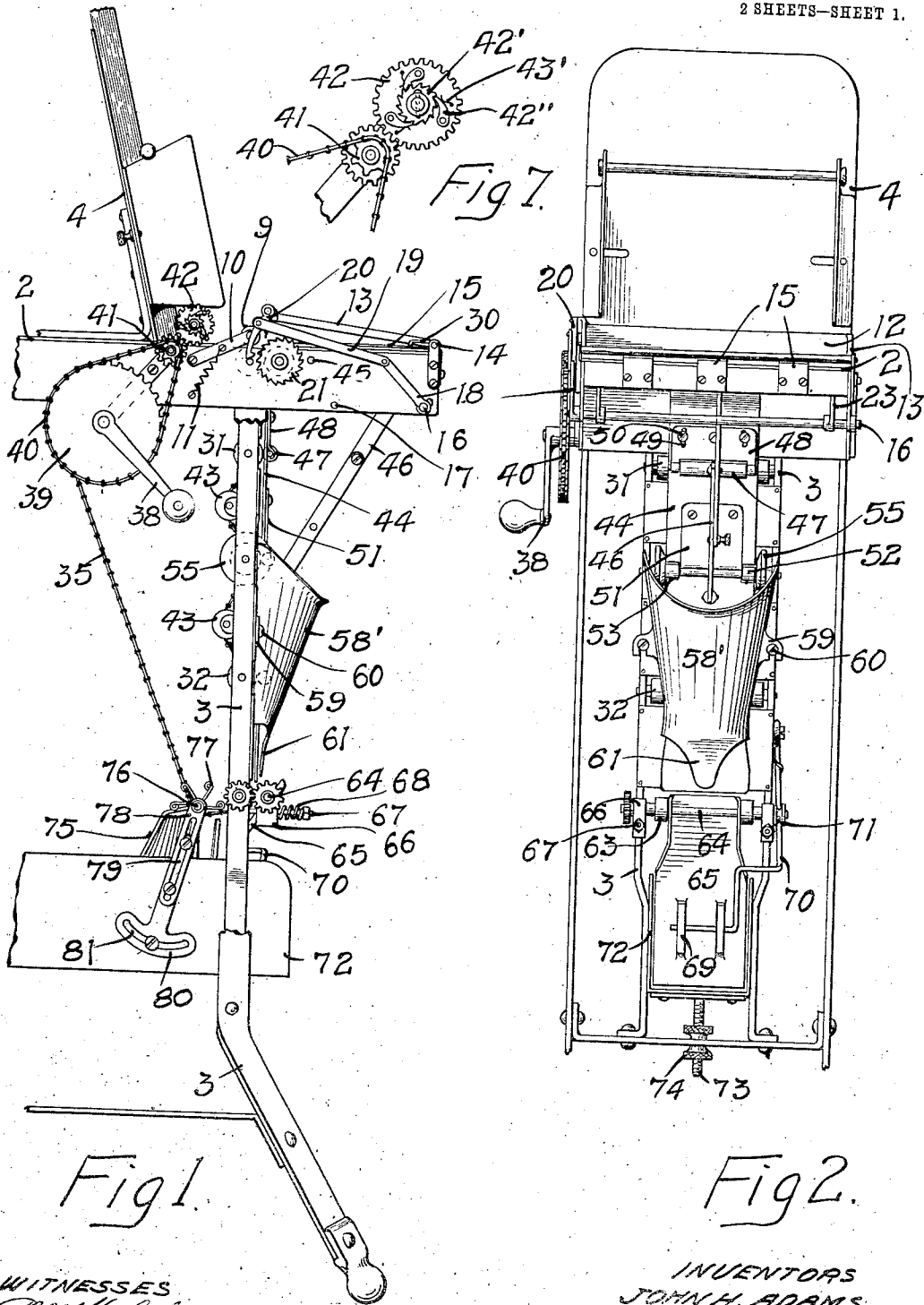


J. H. ADAMS & E. D. WALLACE.
FOLDING MACHINE.
APPLICATION FILED NOV. 25, 1907.

936,506.

