W. M. PHILLIPPIE.

MACHINE FOR FOLDING PAPER.

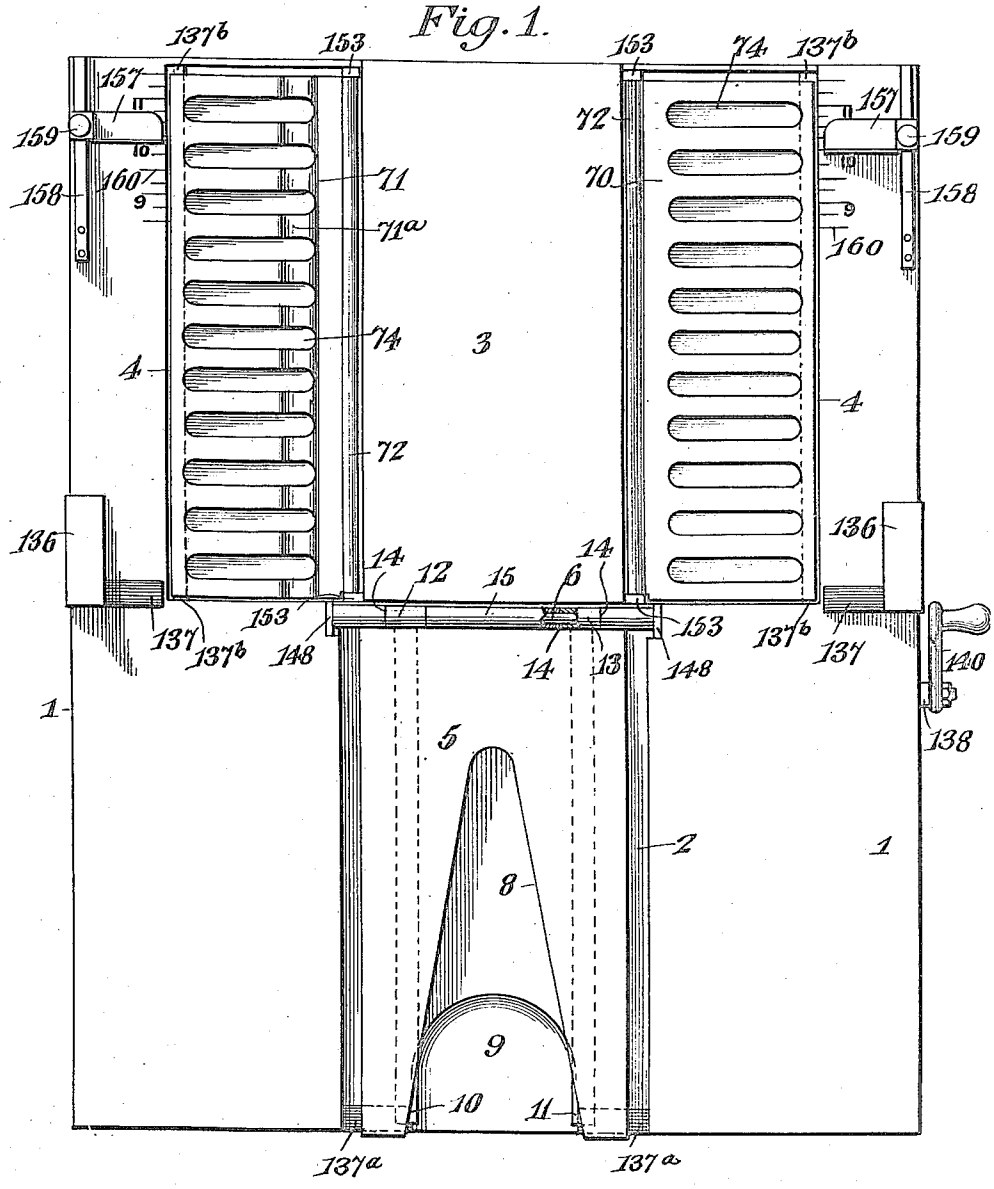
APPLICATION FILED JULY 6, 1915.

1,222,459.

Patented Apr. 10, 1917.

6 SHEETS—SHEET 1.

Fig. 1.



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Webster M. Phillippie, INVENTOR

