

H. C. SCHROEDER.

FOLDING MACHINE.

APPLICATION FILED APR. 18, 1911.

1,025,541.

Patented May 7, 1912.

2 SHEETS—SHEET 1.

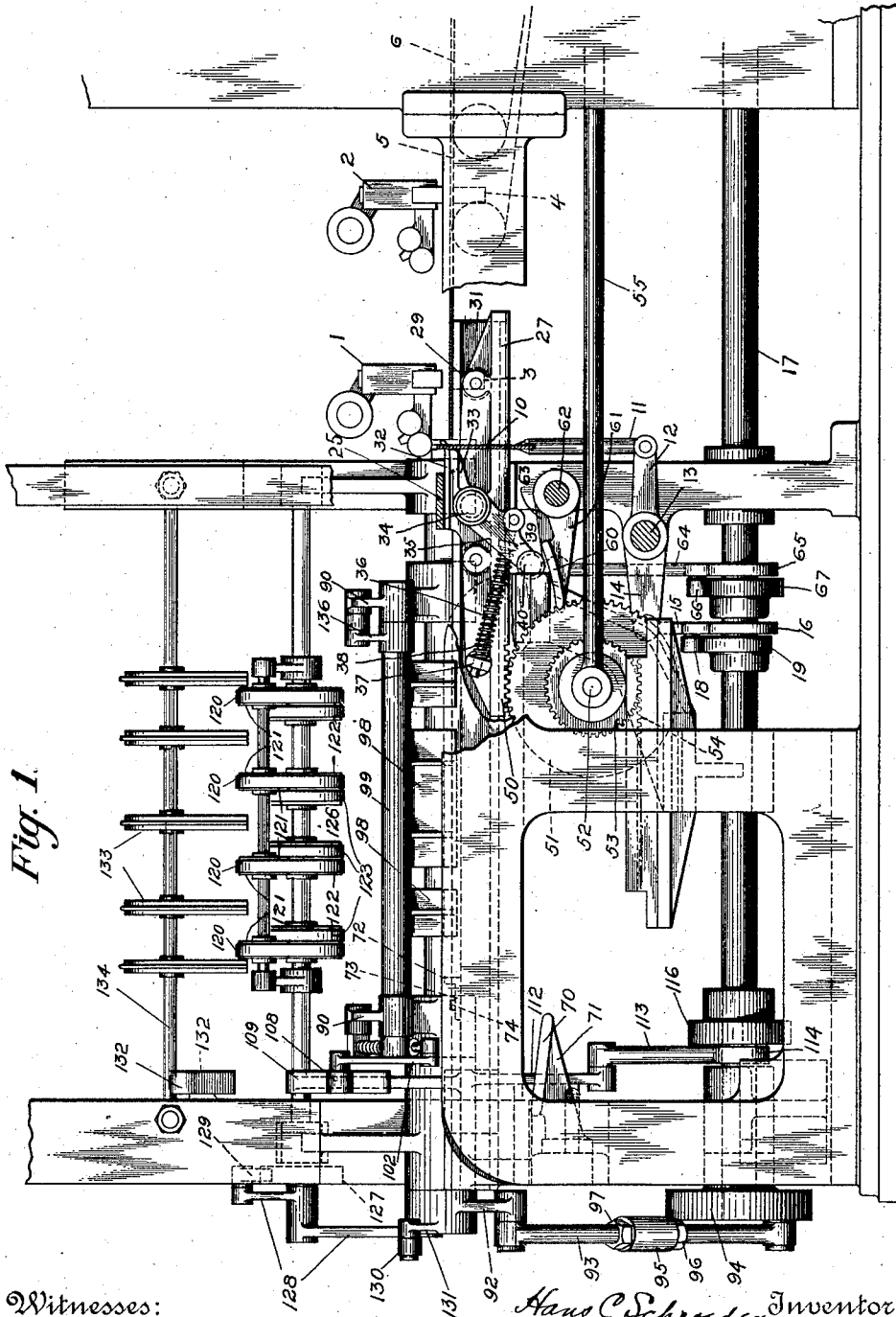


Fig. 1.