Patented Oct. 12, 1909.
2 SHEETS—SHEET 1.



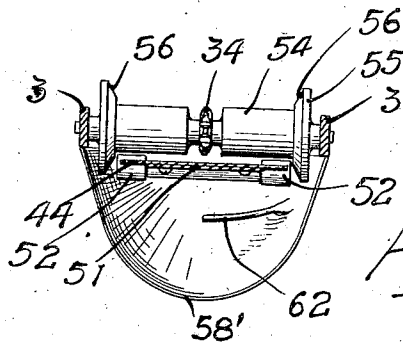
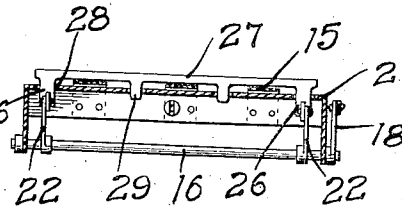
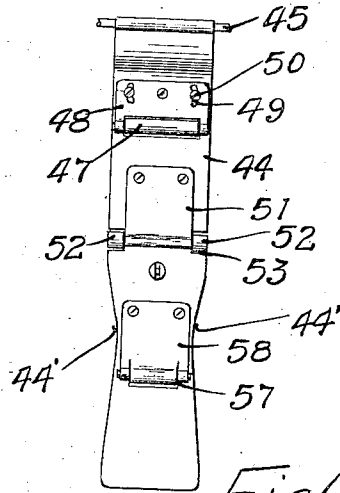
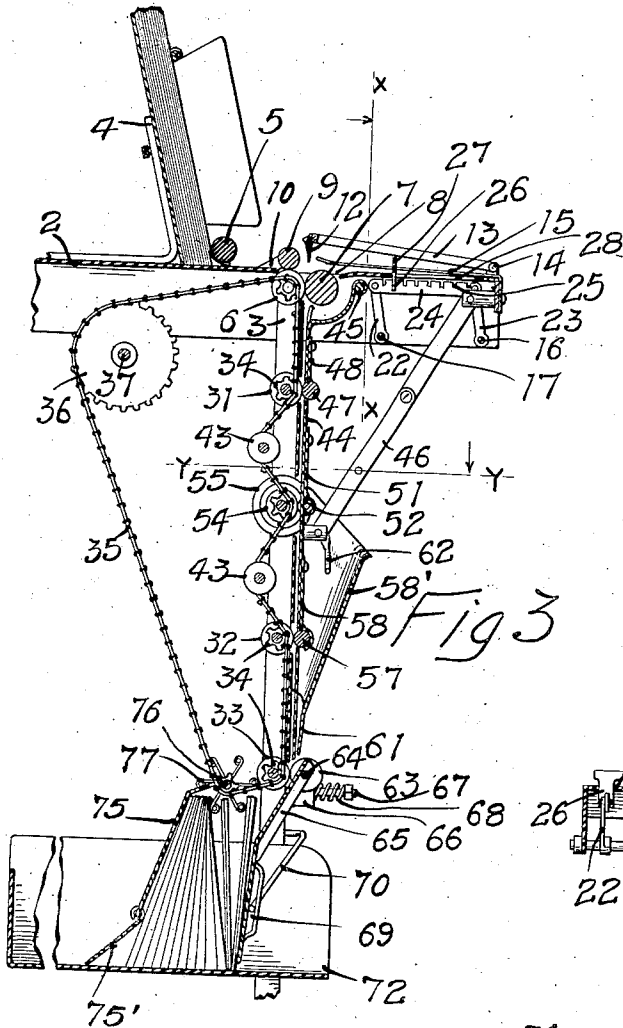
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UNITED STATES PATENT OFFICE.

