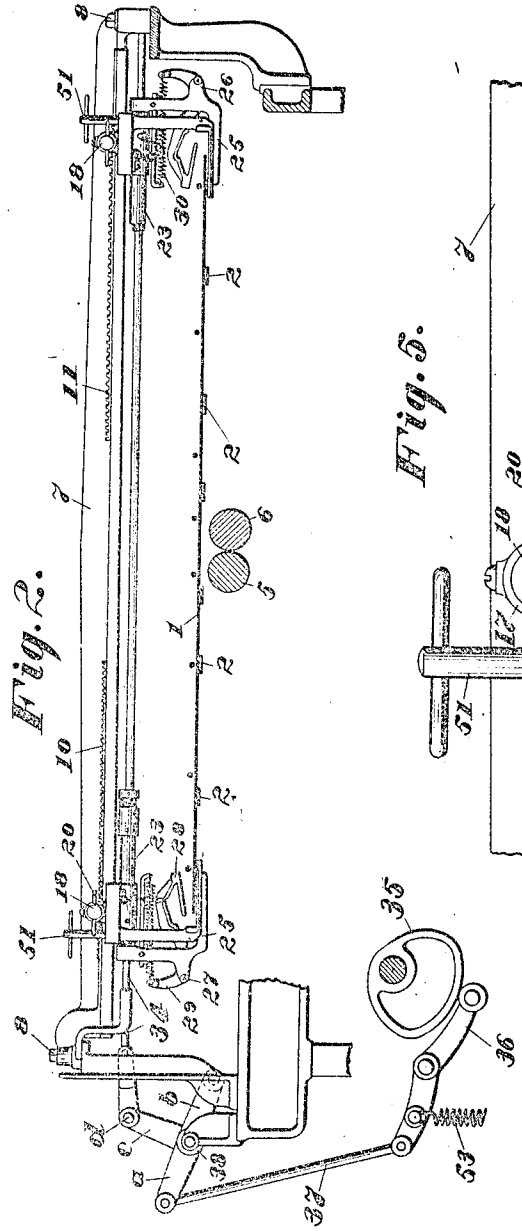


Fig. 3.

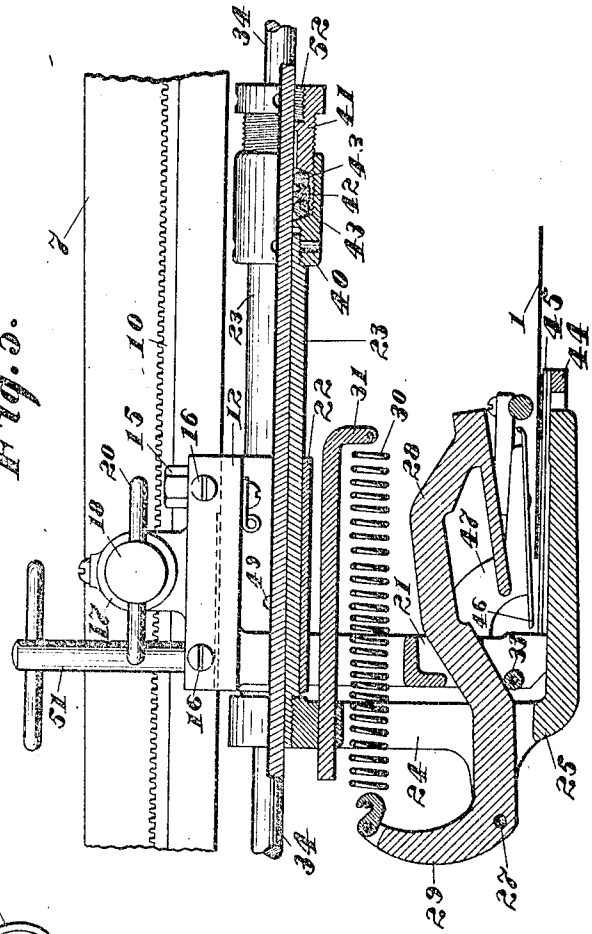
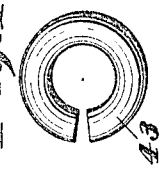


Fig. 10.



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4 SHEETS—SHEET 3.

Fig. 4.

