J. H. ADAMS.

PAPER FOLDING MACHINE.

APPLICATION FILED SEPT. 28, 1907.

909,841.

Patented Jan. 12, 1909.

3 SHEETS—SHEET 1.

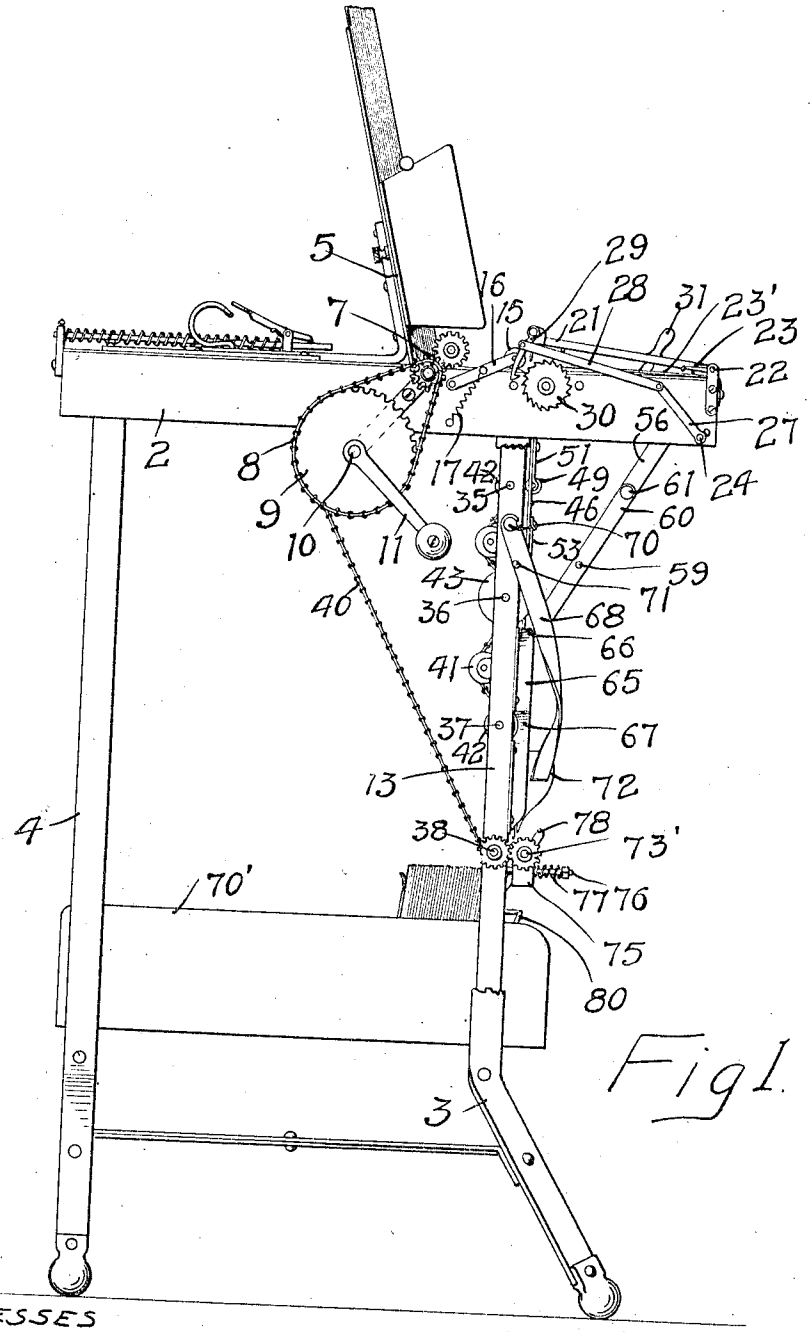


Fig 1.