JOHN H. ADAMS AND ELMER D. WALLACE, OF MINNEAPOLIS, MINNESOTA, ASSIGNORS,
BY MESNE ASSIGNMENTS, TO ADAMS LETTER FOLDING MACHINE COMPANY, OF
CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

FOLDING-MACHINE.

936,506.

Specification of Letters Patent.

Patented Oct. 12, 1909.

Application filed November 25, 1907. Serial No. 403,584.

To all whom it may concern:

Be it known that we, JOHN H. ADAMS and ELMER D. WALLACE, of Minneapolis, Hennepin county, Minnesota, have invented certain new and useful Improvements in Folding-Machines, of which the following is a specification.

The object of our invention is to provide a machine capable of folding sheets of paper of various sizes.

A further object is to provide improved means for making the final folds in the paper, and, a still further object is to provide an improved mechanism for packing the folded sheets in a box or other receptacle.

A further object is to provide a pressure roller by means of which the travel of the sheets preparatory to receiving the final folds, will be controlled.

The invention consists generally in various constructions and combinations, all as hereinafter described and particularly pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a side elevation of a portion of a folding machine embodying our invention. Fig. 2 is an end elevation of the same. Fig. 3 is a detail sectional view showing the position of the operating parts. Fig. 4 is a front view of the hinged guiding plate. Fig. 5 is a sectional view on the line $x-x$ of Fig. 3. Fig. 6 is a sectional view on the line $y-y$ of Fig. 3. Fig. 7 is a detail view illustrating the mechanism at one end of the feed roller.

In the drawing, 2 represents a table supported on legs 3 and provided with a carriage 4 on which the sheets of paper are supported in a substantially vertical position with their lower ends in contact with the top of the table. The general construction and arrangement of this feed mechanism forms the subject matter of an application filed by Adams July 8th, 1907, Serial No. 382,707. The roller 5 is arranged in contact with the paper as in said application and the sheets are fed from the stack one at a time. Rollers 6 and 7 are mounted in the table frame on substantially the same level and have their peripheries projecting through an opening 8 in the table top. A pressure roller 9 is mounted on arms 10 pivoted on said table and said pressure roller is held in yielding engagement with the roller 6 by a

spring 11. The sheets of paper fed from the stack by the movement of the roller 5 will slide along the top of the table and pass between the rollers 6 and 9. There has been some difficulty heretofore in machines of this kind in timing the travel of the sheets so that each sheet will be drawn down between the rollers 6 and 7 before the succeeding sheet fed forward between the rollers 6 and 9, contacts with the descending preceding sheet. The rollers 6 and 9 may be speeded up higher than the feed roller to hasten the delivery of the sheets to the rollers 6 and 7, but in doing this there is danger of tearing the sheets when the pull of the rollers 6 and 9 becomes too severe thereon. To obviate this difficulty we provide a ratchet mechanism in connection with the feed roller and consisting of a ratchet wheel 42' secured on the roller shaft while the gear 42 is loosely mounted thereon. A series of dogs 42'' are mounted on the gear 42 and engage the ratchet 42', being held in contact therewith by springs 43'. The gear 42 driven from the belt 40 will, when turned contra-clockwise, drive the ratchet wheel and the roller and feed the paper forward. In case, however, the sheet of paper is drawn taut by the rollers 6 and 9 and there is danger of tearing it, the feed roller will slip and the dogs will slide over the teeth of the ratchet and allow the feed roller to revolve without operating the gear. This will prevent all danger of damage to the sheets and their travel can be accurately timed so that one sheet will have passed down between the rollers 6 and 7 out of the path of the incoming sheet. 12 is a knife supported on a frame 13 that is hinged at 14 on said table and adapted to swing up and down thereon. Guides 15 are provided beneath said frame between which guides and the top of the table the forward ends of the sheet pass. For the purpose of depressing the knife 12 to contact with the paper and cause it to pass down between the rollers 6 and 7 we provide shafts 16 and 17 journaled in the table frame, the shaft 16 having an arm 18 secured thereon that is pivotally connected by a link 19 with a dog 20 that is pivoted on the frame 13 near the end of the knife 12. The raising of the arm 18 will have the effect of drawing in the free end of the dog 20 until it engages with the teeth of a ratchet wheel 21 on the end of

the roller 7. The dog 20 is released from the ratchet by the pressure of the teeth thereon against the dog as it comes in contact with the teeth when drawn downward.