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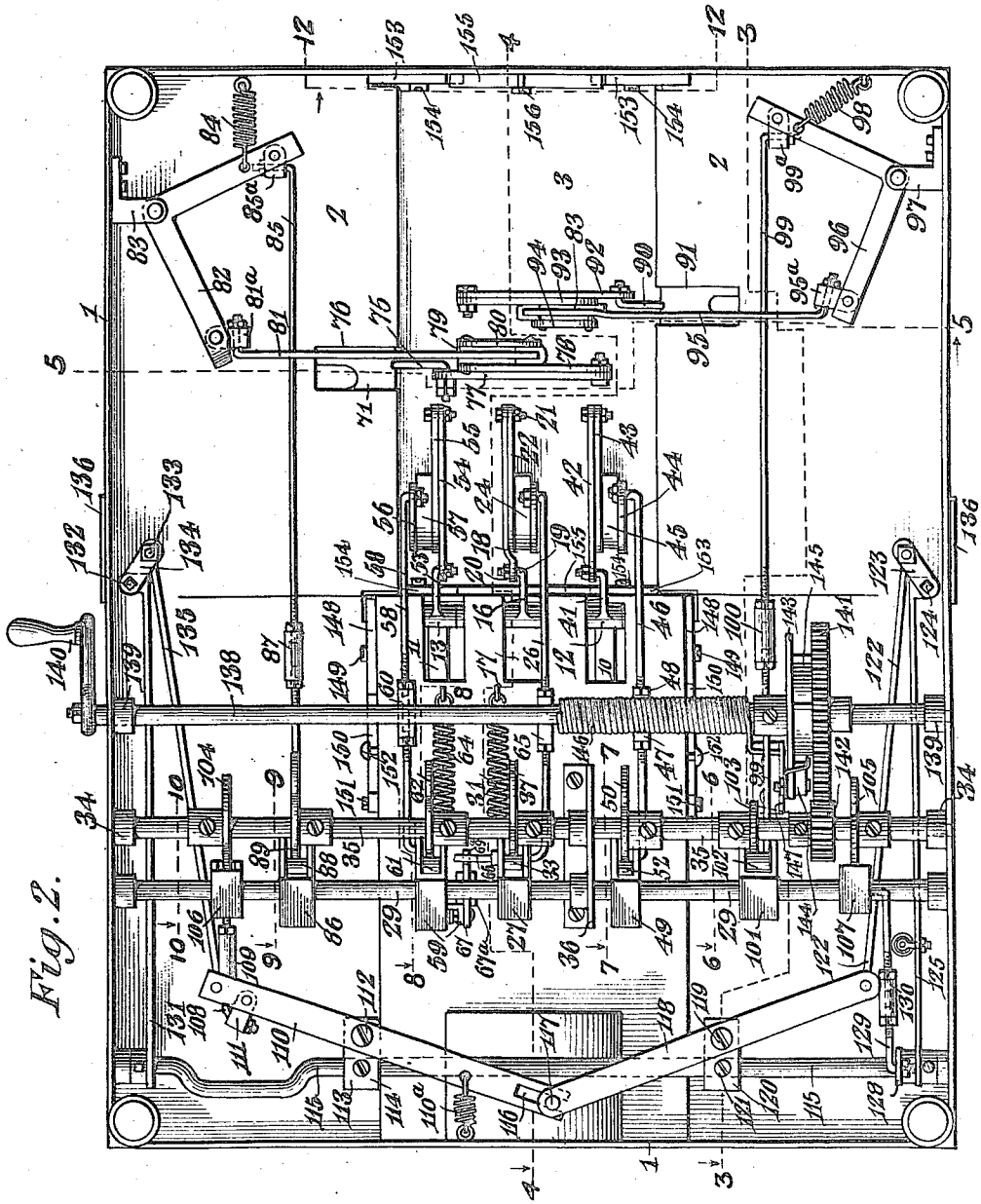


Fig. 2.

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Fig. 3.

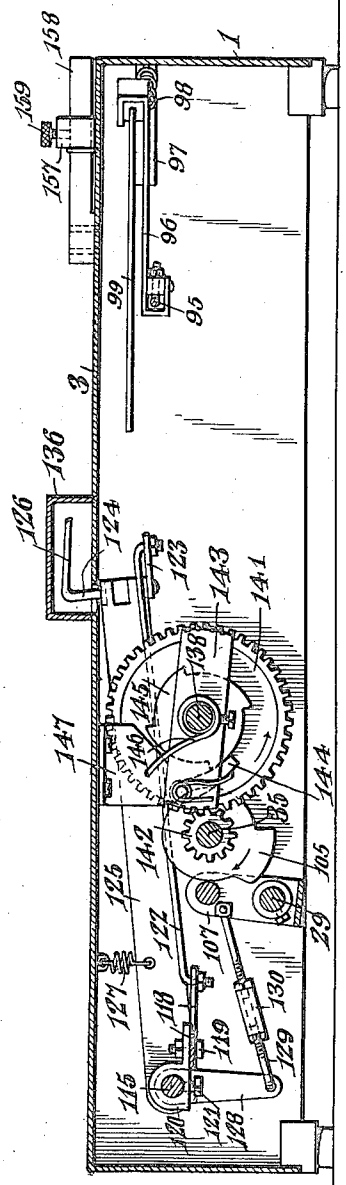
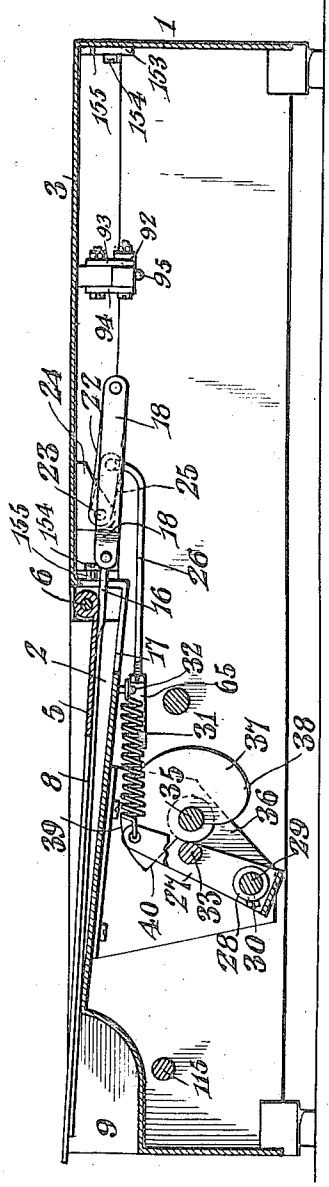


Fig. 4.



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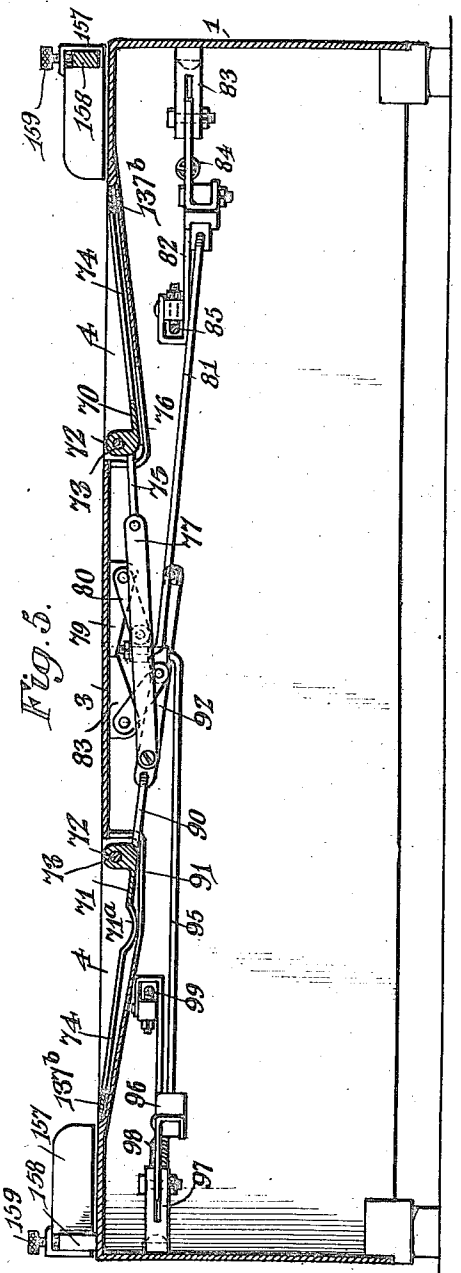


Fig. 5.