WITNESSES

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INVENTOR

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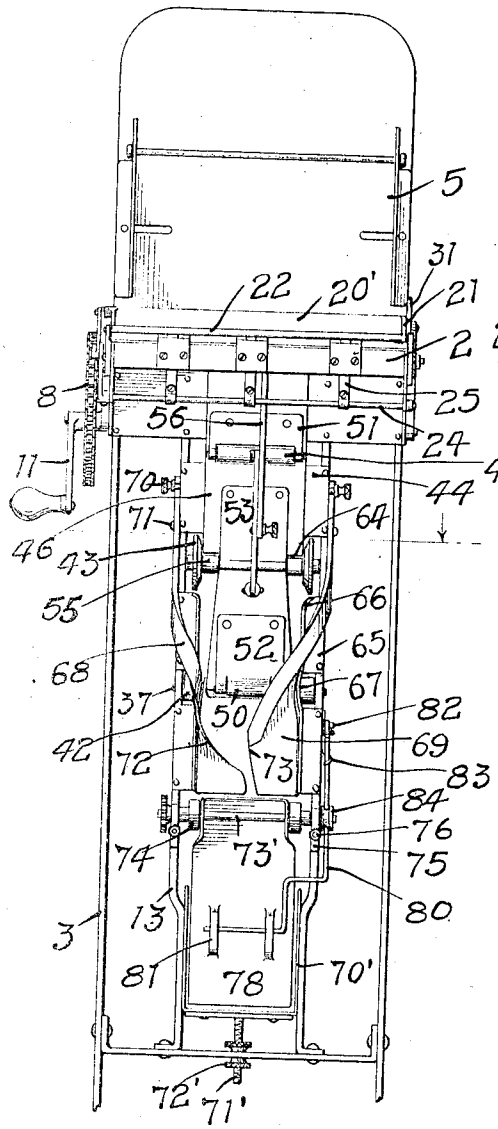