5 The shaft 17 is provided with arms 22 which are connected to corresponding arms 23 on the shaft 16 by bars 24. These bars are provided at intervals with slots 25 adapted to receive lugs 26 provided on a plate 27. The

10 table top has a series of longitudinal slots 28 therein through which the lugs 26 extend, and intermediate lugs 29 are provided on the plate 27 also projecting through slots in said table top. These slots are all of sufficient

15 length to allow the plate 27 to be adjusted at any desired point along the bars 24. The engagement of the paper with this plate will have the effect of oscillating the arms 22 and

20 with the ratchet 21, whereupon the dog will be drawn downward, the frame 13 will be depressed and the knife 12 contacting with the sheet of paper will form a bend therein and direct it in between the rollers 6 and 7

25 by which the first fold in the paper will be made. The frame 13 will be normally held in its raised position by means of a spring 30. Beneath the rollers 6 and 7 we provide a series of feed rollers 31, 32 and 33 journaled

30 in the legs. Sprocket wheels 34 are secured on said rollers and a drive chain 35 connects the said sprocket wheels with a gear 36 on a shaft 37. This shaft is provided with an operating crank 38 and with a sprocket

35 39 that has a belt connection 40 with a sprocket wheel 41 from which the roller 5 is driven through gears 42. Idle wheels 43 are mounted on the legs 3 and in engagement with the drive chain.

40 The guide plate which we will designate by numeral 44 and between which and the feed rollers the sheets of paper pass, is detachably hinged at 45 on the table near the feed rollers 6 and 7. This guide plate is

45 capable of swinging outwardly away from the feed rollers for the purpose of obtaining access to the feed mechanism for adjustment or repairs, and to permit sheets of paper to be delivered from the machine after

50 passing through the rollers 6 and 7 and with but one fold formed therein. This feature of the mechanism is described and claimed in application No. 395,022 of John H. Adams, filed Sept. 28, 1907, and we make no claim

55 to the same in this case. A bar 46 composed of sections hinged together is pivoted at one end on the table frame and at its opposite end is detachably connected to the guide plate and holds the said plate in a

60 vertical position against the feed rollers. Near the upper end of the guide plate a pressure roller 47 is mounted on a spring plate 48 that is adjustably supported by the guide plate by means of slots 49 and

65 screws 50. This pressure roller contacts with the feed roller 31 through an opening in the guide plate and by means of its adjustable support can be tilted up and down to obtain perfect alinement or to insure the movement of the paper through the machine

70 in a straight line or at an inclination to either side to correct any tendency of the paper to move laterally and interfere with the parallel folding of the sheet. This is especially useful when it is desired to fold

75 a sheet on one side only after the initial transverse fold has been made therein. Beneath the roller 47 is a spring plate 51 secured to the guide plate and supporting a pressure roller 52 which projects through

80 slots 53 in the edges of the guide plate. In the rear of the roller 52 is a roller 54 journaled in the legs 3 and provided with end flanges 55 having inner faces 56 which are partly inclined with respect to the axis

85 of the roller and partly at right angles thereto, as indicated in Fig. 6, these faces being contiguous to and cooperating with the ends of the rollers 52. Between these flanges 55 and the roller 52 the edges of the

90 sheet are bent outwardly preparatory to being folded over upon one another by the folder, as hereinafter described. This flanged roller cooperating with the pressure roller forms the subject matter of claims

95 in the application No. 395,022 and we make no claim to the same herein. Below the folding rollers 52 and 54 and opposite the feed roller 32 is a third pressure roller 57 mounted in a spring plate 58 that is secured