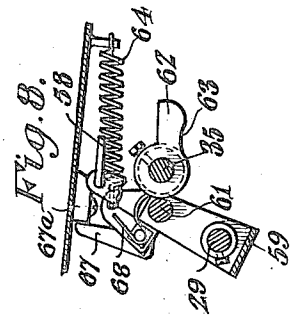


Fig. 8.

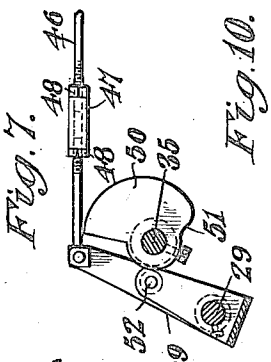


Fig. 7.

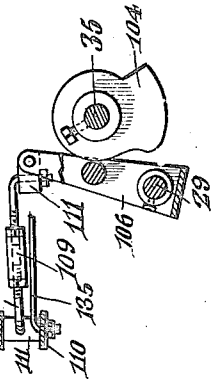


Fig. 10.

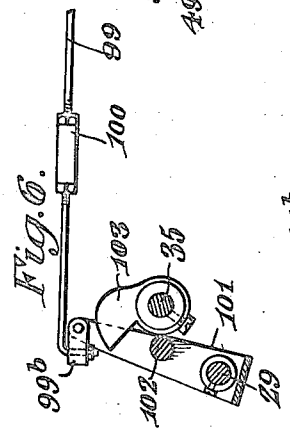


Fig. 6.

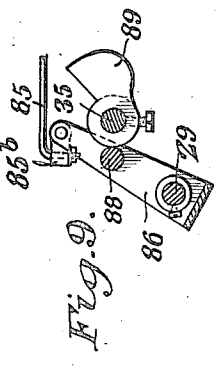


Fig. 9.

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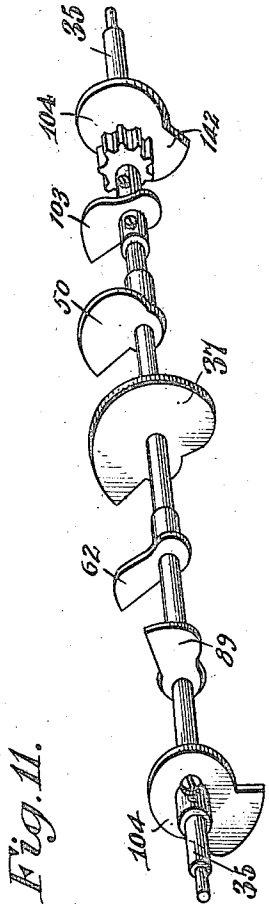


Fig. 11.

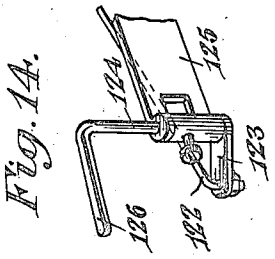


Fig. 14.

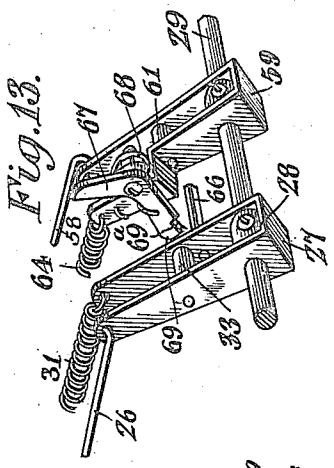


Fig. 13.

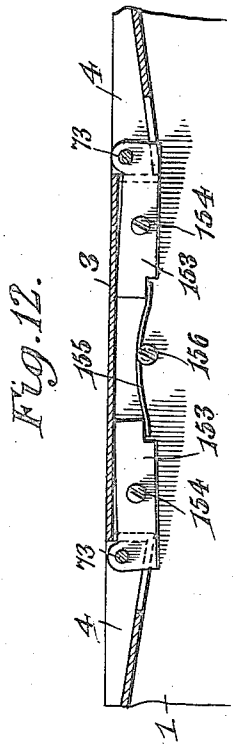


Fig. 12.

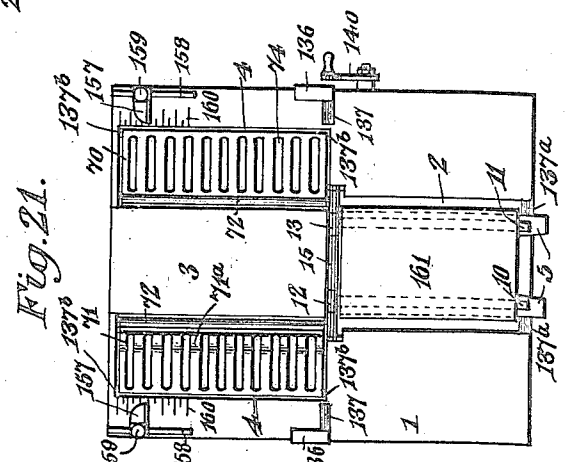


Fig. 21.

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6 SHEETS—SHEET 6.

Fig. 17.

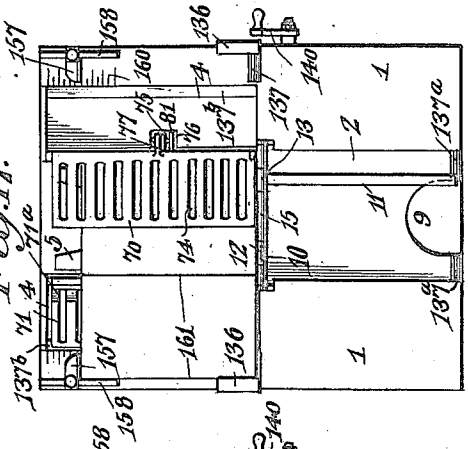


Fig. 20.