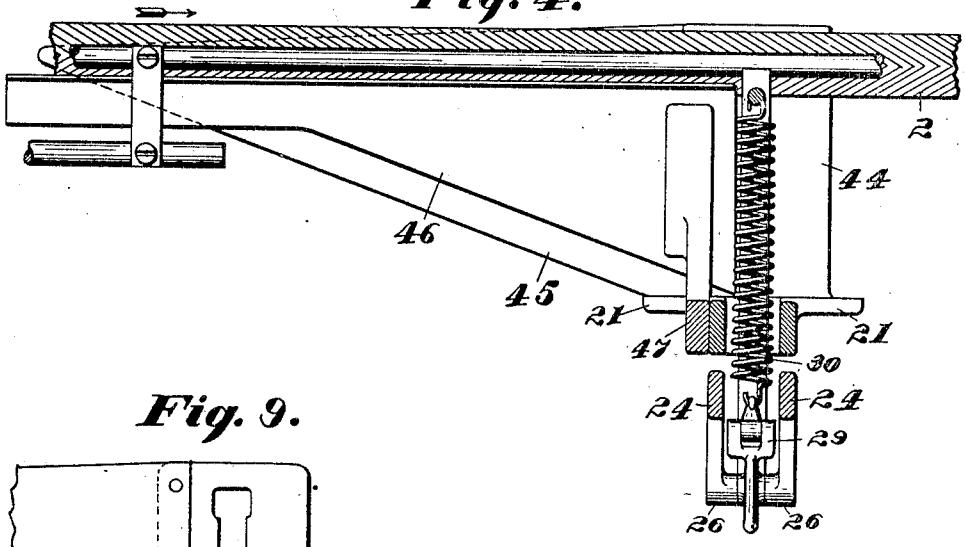

Fig. 9.

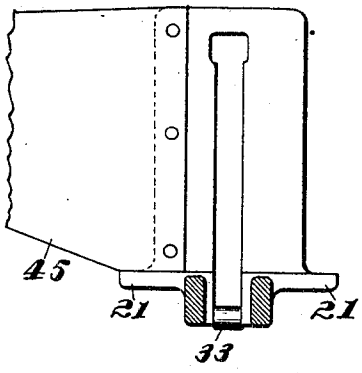

Fig. 3.

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4 SHEETS—SHEET 4.

Fig. 6.

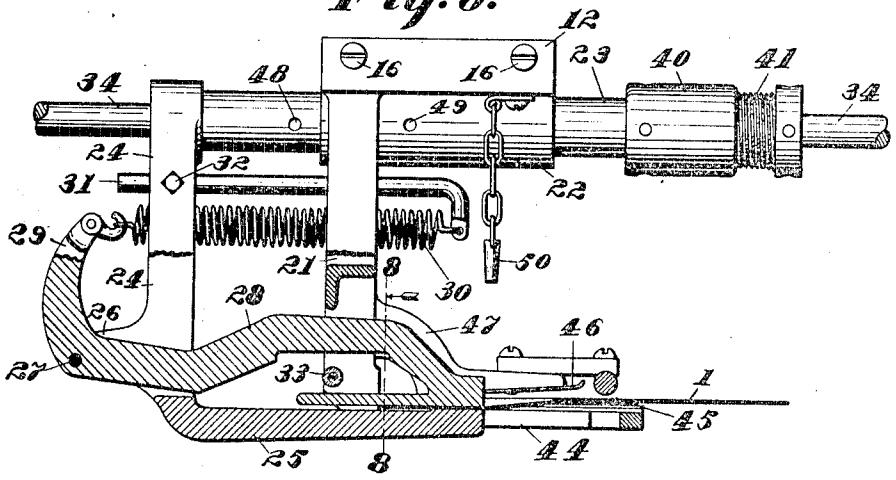


Fig. 7.