Fig 2

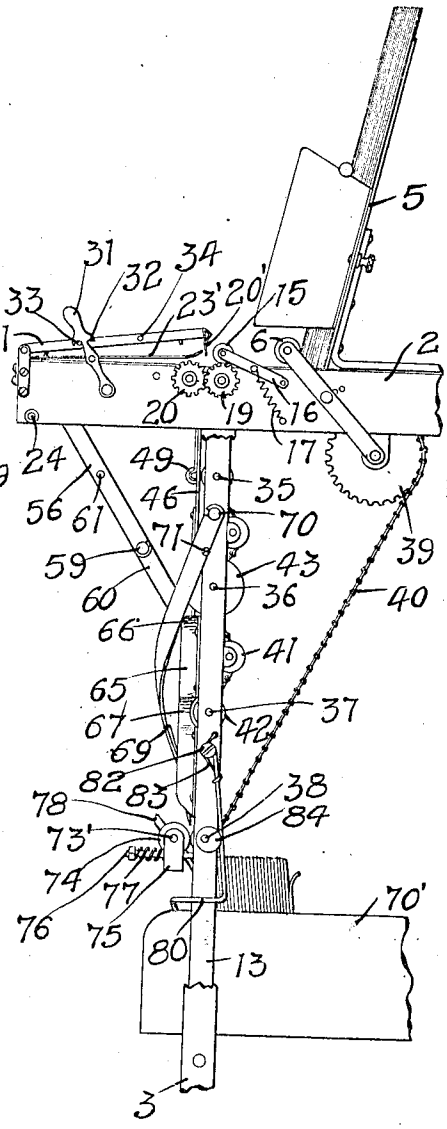


Fig 3

WITNESSES—

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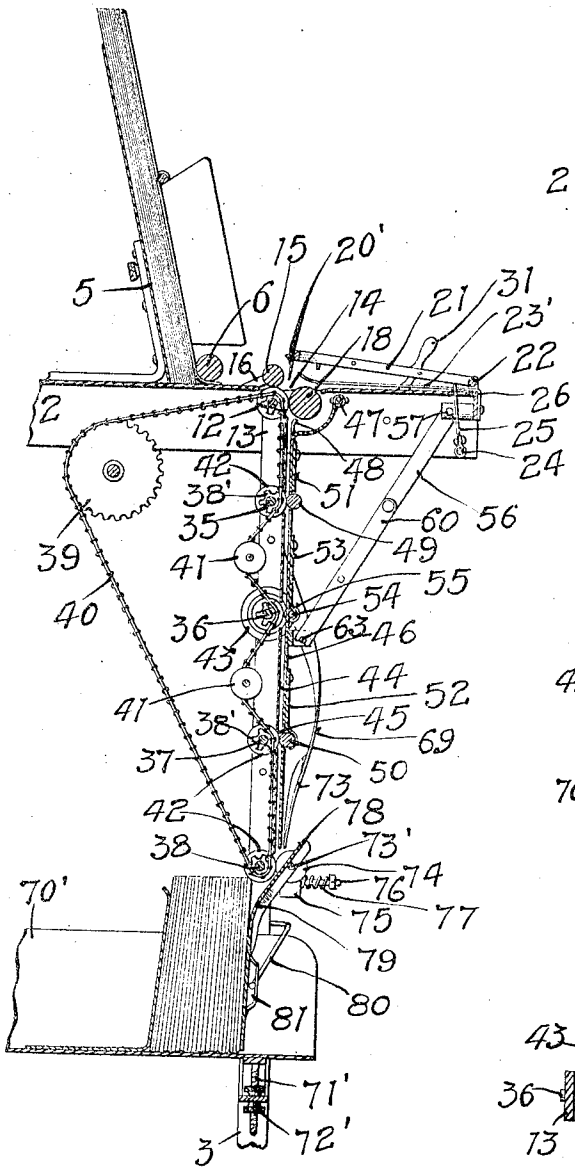


Fig 4

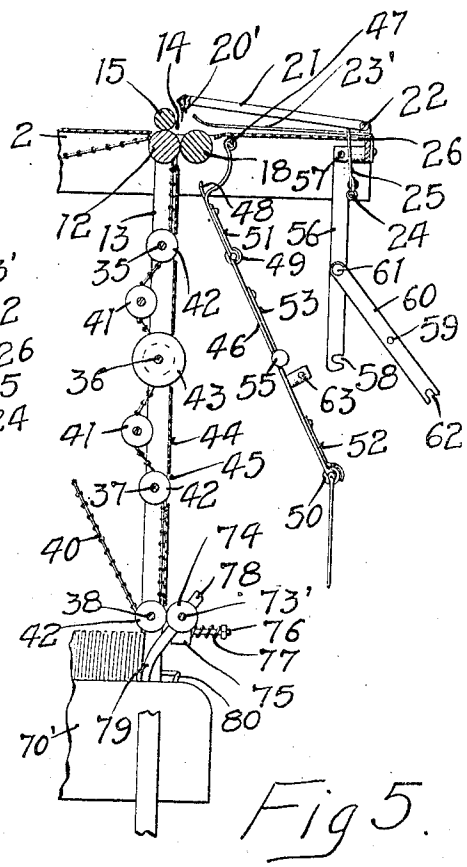


Fig 5.

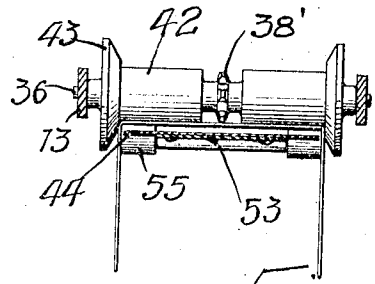


Fig 6.

WITNESSES

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UNITED STATES PATENT OFFICE.

JOHN H. ADAMS, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ADAMS LETTER FOLDING MACHINE COMPANY, A CORPORATION OF MINNESOTA.

PAPER-FOLDING MACHINE.

No. 909,841. Specification of Letters Patent. Patented Jan. 12, 1909.

Application filed September 28, 1907. Serial No. 395,022.