Witnesses:
John Darby
Rose Mehl

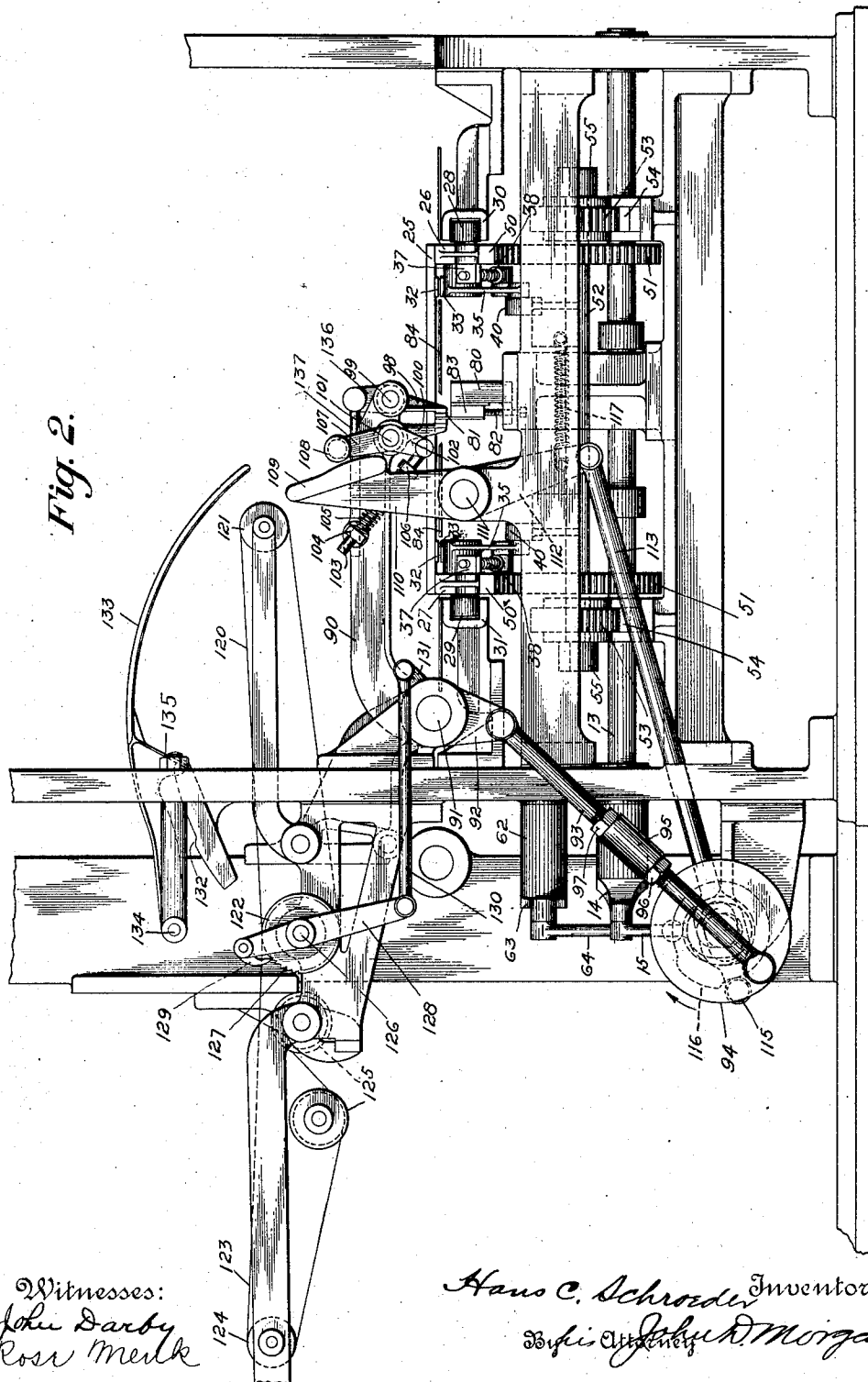
Hans C. Schroeder, Inventor
By John D. Morgan

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2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

HANS C. SCHROEDER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE GOSS PRINTING PRESS COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

FOLDING-MACHINE.