100 to the guide plate, said pressure roller operating through an opening in the guide plate and cooperating with the feed roller to move the paper. 58' represents the device by means of which the folding operation is

105 completed. It consists of a funnel-shaped shield or hood having ears 59 by means of which it is detachably mounted upon screws 60 and with its walls gradually converging from the upper toward the lower end, and

110 provided at its extreme lower end with a tongue 61 between which and the lower end of the guide plate the folded paper is passed. This folder, as indicated in the drawings, has a continuous or unbroken upper front wall

115 and is open at the rear to receive the guide plate. The manner of mounting the folding device or funnel on the machine is such that it may be readily attached or detached with a single movement. We have found this

120 feature of the machine to be a great advantage and an improvement over other machines for the same purpose, as it allows quick access to the working parts in case the mechanism becomes accidentally clogged through

125 the improper folding of a sheet or its lodging in the machine.

The edges of the guide plate 44 are provided with recesses 44' on each side of the pressure roller 57, said recesses being in-

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closed by the folding device 58' and permitting the upper portion of the folded sheet to swing inwardly when the lower portion is drawn through the throat of the funnel shaped folder and cause the folds to be completed along the lines on which the edges of the sheets were bent by the action of the flanges 55 and the pressure rollers 52. We regard this arrangement of the guide plate in connection with the folding device as an important feature of our invention as it prevents any new folds from being formed in the paper when the sheets are drawn out of the lower end of the funnel shaped folder by the action of the lower feed roller. We are thus able to pass the sheets rapidly through the folder and be assured that the folds when formed will be parallel with one another and the sheets be evenly and uniformly folded when delivered to the packing receptacle. As the paper approaches the funnel-shaped device it is turned by means of the rollers 52 and 54 until the edges of the sheet are substantially at right angles to the middle portion thereof, and at the entrance of the folder we provide a finger 62 which engages the turned up edge of the paper on one side and bends it inwardly over the middle portion in advance of the opposite edge of the paper, so that when the folded edges engage the inwardly inclined wall of the folder, one edge will lap by the other and the sheet will be folded with its edges in parallel relation and of suitable size to enter the ordinary envelop. The tongue 61 extending down below the wall of the folder holds the edges of the folded sheet together and prevents them from separating while they are passing from the folder to the lower pair of feed rollers. Below the folder is a roller 63 journaled on a shaft 64 on which a packer plate 65 is mounted. The shaft 64 is supported in bearings 66 that are slidable on pins 67 and are yieldingly held toward the feed roller 33 by springs 68. The lower portion of the packer plate has a sliding connection at 69 with a spring-pressed arm 70 that is mounted on one of the legs 3 and is in engagement with an eccentric 71 on the roller 33. The shaft 64 is geared to the roller 33 as indicated in Fig. 1, and is driven thereby. Below the packer plate is an open-ended box 72 adjustable in the machine frame by means of a screw 73 and lock nut 74. For the purpose of packing the folded sheets in the box we provide a shaft 76 near the packer plate whereon small reels 77 are mounted. The shaft 76 is supported in bars 78 having longitudinal slots 79 therein, by means of which and suitable set screws the bars are adjustably supported on T-shaped plates 80 that are provided with transverse slots 81 by means of which and suitable locking screws, said plates are adjustably mounted on the side walls of the box 72.