To all whom it may concern:

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

The invention relates to machines for folding paper such as letters, circulars and similar matter, and the object of the invention is to improve the folding mechanism shown and described in Letters Patent of the United States issued to me November 20th, 1906, No. 836,235.

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 paper folding machine embodying my invention. Fig. 2 is a front elevation of the same. Fig. 3 is a side elevation showing the opposite side of the machine from the illustration in Fig. 1. Fig. 4 is a vertical sectional view illustrating the folding mechanism in detail. Fig. 5 is a detail sectional view showing the manner of swinging the hinged tongue plate away from the pressure rolls and folding wheels, the folding devices being omitted, to illustrate more clearly the position and arrangement of the other parts. Fig. 6 is a detail sectional view illustrating the operation of the folding wheels.

In the drawing, 2 represents the bed or feed table of the machine supported on the forward and rear legs 3 and 4. 5 represents a portion of a sheet feeding mechanism mounted on the table 2 and forming the subject matter of a companion application for U. S. Letters Patent, filed on July 8, 1907, Serial No. 382,707, and which therefore needs no detailed description or illustration herein.

6 is a feed roll driven from a gear 7 having a belt connection 8 with a large driving wheel 9 mounted on a shaft 10 on which is an operating crank 11. A feed roll 12 is mounted in standards 13 beneath a feed opening 14 in the said table and a feed roll 15 is arranged above the roll 12 and is carried by arms 16 that are pivoted on the table 2 and are provided with springs 17, the tension of which tends to hold the roll 15 in yielding engagement with the roll 12. The paper passing between the rolls 12 and 15 is given a positive feed toward the end of the table and the fingers projecting therethrough. A feed roll 18 is arranged beside the roll 12 and coöperates therewith and is driven therefrom at one end through gears 19 and 20.

In my patent above referred to I have described a device for regulating the number of folds to be made in the paper. In this machine I employ a mechanism for the same purpose but have simplified and improved the same and will now proceed to describe it in detail.

20′ is a blade suspended over and between the rolls 12 and 18 upon a frame 21, mounted on a shaft 22 and normally held in a raised position by a spring 23. Guides 23′ serve to direct the paper and hold it in place on the table. A shaft 24 mounted in the machine table is provided with a series of upwardly projecting trigger arms 25 whose ends extend above the surface of the table through slots 26 therein into the path of the sheets of paper passing between the rolls 12 and 15. An arm 27 is mounted on one end of the shaft 24 and a link 28 connects the said arm with a dog 29 that is pivoted on the frame 21 and is adapted to engage the teeth of a ratchet 30 on the feed roll 18 and cause the downward movement of the frame 21 and the engagement of the plate 20′ with the paper to crease the same and feed it in between the rolls 12 and 18 in the manner described in my patent above referred to. The dog 29 is forced out of engagement with the teeth of the ratchet 30 by the succeeding teeth of said ratchet which strike the dog as it is drawn down in the revolution of the ratchet and when the dog is released it returns to its normal position ready to repeat the operation.

A lever 31 pivoted on the machine table has notches 32 to receive the pins 33 and 34, the engagement of the lever with the pin 33 holding the frame in proper adjustment to make a preliminary transverse fold in the paper and the adjustment of the lever in engagement with the pin 34 causing the blade to be swung downward into the path of the paper and direct it between the feed rolls without making the preliminary fold, thus adapting the fold device for full sized sheets or for note size.