1,025,541.

Specification of Letters Patent.

Patented May 7, 1912.

Application filed April 18, 1911. Serial No. 621,839.

To all whom it may concern:

Be it known that I, HANS C. SCHROEDER, a subject of the Emperor of Germany, residing in Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Folding-Machines, of which the following is a specification.

The invention relates to stitching and folding machines, and as to certain features thereof more particularly to folding machines in which sheets are folded over a folding blade by folding jaws and carried away upwardly, and also in certain of its features it relates more especially to stitching and folding machines in which the sheets are stopped for stitching and are conveyed to the folding position or station by reciprocating grippers.

Objects of the invention are to provide a novel mechanism of the character described which will stitch and fold in exact registry at high speed while preserving the commercial quality of the product at the highest standards of excellence for such work; to provide for rapid and exact stopping and registry for stitching and for folding; to provide for action of the folding jaws which will insure a perfect fold and the carrying away of the folded sheets upwardly for delivery; to provide for uniform action of the reciprocating folding jaws with the folding blade notwithstanding changes in speed, or size of the sheet bundle or quality of paper used, or other changes found necessary or desirable; and to otherwise provide coaction of the various parts to meet commercial requirements of rapid, high grade printing and binding of the kind for which this machine is designed.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

The accompanying drawings, referred to herein and forming a part hereof, illustrate one embodiment of the invention, the same serving in connection with the description herein to explain the principles of the invention.

Of the drawings: Figure 1 is a side elevation of a machine embodying the principles of the invention; and Fig. 2 is an end elevation looking at Fig. 1 from the left.

Referring to the accompanying drawings

and taking up the description thereof in the same sequence as the passing of the sheets through the machine, means for stitching together a bundle of sheets are provided comprising stationary stitchers 1 and 2, arranged longitudinally of and above the path of travel of the sheets and having their clenching dies 3 and 4 below said path. Suitable means for bringing the bundle of sheets to the stitching position are provided, shown herein as tapes 5 and 6, with which opposed tapes (not shown) may cooperate, if desired.

Means are provided for arresting the sheets in position for stitching, that is, in registry with the stitchers, and holding them at rest while the stitches or staples are being driven, comprising a stationary, or non-traveling stop, movable into and out of the path of travel of the sheets. In the embodied form, said stop reciprocates in guides in the machine frame, and is mounted upon rods 11 connecting respectively by arms 12 with a rock shaft 13. Said stop is stationary, that is it does not travel to and fro along the path of travel of the sheets, but is movable to stop and hold the sheets and to permit them to pass onward in the conveying grippers. Fixed to rock shaft 13 is an arm 14, which arm is pivotally connected to a rod 15, said rod terminating in a yoke 16 embracing a driving shaft 17. A cam roll 18 is mounted on the rod 15 and is in operative relation with a cam 19 upon the shaft 17.

The stitched bundle of sheets is conveyed from the stitching position to the folding position by a reciprocating gripper mechanism. The embodied form of such gripper mechanism comprises a carriage having a cross-head 25 extending transversely of the machine, and having side frames 26 and 27 at either side. Said side frames carry rollers 28 and 29, respectively, traveling in corresponding guides 30 and 31 upon the machine frame.

In the embodied form one gripper jaw is fixed and its companion jaw is pivotally mounted to open and close. A pair of such grippers is shown at either side of the carriage, each pair comprising a fixed jaw 32 fixed to the cross head 25, and a movable jaw 33 pivoted at 34 upon the corresponding side frame of the gripper carriage. In the embodied form of opening and closing

means for said movable jaw, a lever arm 35 extends from the pivot point 34, and has pivoted thereto a pin 36, said pin working in an aperture in a lug 37 on the side frame of the gripper carriage. A spring 38 is shown coiled about the rod or pin 36, and in tension between the lug 37 and a collar 39 on said pin 36. It will be seen that the spring tends to keep the pivoted gripper jaw 33 closed against the fixed jaw 32. Carried upon the lever arm 35 is a cam roll 40.