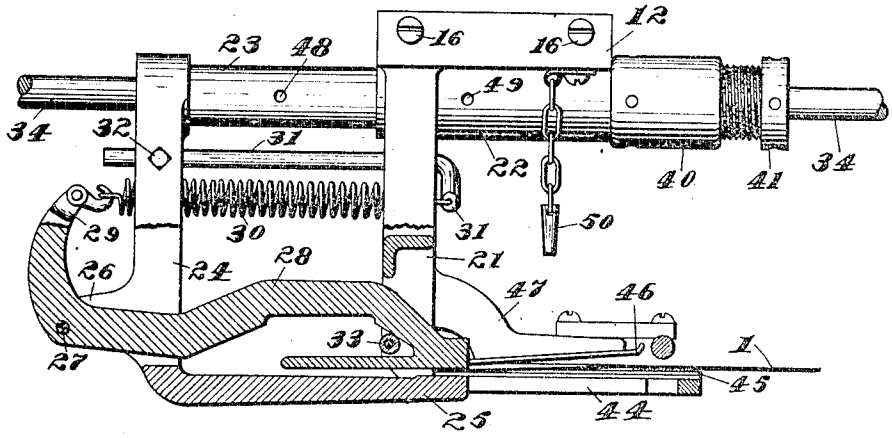
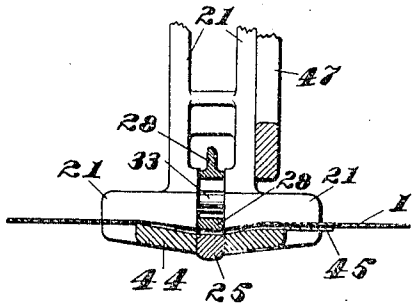


Fig. 8.



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SHEET-REGISTERING DEVICE FOR FOLDING-MACHINES.

No. 844,809. Specification of Letters Patent. Patented Feb. 19, 1907.

Application filed February 4, 1905. Serial No. 244,073.

To all whom it may concern:

Be it known that I, HOWARD K. KING, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Sheet-Registering Device for Folding-Machines, of which the following is a specification.

My invention relates to automatic sheet-registering mechanism to be operated in connection with folding-machines, printing-presses, or other similar devices for operating upon sheets.

The object of my invention is to afford simple, convenient, and accurate means for moving the sheet into the proper position to be operated upon. As an instance of the practical application of my invention I shall now describe the same in connection with a folding-machine in which it is desirable to have the sheet brought automatically into the required position after the same has traveled over the folding-rollers and before it is delivered thereto. My device is adapted, for instance, to be used in connection with folding-machines of the general type described in patents to me, No. 667,021 and No. 667,022, dated January 29, 1901. Reference being made to the descriptions of folding-machines contained in said patents, a further discussion of the details of the folding-machine further than such parts as are especially associated with my new improvements is thought to be unnecessary.

My invention comprises means whereby the sheet when the same has traveled over the rollers to the front stops is then moved automatically sidewise sufficiently to bring the middle of the sheet exactly over the line of contact of said two rollers.

My improved means is especially adapted for use where the variation in the initial position of the sheets is considerable, such variation requiring a considerable range of movement of the registering mechanism. For example, a form of registering mechanism which has been in common use for a number of years utilized the buckling of the paper itself to provide for variation in its position—that is, the gripping means always seized the sheet at a certain depth, no matter what the position of the sheet might be. It was therefore necessary where there was a variation in the position of the sheet that this variation be provided for, and the buckling of the sheet was resorted to. It is obvious that the amount of such buckling which can be safely utilized is limited and that therefore the range of registering devices depending upon this buckling is consequently also limited. By the mechanism herein described I do not resort to the buckling of the sheet, but provide a reciprocating nipper of any required range of movement and a fixed stop for encountering the sheet moved thereby and an adjustment of said nipper whereby its frictional engagement with the sheet is such as to permit the sheet to come to rest when encountering said stop.

My invention comprises improved means for the lateral adjustment of the registering mechanism, and where a pair of such registering mechanisms are used my invention comprises improved means for connecting and disconnecting each of said mechanisms operatively with the operating parts of the folder and also improved means for securing either of said registering devices in the inoperative position.

My invention also comprises improvements in details of construction.

Referring to the drawings, Figure 1 is a plan view of the folding-machine, showing a pair of registering devices mounted thereon. Fig. 2 is a vertical section on line 2 2 of Fig. 1. Fig. 3 is a vertical section on line 3 3 of Fig. 1. Fig. 4 is a horizontal section on line 4 4 of Fig. 3. Fig. 5 is a vertical section on line 5 5 of Fig. 3. Fig. 6 is a vertical section on line 6 6 of Fig. 3. Fig. 7 is a view similar to Fig. 6, showing the gripping member in a different position. Fig. 8 is a vertical section on line 8 8 of Fig. 6. Fig. 9 is a detail in plan view. Fig. 10 is a detail, on an enlarged scale, of one of the rings 43.