A series of shafts 35, 36, 37 and 38 are

journaled in the standards 13 and are provided with sprocket wheels 38′. A similar sprocket wheel is provided on the roller 12 and a large wheel 39 is mounted on the shaft 10 and a sprocket chain 40 is arranged to engage said wheels and drive them all simultaneously when power is applied to the crank 11. Idle rollers 41 are mounted on the standards 13 and engage the chain belt 40. Feed rollers 42 are mounted on the shafts 35, 37, and 38 and feed wheels 43 having wide beveled flanges are mounted on the shaft 36. A vertical plate 44 has openings 45 through which the feed rollers operate and a plate 46 is hinged at 47 and is arranged to coöperate and form a guide with the plate 44 and between which plates the sheets of paper are fed downwardly and folded during their downward movement. The plate 46 has an outwardly curved upper end 48 near the feed rollers, and yielding pressure rollers 49 and 50 are carried by spring plates 51 and 52 that at their upper ends are secured to the pivoted plate 46 and adapted to coöperate with the rolls 42 to feed the sheets downward. A spring plate 53 is mounted on the plate 46 and carries a shaft 54 at its lower end having yielding spools 55 at each end between the wide beveled flanges 43 and coöperating therewith to certainly and positively form a right-angled bend or fold in the paper sheets. A bar 56 is pivoted at 57 on the machine table and has a notch 58 to receive a pin 59 on a secondary bar 60 that is pivoted at 61 on the bar 56 and has a recess 62 to receive a pin 63 on the plate 46 thereby holding the said plate rigidly in vertical relation with the standards 13 and in coöperation with the feed rollers mounted in said standards.

The plate 46 has notches 64 in its opposite edges near the flanged wheels 43 to make room for the spools 55, and the said plate gradually widens from said notches downward and flanges 65 are provided on each side of said plate below the said wheels 43 and have outwardly turned upper ends 66 and bulging or inwardly projecting middle portions 67 which engage the folded sides of the paper and force them inwardly a sufficient distance to insure the proper folding of the paper as it passes between the lower set of rollers. In other words the inward bulge of these flanges prevents the sides of the folded sheets from swinging outwardly and the folds from spreading or separating as the paper passes between the pressure rollers. It is important, of course, to have the folds parallel with one another and this effect is obtained and insured by the use of these flanges with the bulges or projections formed therein.

The recesses formed in the longitudinal edges of the plate 46 allow the upper portion of the paper to be drawn inward as the fold is completed and insure the folded edges in the paper being formed parallel with one another. Without this construction of plate, the upper edges of the sheets would have a tendency to separate or swing outward and the folded edges formed in the paper instead of being parallel with one another, would diverge from the bottom toward the top of the fold. I therefore regard this construction of plate as an important feature of my invention.

The guide plate, as shown plainly in Figs. 4 and 5 is arranged beneath the rollers 12 and 18 and is capable of swinging away from the feed rollers, as indicated in Fig. 5, to allow access to the folding mechanism in case of clogging of the machine, and also to permit a sheet to be removed entirely from the machine after the initial folding operation. This I regard as an important feature of the invention which has no equivalent in any other machine of this type.

To complete the folding of the sheets, I provide plates 68 and 69 supported on pins 70 and 71, the plate 68 having an inwardly curved edge 72 to engage one fold of the paper and the plate 69 having an edge 73 to engage the opposite fold and turn them in upon one another to complete the folding operation. These plates are readily removable and are bent to engage the folds of the paper at the proper time and to produce or form the proper fold therein. Between the standards 13 is a box or receptacle 70′ vertically adjustable by means of a threaded stud 71′ and thumb nuts 72′. A shaft 73′ is mounted near the roller 38 and carries feed rollers 74, said shaft and rollers being movable in blocks 75 that are adapted to slide on pins 76 and are yieldingly held toward the roller 38 by springs 77. The shaft 73′ has a driving connection with the shaft 38. A kicker plate 78 is mounted on the shaft 73′ and is arranged to depend into the receptacle 70 and is provided with a hump or projecting portion 79 which engages the folded sheets of paper and causes them to be moved forward into the receptacle past the roller 38 and out of the path of the next succeeding sheet, and also keeps the folded paper in contact with roller 38 sufficiently to insure the forward movement of the sheet. In other words, the folded sheets passing down between the rollers 42 and 74 will be engaged by the gyrating kicker and moved into the receptacle a sufficient distance and with sufficient speed to be entirely out of the path of the next folded sheet as it descends. The kicker has a rapid and vibratory movement produced by any suitable mechanism, preferably a rod 80, having a sliding connection 81 at one end with the plate 78 and pivoted at 82 on one of the standards 13 and yieldingly held by a spring 83 in engagement with an eccentric 84 on the shaft 38. The

revolution of the shaft 38 will operate the eccentric and produce a gyrating movement of the kicker or packer plate and cause the folded sheets to be pressed back into the receptacle as fast as they are delivered thereto by the folding mechanism above.