Suitable means for reciprocating the gripper carriage in the guides 30 and 31 are provided, the embodied form thereof comprising racks 50 formed on the underside of each of the side frames 26 and 27 of the gripper carriage. In mesh with these racks, respectively, are gears 51 fixed to the shaft 52. Fixed also to the shaft 52, at either side, are pinions 53 meshing, respectively, with toothed racks 54 upon the opposite side of the shaft from the racks 50. Journaled upon the shaft 52, at either end thereof, are rods 55 which are longitudinally reciprocated by suitable mechanism (not shown).

Means are provided for opening the grippers 32 and 33 as they approach and just before they reach the bundle of sheets which is at rest at the stitching position, that the open jaws may pass freely and certainly past the opposite faces of the end of the bundle, and then snap shut upon the bundle just as the gripper carriage starts in the opposite direction. The embodied form of such means comprises cams 60 located and arranged to cooperate with the cam rolls 40 upon the respective arms 35 of the gripper jaws 33. Said cams 60 are carried upon arms 61, fixed to a shaft 62 journaled in the machine frame. Fixed also to said shaft 62 is an arm 63, to which arm is pivotally connected a rod 64. Said rod 64 terminates in a yoke 65 straddling the driving shaft 17. Carried upon the rod 64 is a cam roll 66, cooperating with a cam 67 upon said shaft 17. Near the opposite end of the travel of the gripper carriage are provided cams 70 constructed and arranged to cooperate, respectively, with the cam rolls 40 upon the respective arms 35. The cams 70 are conveniently supported upon the machine frame by brackets 71.

Mounted in the path of travel of the sheets, at the end of the folding position, are registering stops 72. These stops are preferably rendered adjustable, and for this purpose through the foot 73 of each stop passes a bolt 74 having a slot connection with the support for said stop.

The manner of operation of the mechanism so far described is substantially as follows: The bundle of sheets is fed to the stitching position by the tapes 5 and 6, and

is brought to rest in registry with the stitchers, and held at rest during the stitching, by the stop gate 10, which gate has been projected up into the path of the sheets by the train of mechanism from the cam 19 already described. The stitches are driven through the sheet by the stitchers 1 and 2 and clenched by the clenchers 3 and 4. The conveying grippers 32, 33 are approaching the bundle of sheets, and the cam rolls 40 engage with their respective cams 60 which are in their upward position, referred to Fig. 1, thus slightly rocking the arm 35 as the rolls 40 ride up on the cam surfaces 60. This opens the gripper jaws 32 and 33 apart, and they pass on opposite faces of the end of the sheet bundle. The cams 60 are swung downwardly by the train of connections to the cam 67, previously described, the spring 38 acting to close the grippers 32 and 33 together. In the meantime the gate 10 is dropped downwardly out of the path of the sheets which are then conveyed to the folding position in the grip of the jaws 32 and 33. As the gripper carriage approaches the other end of its travel, the cam rolls 40 engage their respective cams 70, thus opening the grippers 32 and 33 apart. The stitched bundle of sheets encounters the stop 72 and is brought to rest in accurate registry with the folding blade, while the conveying grippers travel beyond for a short distance, thus traveling well clear of the sheet bundle. In the meantime the folding jaws have folded the bundle of sheets over the folding blade along the line of the stitches and carried it away upwardly out of the way of the conveying grippers and their carriage as they return. The gripper carriage, it will be understood, is reciprocated by the lateral movement of the shaft 52. This causes the pinions 53 to roll upon the racks 54 and rotate the gears 51 which in turn drive the gripper carriage through the racks 50, the gain in speed of the gripper carriage being proportionate to the ratio of the pinions and their gears.