Similar numerals refer to similar parts throughout the several views.

Referring to Fig. 1, the sheet 1 is carried by the tapes 2 from the feed-roller 3 in the direction of the arrows until the front edge of the sheet encounters the stops 4. Here the sheet normally remains at rest until the same is struck by the folding-blade (not shown) between the rollers 5 and 6. It is obvious, however, that the sheet may vary its position from one side to the other, and therefore its middle will not always be struck through the rollers, which will result in an

uneven fold. To overcome this trouble different means have been provided for operating upon the sheet when the same has come to rest against the stops 4 to pull it sidewise against other stops provided to one side or the other of the sheet, so that each sheet will always be in exactly the same position before being sent through the folding-rollers 5 and 6. This side-moving means must of course be automatic and must be such as to move the sheet always to the same point—that is, against the same side guides, no matter what its original displacement is. In other words, it will thus be obvious that such mechanism to be useful must be capable of causing different amounts of movement to the sheets, depending upon the amount of their original variation from the proper position.

Upon the ordinary folding-machine I mount the slide-bar 7. (See Figs. 1 and 2.) This slide-bar 7 is secured to the side rails or framework of the folding-machine by the bolts 8, operating in slots 9, said slots permitting of a limited adjustment of said slide-bar. Upon an upper flange of this slide-bar are provided the two series of racks 10 and 11. To this bar 7 is slidably secured the hanger 12. The engagement between hanger 12 and bar 7 is best shown in Fig. 3. Bar 7 has at its lower extension beveled edges, forming a dovetail. About one of said beveled edges fits the upwardly-projecting portion 13 of hanger 12, while the block 14 is bolted to said hanger 12 by the bolt 15. (See Fig. 5.) This block 14 has a beveled edge to conform to the bevel of the bar 7. The set-screws 16 are provided in member 12 to adjust block 14 so as to have a nice traveling fit with bar 7 and also to take up wear. It will be noticed that the block 14 is cut away on its under side from near where it is secured by bolt 15, as shown in Fig. 3 and in dotted lines in Fig. 5. The clamp-screw 51 passes through block 14 and is threaded into member 12 and has a shoulder to engage with the top of block 14. This clamp-screw is operated by hand and is adapted to clamp the block 14 against bar 7 to lock the hanger 12 in any desired position. Secured also to hanger 12 is the upwardly-projecting member or bracket 17, in which is journaled the shaft 18, provided with the pinion 19 for coöperation with the rack 10 or 11 of bar 7. This pinion-shaft 18 is provided with the handle 20, so that the same may be manually operated. By the construction above described it is evident that when the clamp-screw 51 is loosened then by the turning of pinion-shaft 18 the hanger 12 may be made to travel to any desired position along the bar 7, where it may be securely locked in said position by said clamp-screw 51. The hanger 12 is provided with the downwardly-extending gage or stop 21 and also with the sleeve 22, in which is supported the hollow shaft or sleeve 23. To one end of sleeve 23 is secured the downwardly-projecting member 24, ending in the horizontal extension 25, which forms one element of the nipper. Member 25 is also provided with the lug 26, to which is pivoted at 27 the other element 28 of the nipper. Member 28 has a rear upward extension 29, which is connected with one end of spring 30. The other end of spring 30 is connected with the adjustable rod 31, passing through member 24 and adjustably secured by the set-screw 32.

By an inspection of Figs. 6 and 7 it will be seen that the spring 30 will normally tend to hold the nipper elements in the closed position. Upon the stop member 21 is secured the roller 33, which is adapted to engage with the under side of the pivoted element 28 when the same is in different reciprocative positions. The pivoted and movable element 28 has its surface which engages roller 33 so proportioned and positioned with respect to said roller 33 as to cause the opening of the nipper just prior to the end of each reciprocation—that is, prior to the end of its movement in each direction. For example, when in the position shown in Fig. 5 the roller 33 has engaged with the rear inclined surface of member 28 and caused the movement of said member in opposition to the tension of spring 30 to the open position. In Fig. 7 the roller 33 is shown in engagement with the front inclined surface, causing a slight opening movement. In Fig. 6 the member 28 is shown entirely free of roller 33, so that the same may respond to the actuation of spring 30 and assume the closed position with respect to member 25.