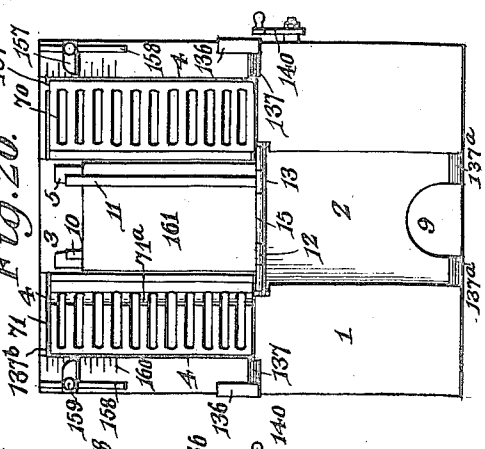


Fig. 16.

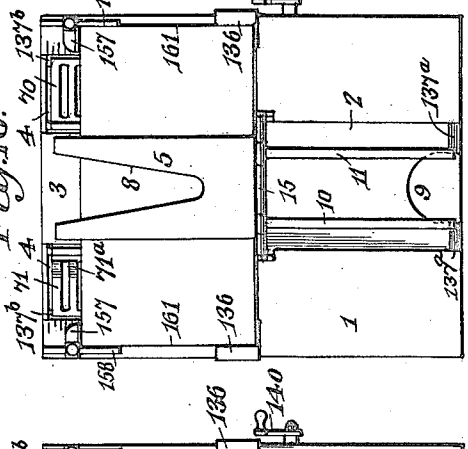


Fig. 19.

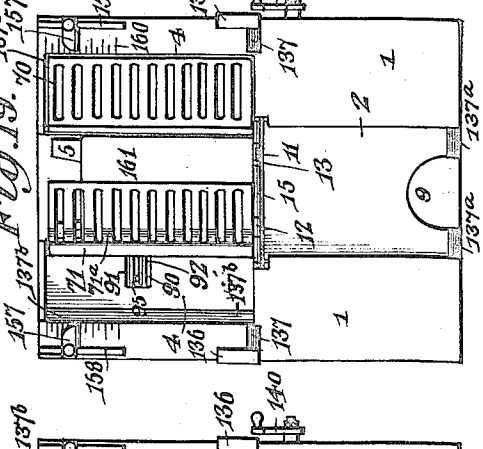


Fig. 15.

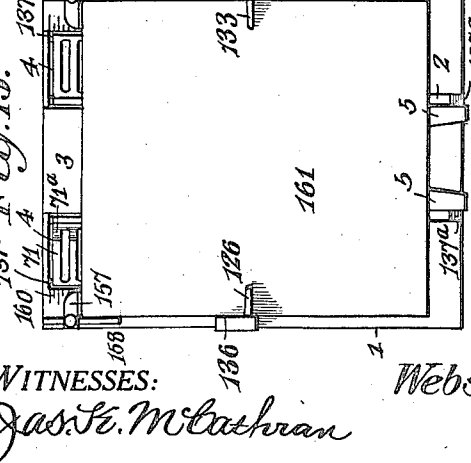
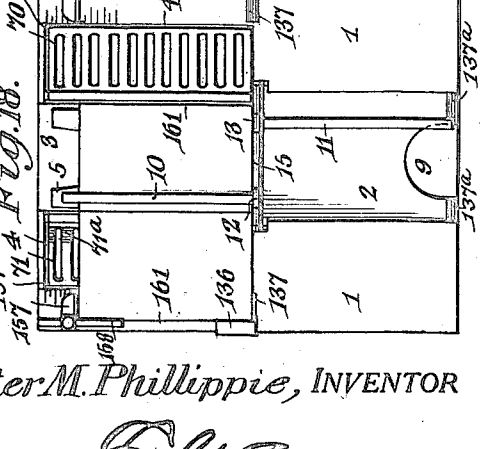


Fig. 18.



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UNITED STATES PATENT OFFICE.

WEBSTER MONROE PHILLIPPIE, OF NEWBERN, NORTH CAROLINA.

MACHINE FOR FOLDING PAPER.

1,222,459. Specification of Letters Patent. Patented Apr. 10, 1917.

Application filed July 6, 1915. Serial No. 38,236.

To all whom it may concern:

Be it known that I, WEBSTER M. PHILLIPPIE, a citizen of the United States, residing at Newbern, in the county of Craven and State of North Carolina, have invented a new and useful Machine for Folding Paper, of which the following is a specification.

This invention has reference to machines for folding paper, and its object is to provide a machine more particularly designed to expeditiously fold letter sheets into a sufficiently small compass for introduction into ordinary envelops.

While the machine is adapted for folding letters, circulars, etc., of different sizes, it will be considered for the sake of simplicity of description that the size of the paper sheets for which the machine is designed is that known as letter size, although the machine without change may be used for other sizes of sheets within certain limits, or may be initially constructed for folding larger or smaller sheets than letter sheets.

In accordance with the present invention there is provided a casing for the mechanism which may also serve as a support for the letter sheet, and housed in the casing is appropriate mechanism having folding elements exterior to the casing in proper relation to those parts of the structure upon which the paper sheet is initially placed.

Means are provided for primarily engaging and holding the paper sheet in proper position and folding elements are so connected to the operating mechanism that they act in proper sequence to produce a main cross fold in the sheet and successive side folds following in order the customary manner of folding letter sheets preparatory to introducing them into envelops.

In order that the folding may be accomplished, the machine is provided with paper holding means, a primary folding member, side folding members, and temporarily acting holding members with successively operating devices acting upon the folding and holding members in proper sequence, and ultimately depositing the folded letter sheet in position for removal from the machine, the whole operation being brought about by a fractional turn of a manipulating handle carried by a rock shaft or otherwise arranged.