A plate 75 is hung at one end on the shaft 76 and normally is suspended therefrom within the receptacle 72. The folded sheets are packed into the box against this plate and it serves to hold the sheets in an upright position and at the same time yields backwardly and upwardly as the box fills until it is in a substantially horizontal position resting on the tops of the folded sheets. A bend is provided in the plate so that its lower portion will bear on the folded sheets at the proper angle to hold the sheets in an upright position. At the end of the plate 75 is a hinged part 75' which as the plate swings to a horizontal position, hangs by gravity vertically, and when engaged by the sheets as they are pressed backward in the box, will gradually assume a horizontal position in line with the plate 75. As soon as the folded sheets are removed the plate 75 and the hinged part 75' will swing down into the box by gravity, ready to contact with the next stack of folded sheets. By means of the bars 78 the reels may be adjusted vertically to accommodate them to the height of the folded sheets, and by means of the plates 80 an adjustment of the reels to any desired location lengthwise of the box or in relation to the rollers 33 and 63, either alongside of and parallel therewith or underneath, may be obtained, thereby securing the proper position of the reel arms 77 with respect to the top of the pack. We are able with this adjustment of the reels to reach any length of folded paper regardless of where it may be delivered, and at any desired distance back into the box.

This machine differs in its operation from other types of folders, as it is not a time machine, but is so constructed that it takes care of the sheets alike at all parts of the machine. In this respect we regard the machine as a decided improvement over others for the same purpose.

We claim as our invention:—

1. In a folding machine, the combination, with means for feeding the sheets, of means for creasing the sheets preparatory to making the initial fold therein, and means comprising a plate having parts projecting through slots in the machine top and adjustable horizontally beneath said top whereby the position of the initial fold may be varied according to the sizes of the sheets, substantially as described.

2. In a folding machine, the combination, with means for feeding the sheets, of means for forming the initial fold therein, said initial folding means being normally inoperative, means actuated by the movement of the sheets for rendering said initial folding means operative, and means whereby the operation of said initial folding means may be hastened or delayed to adapt the machine for folding sheets of different sizes, said has-

tening or delaying means including a plate having parts projecting through slots in the machine top, and bars arranged beneath said top and having slots at intervals therein to receive the projecting parts of said plate.

3. In a folding machine, the combination, with means for feeding the sheets, of means normally inoperative for forming the initial fold in the sheets, means actuated by the movement of the sheets for rendering said initial folding means operative and including an adjustable plate in the path of said sheets and projecting through the machine top and having supports beneath said top whereon said plate is movable, whereby the operation of said initial folding means may be hastened or delayed, for the purpose specified.

4. In a folding machine, the combination, with a table and means for feeding sheets horizontally thereon, means for forming the initial fold in said sheets, said folding means including a pivoted frame and a knife blade carried thereby, bars having oscillating supports beneath said table and provided with a series of transverse slots, and a plate having parts projecting through slots provided in said table and fitting within the slots in said bars and adjustable therein, and said plate projecting into the path of the sheets moving on said table, and means connected with said bars and whereby said folding means is rendered operative upon the engagement of said sheets with said plate, substantially as described.

5. In a folding machine, the combination, with a guide plate, of a feed roller, a pressure roller arranged to cooperate with said feed roller, a plate mounted on said guide plate and supporting said pressure roller and said plate being adjustable on said guide plate, whereby said pressure roller can be tilted up and down for the purpose specified.

6. In a folding machine, the combination, with a guide plate, of a feed roller, a plate having a slotted connection with said guide plate and capable of tilting thereon, and a pressure roller carried by said adjustable plate and cooperating with said feed roller.

7. In a folding machine, the combination, with a guide plate, of a series of feed rollers, a series of pressure rollers, cooperating with said feed rollers, and a funnel-shaped folder comprising a single curved plate inclosing a portion of said guide plate, the walls of said folder converging toward said guide plate and having means whereby one edge of the sheet will be folded in upon the middle portion in advance of the opposite edge, substantially as described.

8. In a folding machine, the combination, with a guide plate, of a series of feed rollers, a series of pressure rollers arranged to cooperate with said feed rollers, a folder in-

closing a portion of said guide plate, said folder having walls which gradually approach said guide plate and within which walls the folded sheets are fed by said rollers, and a finger provided in said folder and adapted to engage one edge of the folded sheets and fold it in over the middle portion in advance of the opposite edge.