The folding devices comprise a folding blade beneath the path of travel of the sheets, and folding jaws which act from above the path of travel of the sheets to fold them over the folding blade and carry them away upwardly for delivery, said jaws being opened before they pass over the blade, and closing upon the sheets and blade to form the fold or crease before they swing off the blade carrying the folded sheets away upwardly by the folded edge. The folding blade and jaws are arranged longitudinally of the path of travel of the sheets in harmony with the arrangement of the stitchers, and the stitched and folded sheets are delivered at the side and above to intermittently traveling delivery bands or tapes.

In the embodied form the folding blade is supported upon a pedestal or bracket 80, at the forward end of the blade, and upon a support at the rear end. The folding blade may be adjusted vertically by suitable means, such as the adjusting screws 82, the blade mounting 83 being slidable in guides in the pedestal or bracket 80. Suitable supports, such as the plates 84 may be provided for the sheet bundle at either side of the blade.

The folding jaws as embodied are mounted upon a pair of arms 90 fixed to the shaft 91, journaled in the machine frame, and they are swung and reciprocated about said shaft by suitable means, the embodied form of such means comprising an arm 92 fixed to said shaft at one end thereof. A connecting rod or pitman 93 is pivotally connected to said arms and to a crank plate 94 upon the shaft 17.

Means are provided for regulating the throw or travel of the folding jaws in order that they may get just the right bite over the folding blade irrespective of changes in the speed of the machine or of the thickness or character of the bundle of sheets being folded, and to make due allowance for the spring and the momentum or inertia of the parts at different speeds of the machine. In the embodied form of such means, the rod 93 is made in two parts, the adjacent ends of said two parts being oppositely threaded into a turning head 95 which is internally tapped. Suitable lock nuts 96 and 97 are provided for locking the parts in position.

A folding jaw 98, or several such jaws, are pivoted upon the shaft 99 carried at the ends of the arms 90. The cooperating jaw or jaws 100 are fixed to a shaft 101 likewise journaled in said arms 90. Means are provided in the embodied form for opening and closing the jaw 100 to fold and to release the sheets. Fixed to the shaft 101 is an arm 102 to which is pivotally connected a pin 103 working in an apertured lug 104 upon the corresponding arm 90. A spring 105 is coiled about the pin 103 and is in compression between the lug 104 and a collar 106 on said pin 103. Also fixed to said shaft 101 is an arm 107 provided with a cam roll 108. Adjacent to said parts, and constructed and arranged to cooperate therewith, is a swinging cam 109 carried upon an arm 110 pivotally mounted on the machine frame at 111. Connected to said arm 110 is an arm 112, and a connecting rod 113 is pivotally connected to the end of said arm 112 and has its other end 114 yoked to inclose the shaft 17. A cam roll 115 thereon cooperates with a cam 116 on the shaft 17. A spring 117 acts to hold the roll to its cam.

The delivery devices comprise endless belts or tapes 120 working over pulleys 121 and 122

and 124, and may if desired be provided with suitable adjusting pulleys 125. The pulleys 122 are fixed on a shaft 126 to which is also fixed a ratchet wheel 127. Pivoted to the shaft 126 is an arm 128 carrying a pawl 129 cooperating with said ratchet 127. A pivoted link 130 connects the other link of the lever 128 with an arm 131 connected to the arm 92 whereby a feed is given to the delivery belts upon each actuation of the folding jaws. An opening cam 132 for the folding jaws is fixed upon the machine frame. Suitable guide fingers 133 are carried upon a support 134, if desired, to assist the atmospheric action in closing the magazine together as it is carried by the folding jaws and before it is deposited upon the delivery tapes. Strippers 135 are also provided to cause the magazine to fall clear of the jaws before the jaws return on their downward movement. A slight spring action or yield to the jaw 98 is provided as it passes on and off the folding blade by the spring controlled arm 136 (said spring not being shown) and rod 137; the jaw having a slight movement against said spring.