The invention will be best understood from a consideration of the following detailed description, taken in connection with the accompanying drawings forming a part of this specification, with the further understanding that while the drawings show a practical form of the invention, the latter is not confined to any strict conformity with the showing of the drawings, but may be changed and modified so long as such changes and modifications come within the scope of the appended claims.

Figure 1 is a plan view of the machine in position to receive the sheet of paper to be folded.

Fig. 2 is a bottom plan view of the machine with the parts in the same position as indicated in Fig. 1.

Fig. 3 is a section on the line 3—3 of Fig. 2.

Fig. 4 is a section on the line 4—4 of Fig. 2 with distant parts omitted.

Fig. 5 is a section on the line 5—5 of Fig. 2 with distant parts omitted.

Fig. 6 is a fragmentary section on the line 6—6 of Fig. 2.

Fig. 7 is a fragmentary section on the line 7—7 of Fig. 2.

Fig. 8 is a fragmentary section on the line 8—8 of Fig. 2.

Fig. 9 is a fragmentary section on the line 9—9 of Fig. 2.

Fig. 10 is a fragmentary section on the line 10—10 of Fig. 2.

Fig. 11 is a perspective view of the cam shaft.

Fig. 12 is a fragmentary section on the line 12—12 of Fig. 2.

Fig. 13 is a perspective view of two adjacent operating arms responsive to the action of responsive cams on the cam shaft.

Fig. 14 is a perspective view of one of the paper holding fingers for initially clamping the paper.

Figs. 15 to 21 are plan views of the device on a smaller scale than the other figures showing successive steps in the operation of folding a letter sheet into a size to be introduced into an envelop.

Referring to the drawings there is shown a casing 1 which may be of generally rectangular shape of a somewhat greater area than the sheet to be folded, said casing being usually constructed of sheet metal pressed into shape or it may be cast or forged into appropriate shape.

The top of the casing is approximately or generally flat, but at one side of the cross

center line the top of the casing is formed with a depression 2 extending from one end of the casing to said line, while the top from said line to the other end of the casing is in the form of a plateau 3 on a level with the greater portion of the top of the casing. On opposite sides of the plateau 3 the top of the casing has depressions 4 therein relatively deep immediately adjacent to the plateau and gradually shallowing toward the corresponding sides of the casing until at an appropriate distance from the side margins of the casing the depressions 4 merge into the general surface of the casing.

Normally lodged in the depression 2, which like the depressions 4 shallows from one end toward the other, the deeper end being adjacent to the cross center line of the casing, there is a folding leaf 5. This folding leaf is mounted on a rod 6 extending transversely of the depression 2 at its deeper end and carried by means to be described. That end of the folding leaf 5 remote from the supporting rod 6, which latter is in the nature of a hinge support, is in-cut or provided with a longitudinally extended tapering notch 8, which, as will hereinafter appear, permits grasping of the folded sheet of paper by the fingers of the hand. This last-named operation is further facilitated by another depression 9 in the top of the casing at that end of the depression 2 remote from the hinge end of the folding leaf.

Near the side edges of the folding leaf 5 and normally underlying such folding leaf between said leaf and the bottom of the depression 2 are holding fingers 10, 11, respectively, each terminating at one end in a sleeve 12, 13, respectively, mounted on the rod 6 and lodged in cut-outs 14 in a cylindrical bead 15 formed on or attached to that end of the folding leaf 5 mounted on the rod 6, said bead being traversed by the rod 6.

Fast to the leaf 5 at the hinge end thereof and on what constitutes the under side of the leaf when lodged in the depression 2, is a finger 16 projecting through a slot 17 in the bottom wall of the depression 2, which slot opens into the interior of the casing.

Fast to the end of the finger 16 remote from that fast to the leaf 5 is one end of a link 18. The junction between the finger 16 and link 18 may be conveniently made by forming the corresponding end of the finger 16 with an angle bend 19 traversing the link and there receiving a nut 20 threaded on the bent end 19, so that the link is held to the finger by a pivotal connection.

The other end of the link 18 is connected by a pivot 21 to the outer end of a rock arm 22 fast to a rock pin 23 carried by a bracket 24 in turn carried by the under side of the top of the casing. The rock pin 23 also carries a rock arm 25 fast thereto, and this rock arm 25 is pivotally connected to one end of a reach rod 26. The other end of the rod 26 is pivotally connected to one end of an arm 27 which may be of U shape with the two sides in parallelism and between the two sides provided with a collar 28 mounted on a supporting bar or rod 29 extending crosswise of the casing 1 within the latter and supported at the ends in the sides of the casing. The collar 28 is held to the rod 29 by a set screw 30 and being located between the two sides of the arm 27 the latter may rock on the rod 29 without longitudinal movement in either direction on the rod. A spring 31 fast at one end to the arm 27 and at the other end to a fixed point of the casing, as, for instance, a pin 32 on the under wall of the depression 2, tends to hold the arm in a certain position, but will yield to displacement of the arm by means to be described. Extending between the two sides of the arm is a rotatable pin 33 at an appropriate distance from the pivot support of the arm represented by the rod or bar 29.

Journaled at the ends in journal bearings 34 carried by the sides of the casing is a rotatable shaft 35 having appropriate intermediate supporting journal brackets 36 where needed.

Fast on the shaft 35 is a cam 37 having a snail edge 38 for a portion of its periphery, and the remainder 39 of the periphery concentric with the axis of rotation of the cam, said peripheral portion of the cam terminating in a radial portion 40 at an appropriate distance from the beginning of the snail edge 38.

The pitch of the cam 37 is such that on rotating the shaft 35 the snail edge 38 will engage the pin 33 and rock the arm 27 against the action of the spring 31 to an extent to cause the actuation of the arms 25 and 22 through the connecting reach rod 26, so as to in turn rock the folding leaf 5 on its hinge or pivot rod 6 from the normal housed position within the depression 2 into a position where the folding leaf 5 is in close parallel relation to the plateau 3. The leaf 5 is held in such last-named position with relation to the plateau 3, so long as the concentric edge 39 of the cam is in engagement with the pin 33, but as soon as the pin 33 escapes at the shoulder 40 the spring 31 immediately returns the arm 27 to its first position in turn returning the leaf 5 to its first position within the depression 2.