9. In a folding machine, the combination, with a guide plate, of a series of feed rollers, a series of pressure rollers cooperating with said feed rollers, a folding device removably supported in front of said guide plate and partially inclosing the same, said folding device being composed of a single substantially funnel shaped plate and having walls which gradually approach said guide plate, and means provided within said folding device, whereby one edge of the sheet will be folded down upon the middle portion thereof in advance of the opposite edge.

10. In a paper folding machine, a guide plate and a paper feeding means, in combination with a funnel shaped folder comprising a curved plate having a continuous upper front wall open at the rear and inclosing a portion of said guide plate, the walls of said folder converging toward said guide plate from the top downwardly and adapted to engage one edge of the paper and turn it inwardly over the middle portion thereof.

11. In a paper folding machine, a guide plate and a paper feeding means in combination with a funnel-shaped folder, comprising a curved plate having a wall unbroken in front at the top of the folder and open at the rear and inclosing a portion of said guide plate, the walls of said folder converging toward said guide plate and adapted to engage one edge of the paper and turn it inwardly over the middle portion thereof, the edges of said plate having means for securing them and said means being readily detachable to permit the removal of said plate and access to the space inclosed thereby.

12. In a paper folding machine, a frame, a vertical guide plate and a paper feeding means in combination, with a vertical folder corresponding substantially in form to one of the sections of a longitudinally and centrally divided cone shaped funnel and inclosing a portion of said plate, and said folder having notched lugs to receive supports on said frame, whereby said folder is rendered readily removable.

13. In a folding machine, the combination, with a funnel-shaped folder composed of a single curved plate having continuous outer walls converging toward the bottom of the folder and means located near the entrance to said folder for making a preliminary bend in the edges of the sheet, substantially as described.

14. In a folding machine, an upright frame, a guide plate hinged therein and

adapted to be swing outwardly therefrom, pressure rolls carried by said guide plate and a paper folder carried by said frame and inclosing the lower portion of said guide plate and consisting of a single plate having upwardly and outwardly flaring walls, substantially as described.

15. In a machine of the class described, a folder comprising a plate having curved walls and substantially funnel shaped in form, said plate having unbroken walls converging toward the lower end of the folder and a fixed finger mounted on the inner wall of said folder and projecting inwardly therefrom, for the purpose specified.

16. In a folding machine, the combination, with a frame, of a vertically arranged guide plate, a series of feed rollers arranged one above another in the rear of said plate, a series of pressure rollers coöperating with said feed rollers in front of said plate and a folder corresponding in form substantially to one section of a longitudinally and centrally divided cone-shaped funnel and inclosing the lower portion of said guide plate, and said folder having means whereby one edge of the sheet will be turned in upon the middle portion in advance of the opposite edge.

17. In a machine of the class described the combination, with a frame, a guide plate hinged thereon, feed and pressure rollers between which the paper to be folded is to be fed, and a folder inclosing a portion of said

guide plate and composed of a single curved sheet having a continuous outer wall, and said folder being removable to permit said guide plate to be swung outwardly, substantially as described.

18. In a machine of the class described, the combination, with a frame, of feed rollers mounted therein, a hinged guide plate, pressure rollers carried thereby and coöperating with said feed rollers and a funnel shaped folder having an unbroken outer wall and removably mounted on said frame and inclosing the lower portion of said guide plate, for the purpose specified.

19. In a machine of the class described, the combination with a frame, of a guide plate, a series of feed rollers, a series of pressure rollers coöperating with said feed rollers, a vertical folder corresponding in form substantially to one section of a longitudinally and centrally divided cone shaped funnel and open in the rear and inclosing a portion of said guide plate and having an unbroken upper front wall and said folder being removable to permit access to the paper between said feed and pressure rollers.

In witness whereof, we have hereunto set our hands this 21st day of November 1907.

JOHN H. ADAMS.
ELMER D. WALLACE.

Witnesses:

J. H. BALDWIN,
RICHARD PAUL.