The manner of operation of the mechanisms just described is substantially as follows: The bundle of sheets being positioned over the folding blade 81, the folding jaws are moving downwardly, by means of the connections described, toward the sheets. The cam 109 has been swung toward the right referred to Fig. 2, and is engaged by the cam roll 108. This serves to swing the jaw 100 against the spring 105 to open same, and the folding jaws are so held open as the sheets are tucked within the folding jaws as the jaws pass over the blade. The cam 109 is then swung toward the left, referred to Fig. 2, thus permitting the spring 105 to close the jaws together upon the sheets while the jaws are still about the sheets and blade, and preparatory to the folding jaws swinging upwardly off the folding blade carrying the sheets with them. As the jaws swing back toward the left referred to Fig. 2, the sheets pass between the pulleys 121 and the fingers 133 and are drawn together, without being subject to direct rubbing or friction tending to smear or mar the outside sheets, or cover. The cam 132 then serves to open the jaws, permitting the folded book or pamphlet to fall upon the delivery tapes 120, the strippers 135 engaging the folded edge of the pamphlet, and the jaws continuing their travel sufficient to insure the book or pamphlet falling free thereof before they return. The delivery tapes receive their intermittent feed as already described.

It will be understood from all the foregoing that a machine has been provided embodying the features and objects of invention set forth and realizing the advan-

tages enumerated, together with other objects and advantages. It will be understood further that certain changes may be made from the mechanism as shown and described within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its objects and advantages.

What I do claim as my invention and desire to secure by Letters Patent is:

1. A folding machine including in combination means for positioning the sheets for folding, a folding blade below the positioned sheets, a pair of reciprocating folding jaws cooperating with said folding blade from above the sheets to fold the sheets thereover and carry them away upwardly, and devices for opening said jaws prior to the folding in of the sheets and for closing the jaws while still about the sheets and blade.

2. A folding machine including in combination means for positioning the sheets for folding, a folding blade below the positioned sheets, a pair of folding jaws reciprocating about a center cooperating with said folding blade from above the sheets to fold the sheets thereover and carry them away upwardly, and devices for opening said jaws prior to the folding in of the sheets and for closing the jaws while still about the sheets and blade.

3. A folding machine including in combination means for positioning the sheets for folding, a folding blade below the positioned sheets, a pair of reciprocating folding jaws cooperating with said folding blade from above the sheets to fold the sheets thereover and carry them away upwardly, spring means tending to close said folding jaws, and movable means for opening said jaws against the action of said spring means prior to the folding in of the sheet and for permitting said jaws to close while still about the sheets and blade.

4. A folding machine including in combination means for positioning the sheets for folding, a folding blade below the positioned sheets, a pair of folding jaws reciprocating about a center cooperating with said folding blade from above the sheets to fold the sheets thereover and carry them away upwardly, spring means tending to close said folding jaws, and movable means for opening said jaws against the action of said spring means prior to the folding in of the sheet and for permitting said jaws to close while still about the sheets and blade.

5. A folding machine including in combination means for positioning the sheets for folding, a folding blade below the sheets, traveling folding jaws above the sheets cooperating with said folding blade, spring devices tending to hold said jaws closed, and a member adjacent to the path of travel

of said jaws in position to force said jaws open as they approach the folding blade to fold the sheets thereover, said member being movable to permit said spring devices to close the folding jaws upon the sheets while said jaws are still about the sheets and folding blade, preparatory to carrying away the sheets upwardly by the fold.

6. A folding machine including in combination means for positioning the sheets for folding, a folding blade below the positioned sheets, swinging arms, folding jaws mounted upon said arms above the sheets, spring means for closing said folding jaws, a movable cam for forcing said jaws open prior to the folding in of the sheets, and means for moving said cam to permit said spring means to close said folding jaws upon the sheets while still about the sheets and blade preparatory to carrying away the sheets upwardly by the fold.