The sleeve 12 has fast thereto a finger 41 connected by a link 42 to one end of a two-part rock arm 43, 44 like the rock arm 22, 25, and carried by a bracket 45. The member 44 of the double rock arm has one end of a reach rod 46 pivoted thereto, and this rod includes a coupling 47 into which the rod 46 where joined by the coupling 47 enters by right and left hand screw threads and jam nuts 48 are provided to lock the

sleeve in adjusted positions. That end of the rod 46 remote from the arm 44 is pivoted to a rock arm 49 similar in construction to the rock arm 27, and hence no specific description thereof is deemed necessary. The arm 49 is mounted to rock on the rod or bar 29, and is under the control of a cam 50 fast on the shaft 35. The cam 50 has an active peripheral portion 51 and the arm 49 has a pin 52 in the path of the cam 50.

The sleeve 13 has fast thereto a finger 53 connected by a link 54 to one member 55 of a double rock arm having another member 56, and this rock arm is mounted in a bracket 57. The member 56 is connected by a reach rod 58 to a rock arm 59 mounted on the rod 29. The reach rod 58 includes an adjusting coupling 60, and the arm 59 is of the same general character as the arms 27 and 49. The arm 59 is provided with a pin 61 in the path of a cam 62 fast on the shaft 35 and having an active edge portion 63 to engage the pin 61. A spring 64 is connected at one end to the arm 59 and at the other end to a fixed part of the casing 1.

Since the reach rods 46 and 58 are made adjustable as to length, the reach rod 26 also contains an adjusting coupling 65 similar to the couplings 47 and 60.

The arm 27 has a pin or stud 66 projecting therefrom toward the arm 59 and mounted on the arm 59 is a latch dog 67 under the control of a spring 68 and having a rounded nose portion 69 in the path of the pin 66, so that under circumstances to be described the two arms 27 and 59 will temporarily lock together, but in a manner permitting their separation under certain phases of operation of the structure.

Lodged in the depressions or recesses 4 are folding leaves or blades 70, 71, respectively, each having a rib 72 along one long edge traversed by a pivot rod or pintle 73 carried by means to be described. Each leaf 70 and 71 has numerous slots 74 therein whereby the weight of the leaf is correspondingly lessened.

The leaf 70 has fast to the rib edge 72 thereof a projecting finger 75 extending into the interior of the casing through a slot 76 in the bottom wall of the corresponding depression 4. Connected at one end to the finger 75 is a link 77 and the other end of this link is pivoted to one member 78 of a rock arm mounted in a bracket 79 fast to the under side of the plateau 3, while the other member 80 of the rock arm is connected by a reach rod 81 to one end of a bell crank lever 82 carried by a bracket 83 fast to the casing 1. This bell crank lever is under the normal control of a spring 84 which through the connections of the lever 82 to the folding leaf 70 normally maintains the folding leaf housed in the corresponding depression 4. The bell crank lever 82 is in that end of the casing remote from the rod 29 and is connected by a reach rod 85 to a rock arm 86 on the rod 29. For the purposes of adjustment the rod 85 includes an adjusting coupling 87 like the couplings 47, 60 and 65 already referred to. The arm 86 carries a pin 88 in the path of the cam 89 fast on the shaft 35.

The folding leaf or blade 71 has a longitudinal groove 71a and also has fast to it at its ribbed end 72 a finger 90 like the finger 75, and this finger projects through a slot 91 in the bottom wall of the corresponding recess 4. The finger 90 is connected by a link 92 to one member 93 of a two-part rock arm journaled from the plateau 3, while the other member 94 of the rock arm is connected by a reach rod 95 to one end of a bell crank lever 96 supported by a bracket 97 fast to the casing. The lever 96 is under the control of a spring 98 acting in the same manner as the spring 84. The lever 96, like the lever 82, is connected by a reach rod 99 including an adjusting coupling 100 to a rock arm 101 mounted on the rod 29 and provided with a pin 102 in the path of a cam 103 on the shaft 35.

Near opposite ends the shaft 35 carries two cams 104 and 105, respectively. The cam 104 engages a rock arm 106 mounted on the rod 29 and corresponding in construction to the other rock arms mounted on the rod 29, while the cam 105 engages and controls a rock arm 107 similar to the other corresponding rock arms and mounted on the rod 29.

The rock arm 106 is connected by a rod 108, provided with an adjusting coupling 109, to one end of a lever 110 through a rocking connection 111. The lever 110 is pivotally mounted by means of a screw 112 or otherwise upon a block 113 fast by means of a set screw 114 to a rock shaft 115, which shaft, however, has but a very limited rocking movement. The lever 110 terminates near the longitudinal center line of the casing, and is there provided with a longitudinally extended recess 116 receiving a pin 117 on the corresponding end of another lever 118 similar to the lever 110, and like said lever 110 pivotally mounted by means of a screw 119 or otherwise in a block 120 made fast to the shaft 115 by a set screw 121. The other end of the lever 118 is pivotally connected to a reach rod 122 which in turn is at the end remote from the lever 118 pivoted to a crank 123 on one end of a rock shaft 124 journaled in one end of an extended rock bar 125 and rising through the top of the casing 1 where the shaft 124 terminates in an angle projection or clamp finger 126. The rock bar 125 is held in a normally elevated position at the end carrying the clamp finger 126 by a spring 127 fast at one end to the bar 125 and at the

other end to a fixed part of the casing. That end of the bar 125 remote from the shaft 124 with its finger 126 is secured to the shaft 115 to rock therewith.

Fast to the rock shaft 115 near that end thereof to which the bar 125 is secured is a radially projecting arm 128 connected by a reach rod 129, including an adjusting coupling 130, to the arm 107.

On the side of the machine remote from the bar 125 is another similar bar 131 fast to the shaft 115 at one end, and at the other end carrying a rock shaft 132 extending through the top of the casing and terminating in an angle clamp finger 133. The rock shaft 132 is provided within the casing with a crank arm 134 connected by a reach rod 135 to the lever 110 at the end to which the reach rod 109 is connected.