The reciprocative movement of the sleeve 23 and the part supported thereby is secured by the following mechanism: The rod 34 extends through the sleeves 23 and is supported thereby and is adapted to slide through either of said sleeves. Reciprocative movement is given to said rod by the rotating cam 35, which is suitably geared or connected with the other operating parts of the machine. This cam 35, operating against the tension of spring 53, actuates the bell-crank 36, which through connecting-rod 37 actuates the bell-crank 38, which is connected with rod 34. It is to be noted that the element *c* of the bell-crank 38 is bifurcated, the outer ends of the two arms *c* being connected by the rod *d*, to which rod 34 is slidably secured to permit of the adjustment of slide-bar 7, as above described. The shape of the cam 35 is such that with each reciprocation of rod 34 there is a considerable period of dwell in one position of said rod for the purpose hereinafter to be explained. It is also to be noted that the bell-crank 38 is provided with the alternative arms *a* and *b*, as shown in Fig. 2. When the left-hand registering device is in operation,

arm *a* is connected with rod 37. When, however, it is desired to have the right-hand registering device operate instead of the left-hand one, it is necessary to bring the dwell in the reciprocation of rod 34 into proper relation with said right-hand registering device. This is accomplished by reversing the connection of the bell-crank 38—that is, rod 37 is connected with arm *b*.

The operative relationship between either sleeve 23 and the reciprocating rod 34 is accomplished by the following mechanism. I prefer a friction-clutch of the following form: The sleeve 40 is threaded at one end to coöperate with a thread provided on the end of sleeve 23. From the other end the interior of sleeve 40 is threaded to receive the threaded member 41. The outer end of 41 is threaded at 52 to coöperate with the threaded end of the other member 23 on the other side of the machine. As will be seen from an inspection of Fig. 5, the end of the member 41 which enters the sleeve 40 is beveled and corresponds to the beveled opposite end of the interior of sleeve 40. A beveled washer 42 is inserted in said opening, and on either side of this beveled washer in what may be called "beveled channels" are inserted the rings 43 of leather or other suitable substance. These rings are adapted to fit closely about the rod 34. It is also to be noted that these rings 43 have an interrupted peripheral extension, as shown in Fig. 10, to permit of their contraction. It will now be readily understood that by the screwing of member 41 into member 40 against the rings 43 in view of the bevel-shaped channels occupied by them said rings will be contracted and forced against the rod 34, and thus is readily secured a frictional clutch relationship between sleeve 23 and rod 34 of any required efficiency.

The special feature of the friction-clutch above described is that while it is readily adjustable so that it may be varied to meet any requirements it is especially adapted to establish such an operative relationship between sleeve 23 and rod 34 as will serve to secure the performance of the work required by the various elements supported by sleeve 23, due to the oscillation of rod 34. At the same time said frictional engagement between 34 and 23 is such as to permit the independent movement of sleeve 23 upon rod 34 whenever the same becomes necessary by cause of the adjustment of the hanger 12. For example, it is to be understood that in Fig. 5 the distance between hanger 12 and sleeve 40 corresponds approximately to the length of the stroke of rod 34. It will therefore be obvious that if hanger 12 is moved to the right upon slide-bar 7 the sleeve 40 would encounter said hanger 12 upon the next reciprocation of rod 34, and said rod could not make its reciprocation unless the engagement between it and sleeve 23 should yield. This frictional clutch engagement is such therefore that whenever the hanger 12 is moved into any different position the frictional engagement between member 34 and sleeve 23 permits an immediate and automatic adjustment to correspond to the new position of said hanger 12, and consequently to the gage or stop 21. Considering hanger 12 when in the fixed position as the stationary part of the mechanism and the reciprocating sleeve 23 and the mechanism supported thereby and rod 34 as the moving parts, it follows that this friction-clutch is adapted at all times to permit an automatic adjustment between the movable parts with respect to the stationary part whenever the adjustable position of the stationary part is changed.