I claim as my invention:

1. In a paper folding machine, the combination, with a frame, of means for feeding sheets of paper therein, a series of feed rollers arranged one above another in said frame, a guide plate hinged on said frame, a series of pressure rollers carried by said guide plate and arranged to coöperate with said feed rollers, means for holding said guide plate toward said feed rollers, and said guide plate being adapted to swing away from said feed rollers to permit access to the paper between said feed and pressure rollers.

2. In a paper folding machine, the combination, with a suitable frame, of a series of feed rollers arranged at intervals one above another, a guide plate hinged on said frame, spring plates mounted on said guide plate and pressure rollers carried by said spring plates and arranged to coöperate with said feed rollers, and said guide plate being capable of swinging away from said feed rollers to permit access to the paper between said feed and pressure rollers.

3. In a paper folding machine, the combination, with a frame, of a vertical guide plate hinged at one end thereon, a series of feed rollers mounted in said frame in the rear of said plate, yieldingly mounted pressure rollers carried by said plate and cooperating with said feed rollers, and folding means between which the edges of the paper are bent to form the folds therein.

4. In a paper folding machine, the combination, with a frame, of feed rollers mounted therein one above another, a guide plate, spring plates mounted on said guide plate, pressure rollers carried by said spring plates and between which and said feed rollers the sheets are fed.

5. In a paper folding machine, the combination, with a frame, of feed rollers arranged one above another, a guide plate having openings therein, spring plates mounted on said guide plate, pressure rollers carried by said spring plates and arranged to coöperate through said openings with said feed rollers, and means for holding said guide plate and pressure rollers in coöperating relation with said feed rollers.

6. The combination, with a frame, of a series of feed rollers arranged one above another therein, a guide plate supported in said frame and adapted to be moved toward or from said feed rollers, a series of pressure rollers carried by said guide plate and coöperating with said feed rollers, mechanism for forming a single fold in the paper and located above said feed rollers and said guide plate, and said guide plate when moved away from said feed rollers permitting the direct delivery of the sheets from said preliminary folding mechanism.

7. In a folding machine, the combination, with a frame, of a series of feed rollers arranged one above another therein, a guide plate, a series of pressure rollers carried by said guide plate and coöperating with said feed rollers, means for locking said guide plate and the pressure rollers in coöperating relation with said feed rollers, means for effecting the initial fold in the paper and located above said guide plate and said pressure rollers, and said guide plate being capable of removal from its operative position whereby the sheets will be delivered from the machine after the initial fold therein, substantially as described.

8. In a folding machine, the combination, with a frame, of an initial folding mechanism, feed rollers arranged to receive the sheets from said initial folding mechanism, a guide plate capable of movement toward or from the said feed rollers, a series of yieldingly mounted pressure rollers coöperating with said feed rollers, a secondary folding means, and said guide plate when moved away from said feed rollers permitting the direct delivery of the sheets from said initial folding mechanism.

9. The combination, with a frame, of initial folding rollers mounted therein and means for delivering the paper to be folded thereto, feed rollers arranged one above another below said initial folding rollers, a vertical guide plate in front of said rollers and capable of moving toward and from them, folding devices to which access is permitted by the movement of said guide plate away from said feed rollers, and a means mounted on said frame and connected to said guide plate for holding it in operative relation with said feed rollers.