The clamp fingers 126 and 133 which are located about midway of the length of the casing, are normally housed within the hoods 136 on opposite sides of the casing, and are capable of being projected from the hoods, so as to point one toward the other. When in such position the clamp fingers 126 and 133 are over pads 137 on the upper surface of the casing 1.

Extending across the casing at an appropriate point is a manipulating shaft 138 having journal bearings 139 in the sides of the casing. This shaft projects through one side of the casing and there carries a manipulating crank or handle 140.

Mounted upon the shaft 138 within the casing so as to turn on the shaft is a gear wheel 141 meshing with a gear pinion 142 fast on the shaft 35.

Fast on the shaft 138 is a pawl carrier 143 on which is mounted a spring-controlled pawl 144. Fast to the gear wheel 141 is a ratchet disk 145 in the path of the pawl 144. A spring 146 surrounding the shaft 138 is fast at one end thereto, and at the other end to a bracket 147 fast to the casing 1. The tendency of this spring is to maintain the shaft 138 in a predetermined position from which it will yield on movements of the crank 140 tending to rock the shaft in the other direction.

In order that the folding leaf 5 may have some small degree of elastic play where pivoted, the rod 6 is mounted at the ends in the pivoted arms 148 at the sides of the deeper end of the depression 2. These arms 148, which are mounted upon pivot pins or screws 149, are yieldingly maintained in normal position by leaf springs 150, each carried at one end by a screw or stud 151 and at an intermediate point held in engagement with the arm 148 by a stop pin 152.

Similarly the rods 73 are each mounted at the ends in rock arms 153 mounted on pivot pins or screws 154 and engaged by a leaf spring 155. Since there are two pivot rods or pintles 73 in spaced relation at the ends, a single spring 155 is sufficient for a pair of rock arms 153, and this spring is held in place by a single pin 156.

At that end of the top of the casing occupied by the plateau 3 and near the outer edges of the said portion of the casing are adjustable gages 157 mounted to slide upon elongated guides 158 and held in adjusted positions by set screws 159. To facilitate the adjustment of the gages 157 scales 160 are produced upon the upper surface of the casing.

In the ordinary position of the parts with the machine ready to fold a sheet of paper, the gages 157 are properly set and a sheet of paper, indicated at 161, in Fig. 15, and other figures, is placed upon the top of the folding device with one edge of the paper abutting the gages 157.

The crank handle 140 is grasped and is rocked from a position which may be approximately upright to a lowered position through an arc of say about ninety degrees or a little more, so that the gear wheel 141 will be rotated a corresponding distance and the return of the crank handle will move the pawl 144 into engagement with the next tooth in order of the ratchet disk 145. Since the gear wheel is considerably larger than the pinion with which it meshes, the cam shaft is rotated through a correspondingly greater distance, and the parts are so proportioned that the operations to be described are all brought about by a single active movement of the crank handle through a relatively short throw, of, say, about ninety degrees.

The first action of the parts is to bring the cam 104 into engagement with the arm 106 thereby rocking the latter and moving the compound lever made up of the levers 110 and 118 in a manner to rock both shafts 124 and 132 to project the clamp fingers 126 and 133 out of the hoods 136 into transverse relation to the paper sheet 161 about midway of the length of the latter. While this is occurring the cam 105 is brought into engagement with the arm 107 thereby through the rod 129 rocking the shaft 115 sufficiently to carry those ends of the bars 125 and 131 in which the shafts 124 and 132 are mounted away from the top of the casing, whereby the clamp fingers 126 and 133 are forced against the sheet 161, thus clamping it to the pads 137.

As soon as this is accomplished the concentric peripheral portions of the cams are reached and the clamp fingers 126 and 133 are held for an appropriate time in clamping relation to the paper sheet 161. As soon as the concentric portions of the cams have been moved sufficiently to release the arms 106 and 107 the parts just described are returned to their normal positions by any suit-

able means such as a spring 110ª connected to the lever 110.

As soon as the paper is clamped the cam 37 actuates the arm 27, thus through the connections to the folding leaf 5 rocking the latter upon its pintle support 6 from the normally housed position within the depression 2 into overlying relation to the plateau 3. The result of this is that the paper sheet 161 is folded about midway of its length upon a line crosswise of the direction of travel of the folding leaf 5, which line is determined by the position of the clamp fingers 126 and 133. The folding leaf 5 is then held in the new position by the inactive or concentric edge 39 of the cam 37, and this relation of the parts continues until the pin 33 runs off of the cam at the shoulder 40, the cam being long enough to maintain the folding leaf 5 in the active position until certain other operations have been accomplished. Since the folding leaf 5 now acts as a clamp for the paper sheet, the clamps 126 and 133 are released by the running off of the cams 104 and 105 from the respective arms they control, so that the clamps 126 and 133 are no longer in the way of the performance of other folding operations.

As soon as the first fold is completed the folding leaf 70 begins to turn upon its pintle 73, this being brought about by the engagement of the cam 89 with the arm 86. While the second fold is being produced, and before the folding leaf 70 has completed its folding movement, the cam 50 starts into operation, and the finger 10 follows the folding leaf 5, so that by the time the folding leaf 70 has completed the folding over of the already folded sheet in a direction laterally to the first fold, the finger 10 is in engagement with the free edge portion of the second fold, thereby holding it and permitting the folding leaf 70 to return to its inactive position to which it moves because the cam actuating it has run off from the arm it acts upon, and the spring 84 which controls this leaf is released to action. In the meantime the leaf 71 is moving toward the plateau 3 but in such timed relation to the other parts as to avoid interference and the third fold is completed by the action of the cam 103, the groove 71ª allowing for the finger 10, this being followed up by the operation of the cam 62 causing the holding finger 11 to engage the third fold to one side of the leaf 71 as soon as the fold is completed, so that the leaf 71 then returns to its first position because of the running off of the cam 103 from the arm 101.