The downwardly-projecting member 21 supports a horizontally-extending member 44, to which is secured the lower guide-plate 45. The upper guide-plate 46 is secured to a bracket 47, which is also connected with the downwardly-projecting member 21. The member 44 is channeled longitudinally for accommodating the lower element 25 of the nipper, and its upper surface is sloped or inclined on either side toward said channel, so that when the gripper-jaws are in the operative position, as shown in Fig. 8, the sheet will be given four separated and distinct bends in parallel lines and in the direction of movement of the sheet against the stop or gage 21. These four bends are as follows: two bends, one on each of the two outer margins of the horizontal member, and two bends, one on each side of the horizontal surfaces of the gripper-jaws. These four bends are obviously caused by pressing a portion of the sheet from the horizontal position down the inclined surfaces of the member 44 and then between the horizontal surfaces of the gripper-jaws. These four horizontal and parallel bends form a most efficient resistance to buckling as the sheet is brought into engagement with stop or gage 21.

The operation of my device is as follows: With each folding operation of the machine the cam 35 makes one complete rotation. With each rotation of the cam there is a complete reciprocation of the rod 34, which causes a complete forward and back movement of the nipper mechanism supported by the sleeve 23, which is operatively engaged with said rod. As above stated, the shape of the cam is such as to secure a dwell in the reciprocative operation of the rod at such point in its reciprocation as may be desired. This point is approximately that shown in Figs. 2 and 5, in which the nipper mechanism is held in the forward position—that is, toward the sheet and in the open position—so that the sheet may readily enter therein. The dwell in this position remains until the sheet has approached to near its final position, when the return movement

of the bar begins, which tends to withdraw the nipper from the sheet and at the same time permit the closing thereof. This return movement of the nipper may begin before the sheet has reached the final position against the stops 4. It is only essential that the sheet shall have reached its final position before the nipper elements completely close upon the sheet, as shown in Fig. 6. From the fact that the nipper may be moving before the sheet comes to rest it will be obvious that great economy in the time required for the registering operation is secured. When the nipper has seized the sheet, as shown in Fig. 6, the continued rearward movement of the nipper drags the sheet with it until said sheet is brought against the guide or stop 21. In case the sheet is brought against said stop 21 before the nipper has reached the limit of its rearward travel the force exerted by spring 30 is sufficiently yielding to permit the nipper to slip along the sheet after the sheet has come to a stop. By means of the adjusting-rod 31, above described, the tension of spring 30 may be so nicely adjusted with respect to the thickness and character of the sheet to be operated upon that the nipper shall have a sufficient frictional engagement with the sheet to enable it to move the sheet only until the same encounters the stop 21. The following means are also provided for preventing the buckling of the sheet after it reaches the stop: A portion of the upper surface of the horizontal part of guide member 44 is slightly hollowed out or inclined transversely, as shown in Fig. 8, so that when the element 28 closes down on the sheet the same is curved or bent into the hollow, thereby forming a curved or angular line of encounter against the face of stop 21, which prevents any tendency of the sheet to buckle. As the nipper approaches the limit of its rearward movement member 28 again encounters roller 33, causing the opening of said nipper to release the sheet just before the same is struck by the folding-blade. Thus with automatic precision as each sheet reaches the front stops 4 it is seized and moved either to the right or left, as the case may be, to another fixed stop. The guide-plates 45 and 46 are so shaped as to secure the safe entry of the edge of the sheet into the nipper-jaws. It is obvious that only one nipper mechanism is used at a time, the other being pushed to the other side of the machine. The member 28 is arbitrarily elevated out of the way of the sheet by moving sleeve 23 into sleeve 22 until hole 48 registers with hole 49. The pin 50 is then inserted through said holes to maintain said sleeves in such relation against the tension of spring 30.

What I claim is—

1. In a sheet-registering machine, the combination of an adjustable stop or gage, a reciprocating gripper, means for reciprocating the gripper, and means for automatically establishing the required relationship between the stop or gage and the reciprocating means, at any given position of the stop or gage.

2. In a sheet-registering machine, the combination of an adjustable stop or gage, a reciprocating gripper, means for reciprocating the same, means connected with the stop or gage for opening and closing the gripper, and means for automatically establishing the required relationship between the stop or gage and the reciprocating means, at any given position of the stop or gage.

3. In a sheet-registering machine, the combination of an adjustable stop or gage, a reciprocating gripper, means for reciprocating the gripper, means for opening and closing the gripper as the same is reciprocated, and means for automatically establishing the required relationship between the stop or gage and the reciprocating means, at any given position of the stop or gage.