10. In a folding machine, the combination, with a frame, of an initial folding mechanism horizontally arranged therein, a vertically arranged secondary folding mechanism located below said initial folding mechanism and including a guide plate that is capable of movement to an inoperative position to allow the discharge of the sheets from the machine after the initial folding operation.

11. In a paper folding machine, the combination, with a guide plate and pressure rollers, of wheels arranged upon each side of said plate and having beveled inner faces, and said wheels coöperating with said pressure rollers and with said plate to bend the paper passing between them.

12. In a folding machine, a vertically arranged hinged plate having recesses or notches in its longitudinal edges, the width

of said plate gradually increasing from the bottom of said notches downwardly, wheels operating near said notches and having beveled inner faces, and rollers fitting into the notches in said plate and coöperating with said wheels to bend the paper.

13. In a paper folding machine, the combination, with a suitable frame, of a guide plate having an outwardly turned guiding edge, a series of feed rollers, spring plates mounted on said plate, pressure rollers carried by said spring plates and arranged to coöperate with said feed rollers, said plate having notched longitudinal edges and means operating in said notched edges to bend the paper.

14. In a paper folding machine, the combination, with a horizontal feed table and vertical standards, feed rollers arranged one above another on said standards, a guide plate, a series of pressure rollers carried thereby, wheels having beveled inner faces provided on each side of said plate, there being a pair of pressure rollers opposite said feed wheels and operating between them, and said plate increasing in width downwardly therefrom whereby the top of the paper will be drawn inwardly and the folds formed parallel with one another.

15. In a paper folding machine, the combination, with a frame, of a roller having flanged ends provided with beveled inner faces, a guide plate fitting between said flanged ends, pressure rollers carried by said guide plate and coöperating with said flanged ends to bend and fold the edges of the sheets, and means for delivering sheets of paper between said flanged roller and said guide plate.

16. In a paper folding machine, the combination, with the vertical standards, of feed rollers mounted therein one above another, a roller having flanged ends mounted in said standards intermediate to said feed rollers, a guide plate fitting between said flanged ends, pressure rollers mounted on said guide plate and arranged to coöperate with said feed rollers, and rollers mounted on said guide plate contiguous to said flanged ends and coöperating therewith to form bends or folds in the edges of the paper.

17. The combination, with a frame of an initial folding mechanism including rollers arranged side by side, a rising and falling knife supported above said rollers, a ratchet wheel, a dog connected with said knife and normally out of engagement with the teeth of said ratchet, and mechanism actuated by the impact of the moving article for causing said dog to engage the teeth of said ratchet to draw down said knife between said rollers, substantially as described.

18. The combination, with a frame, of an initial folding mechanism comprising rollers and an oscillating knife, a ratchet wheel, a dog connected with said knife, mechanism actuated by the impact of the moving article for causing said dog to engage the teeth of said ratchet whereby said knife will be drawn to a point between said rollers and the pressure of the ratchet teeth on the said dog disengaging it therefrom at a predetermined point in the revolution of said ratchet, substantially as described.

19. The combination, with a frame, of an initial folding mechanism comprising rollers and an oscillating knife, a ratchet wheel, a dog connected with said knife and normally out of engagement with the teeth of said ratchet, and mechanism actuated by the impact of the moving article for causing said dog to temporarily engage the teeth of said ratchet and move said knife to a point between said rollers, substantially as described.

20. The combination, with a frame, of an initial folding mechanism comprising rollers, a pivoted frame, a knife blade carried thereby and movable toward and from said rollers, a ratchet wheel, a dog pivoted on said frame and normally out of engagement with the teeth of said ratchet, a link connected with said dog, and a rock shaft having an arm pivotally connected with said link and provided with means in the path of the moving article whereby said shaft will be rocked by the impact of the article and said dog moved temporarily into engagement with the teeth of said ratchet, for the purpose specified.

In witness whereof, I have hereunto set my hand this 19th day of September, 1907.

JOHN H. ADAMS.

Witnesses:
RICHARD PAUL,
J. B. BYINGTON.