7. A folding machine including in combination a folding blade, arms reciprocating about a center, a pair of folding jaws mounted upon said arms and cooperating with said blade to fold the sheets thereover and carry away said sheets by the fold, and means for controlling the distance that the said blade passes within said jaws during the folding of the sheets.

8. A folding machine including in combination a folding blade, arms reciprocating about a center, a pair of folding jaws mounted upon said arms and cooperating with said blade to fold the sheets thereover and carry away said sheets by the fold, means for swinging said arms, and means for varying the swing of said arms to regulate the distance that said blade passes within said jaws during the folding of the sheets.

9. A folding machine including in combination a fixed folding blade, arms reciprocating about a center, a pair of folding jaws mounted on said arms and cooperating with said blade to fold the sheets thereover and carry them away by the fold, a rod connected to said arms to swing said arms, means for varying the length of said rod and means for actuating said rod.

10. A folding machine including in combination a folding blade, arms reciprocating about a center, a pair of folding jaws mounted upon said arms and cooperating with said blade to fold the sheets thereover and carry away said sheets by the fold, and means for varying the swing of said jaws to control the distance that said blade passes within said jaws during the folding of the sheets.

11. A stitching and folding machine including in combination stitching devices, folding devices, reciprocating grippers for conveying the stitched bundle of sheets from the stitching position to the folding posi-

tion, a stop for arresting the sheet bundle before said conveying grippers have reached the end of their travel at the folding end, whereby the sheet bundle is cleared from the conveying grippers and folded and carried away before the conveying grippers return.

12. A stitching and folding machine including in combination stitching devices, a folding blade, reciprocating grippers for carrying the stitched bundle of sheets from the stitching position to the folding position, a stop for arresting the bundle of sheets before said conveying grippers have reached the end of their travel at the folding end, whereby the sheet bundle is cleared from said conveying grippers, and folding jaws operating from above to fold said sheet bundle over the folding blade and carry it away upwardly when positioned by said stop.

13. A stitching and folding machine including in combination stitching devices, a folding blade, reciprocating grippers for conveying the stitched bundle of sheets from the stitching position to the folding position, a stop for arresting the bundle of sheets before said conveying grippers have reached the end of their travel at the folding end, whereby the sheet bundle is cleared from said conveying grippers, means for opening said conveying grippers as they pass said stop, and folding jaws operating from above to fold said sheet bundle over the folding blade and carry it away upwardly when positioned by said stop.

14. A stitching and folding machine including in combination means for conveying sheets along a path, stationary stitching devices, a stop movable into and out of the path of travel of the sheets to stop and hold the sheets in position for stitching and then to permit them to be conveyed away, reciprocating grippers for conveying said sheets from said stitching position to a folding position, means for operating said grippers as

they approach the stopped sheets and for closing them upon the sheets as they reverse their direction of travel, and folding means for folding the sheets.

15. A stitching and folding machine including in combination means for conveying sheets along a path, stationary stitching devices, a stop movable into and out of the path of travel of the sheets to stop and hold the sheets in position for stitching and then to permit them to be conveyed away, reciprocating grippers for conveying said sheets from said stitching position to a folding position, means for opening said grippers as they approach the stopped sheets and for closing them upon the sheets as they reverse their direction of travel, folding means for folding the sheets, and a stop in the path of travel of the sheets for freeing said sheets from said conveying grippers near the end of their travel and for positioning said sheets for folding.

16. A stitching and folding machine including in combination means for conveying sheets along a path, stationary stitching devices, a stop movable into and out of the path of travel of the sheets to stop and hold the sheets in position for stitching and then to permit them to be conveyed away, reciprocating grippers for conveying said sheets from said stitching position to a folding position, spring means tending to close said grippers, a cam for opening said grippers against said spring means as said grippers approach the stopped sheets, and means for moving said cam to permit said grippers to close upon the stopped sheets as said grippers begin to move in the opposite direction.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

HANS C. SCHROEDER.

Witnesses:

CHARLES E. PICKARD,
W. H. DE BUSK.