4. In a sheet-registering machine, the combination of an adjustable stop or gage, a reciprocating gripper, means for reciprocating the gripper, a friction-clutch for connecting the reciprocating means with the gripper, and means for limiting the movement, in either direction, of the gripper relatively to the stop or gage, to form, in connection with the friction-clutch, means for automatically establishing and maintaining the desired relationship between the gripper and the adjustable stop or gage in all positions of the latter.

5. In a sheet-registering machine, the combination of an adjustable stop or gage, a reciprocating gripper, means for reciprocating the gripper, a friction-clutch between the reciprocating means and gripper, means for varying the efficiency of said clutch, and means for limiting the movement, in either direction, of the gripper relatively to the stop or gage, to form, in connection with the friction-clutch, means for automatically establishing the desired relationship between the gripper and the adjustable stop or gage in all positions of the latter.

6. In a sheet-registering machine, the combination of a reciprocating gripper, and a gage or stop member having a vertical face for engaging the sheet, and a horizontal extension therefrom, said horizontal extension being channeled longitudinally to receive the lower jaw of the gripper, the upper surface of said horizontal extension, on each side of the channel, having a downward inclination toward said channel.

7. In a sheet-registering machine, the

combination of a reciprocating gripper, and a gage or stop member having a vertical face for engaging the sheet and a horizontal extension therefrom, said horizontal extension being channeled longitudinally to receive the lower jaw of the gripper, the upper surface of said horizontal extension on each side of the channel having a downward inclination toward the upper surface of the lower gripper-jaw.

8. In a sheet-registering machine, the combination of a reciprocating gripper having upper and lower pivotally-related jaws, a gage or stop member having a vertical face for engaging the sheet, and a horizontally-extending member approximate thereto channeled longitudinally to receive the lower jaw of the gripper, the upper surface of said horizontal member being so inclined and disposed with respect to the coöperating surfaces of the gripper-jaws when in operative position, as to give the sheet four separated and distinct bends in lines parallel with each other, and in the direction of movement of the sheet against the stop or gage.

9. In a sheet-registering device, the combination of a reciprocating nipper, an adjustably-supported slide-bar, a hanger slidably supported thereon and means for adjusting the position of the hanger on the slide-bar, the hanger forming a support for the nipper and also forming a stop for the sheet.

10. In a sheet-registering device, the combination of a reciprocating nipper, an adjustable slide-bar, a hanger slidably supported thereon, rack-and-pinion means for adjusting the position of the hanger on the slide-bar and locking means for maintaining such position, the hanger forming a support for the nipper.

11. In a sheet-registering device, an adjustably-supported hanger, a nipper having an extension supported by and horizontally movable in the hanger, a reciprocating rod and a friction-clutch between said rod and nipper extension.

12. In a sheet-registering device, an adjustably-supported hanger, a nipper having an extension supported by and horizontally movable in the hanger, a reciprocating rod, a friction-clutch between said rod and nipper extension, a cam and mechanism operating between the cam and rod, for causing the reciprocation of the rod with the required intermittent dwell.

13. In combination with a registering-nipper for sheets, means for oscillating the same comprising an oscillating rod, a sleeve surrounding the same, and an automatically-adjustable friction-clutch between the sleeve and rod comprising a ring of yielding material in beveled channels and means for contracting said channels to cause a pressure of the ring against the rod.

14. In combination with a machine for operating upon sheets, registering mechanism for the sheets comprising a slide-rail secured to the stationary framework of the machine, a hanger slidably secured to the rail, rack-and-pinion means for adjusting the position of the hanger and clamping means between the hanger and the rail, and oscillating means supported by said hanger for moving the sheet.

15. In combination with a machine for operating upon sheets, registering mechanism for the sheets comprising a slide-rail secured to the stationary framework of the machine, a hanger slidably secured to the rail, rack-and-pinion means for adjusting the position of the hanger and clamping means between the hanger and the rail, a fixed stop and oscillating means supported by said hanger for moving the sheet to the stop.

16. A sheet-registering mechanism, the combination of a reciprocating nipper and means for causing its reciprocation comprising an adjustable slide-bar and means for supporting the same, a hanger adjustably secured thereto, a sleeve slidably mounted in the hanger, a reciprocating rod slidably mounted in the sleeve, and an adjustable friction-clutch for securing operative relationship between the sleeve and the reciprocating rod having such adjustment as to enable the sleeve to do the work required, but to permit independent movement between rod and sleeve to automatically adjust the sleeve with the adjustment of the hanger.

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