When the arms 27 and 59 are in their normal retracted position the dog 67 is in engagement with a stop 67ª on the casing 1 in such manner as to move the end 69 of the dog out of the path of the pin or stud 66, so that the arm 27 may rock toward its active position without interference from the dog 67. When, however, the arm 59 is rocked in the active direction the dog 67 engages the stop 66, which latter then rests in a notch 69ª in the dog, thus locking the two arms 27 and 59 together, and the finger 11 cannot then retract.

In the drawings Fig. 15 shows the position of the folding members when the sheet 161 is first clamped in position. Fig. 16 shows the position of the folding members at the completion of the first fold where the sheet 161 is doubled upon itself. Fig. 17 shows the position of the parts at the completion of the second fold where approximately one-third of the folded sheet is turned over upon itself. Fig. 18 shows the position of the parts when the finger 10 has moved into position to retain the second fold in place and the leaf 70 has returned to the inactive position. Fig. 19 shows the position of the parts at the completion of the third fold by the leaf 71, but before the finger 11 has completed its movement. Fig. 20 shows the position of the parts at the completion of the third fold when the leaf 71 has returned to normal position and the finger 11 is in holding relation to the third fold.

At this point the shoulder 40 of the cam 37 has reached the pin 33 of the arm 27 and the said arm 27 is released to the action of its spring 31, thus returning the folding leaf 5 together with the fingers 10 and 11 to the first position, but carrying the folded sheet with it so that this sheet is now in inclosing relation to the folding leaf 5, but lodged in the recess 2. The folded sheet is readily accessible because of the room afforded by the depression 9 and slot or recess 8 and the operator may by grasping the folded sheet between the thumb and finger readily slide it from the parts carrying it.

On the completion of the folding operation which takes place during the movement of the crank handle 140 through about a quarter of a circle, the crank handle is released to the action of the spring 146 and returns to its first or normal position bringing the pawl 144 behind the next ratchet tooth in order ready for a second operation after another sheet 161 of paper has been placed upon the top of the machine.

The structure is susceptible of operation with sheets of different sizes within the range of the stops 157 and of different widths within the range of the clamps or clamp members 126 and 133.

While the machine has been described with special reference to folding sheets of letter paper so as to be readily introduced into envelops, it will be understood that the machine in whole or in part may be employed for folding articles for other pur-

poses and hence while for convenience of description the machine has been and will in the claims be referred to as a folding means for paper sheets, such allegation of specific use is not to be taken as limiting the invention to such particular purpose.

To avoid noise by contact of the leaves 5, 70 and 71, pads or cushions 137[a] of leather or suitable material are lodged in the depression 2 and like pads 137[b] are lodged in the depressions 4 in the path of the respective leaves.

The reach rods 81, 85, 95 and 99 connect to the bell crank levers 82 and 96 by rock blocks 81[a], 85[a], 95[a] and 99[a], respectively. In like manner the reach rods 85 and 99 connect through respective rock blocks 85[b] and 99[b] with the respective arms 86 and 101.

What is claimed is:—

1. In a paper folding machine, a folding leaf movable in a direction to double the paper sheet upon itself and there hold it, another folding leaf movable in a direction transverse to the direction of movement of the first leaf to produce a fold in the leaf of less than half its width, a holding finger movable into position to hold the second folded portion of the sheet in the folded condition for the return of the second folding leaf to normal position, a third folding leaf movable in a direction opposite to the second folding leaf to produce a third folded portion of the sheet in overlying relation to the second folded portion, and a second holding finger for retaining the third folded portion in position and permitting the return of the third leaf to normal position.

2. A machine for folding sheets of paper into smaller compass, comprising a movable primary folding leaf, oppositely movable secondary folding leaves operating in sequence and having the direction of movement transverse to that of the primary folding leaf, and holding fingers also movable in sequence and in the same direction and to a like extent to the movement of the primary folding leaf, each holding finger cooperating with and following a respective one of the secondary folding leaves in the order of movement.

3. A machine for folding sheets of paper, comprising a support for the paper sheet, clamp members for engaging the paper sheet on opposite sides at points about midway of its length, a primary folding leaf movable with relation to the sheet to fold it upon itself intermediate of its length, a folding leaf in position to engage the paper sheet first folded by the first leaf and fold it from one side upon said leaf, a holding finger movable with relation to the second folding leaf to engage and hold the second folded portion of the paper to permit the return of the second folding leaf to normal position, a third folding leaf movable oppositely to the second folding leaf for producing a third fold in the paper upon the second folded portion, and a second holding finger to hold the third fold upon the second fold for permitting the third folding leaf to return to normal position.

4. A machine for folding paper sheets, comprising a folding member for engaging a sheet and folding it upon itself transversely of its length, other folding members for folding the primarily folded sheet in opposite directions upon itself and upon the first folding member, means for holding the folded sheet on the first folding member and permitting the return of the other folding means to initial position and for the return of the first folding means with the folded sheet thereon to the initial position of the first folding means.

5. A machine for folding sheets of paper, comprising a receptacle to support the sheet of paper to be folded, clamp means for engaging the paper sheet in substantially the line of the first fold, means for doubling the paper sheet upon itself in the line of the clamp means and for holding the paper temporarily in such position, oppositely movable folding means for folding the doubled sheet from opposite sides upon itself and timed to operate in succession, and holding fingers timed to operate each subsequent to a respective one of the second-named folding means for holding the folds thus produced while the second-named folding means are returned to initial position.

6. A machine for folding sheets of paper comprising a receptacle to support the sheet of paper to be folded, clamp means for engaging the paper sheet in substantially the line of the first fold, means for doubling the paper sheet upon itself in the line of the clamp means and for holding the paper temporarily in such position, oppositely movable folding means for folding the doubled sheet from opposite sides upon itself and timed to operate in succession, and holding fingers timed to operate each subsequent to a respective one of the second-named folding means for retaining the folds thus produced while the second-named folding means are returned to initial position, the machine being also provided with means whereby the first folding means, together with the folded sheet, are returned to the initial position of the first folding means for the removal of the folded sheet from said first-named folding means.

7. In a machine for folding sheets of paper, a support for a paper sheet with clamping means in position to engage the sheet on opposite sides on the line of the first fold to be produced, a folding member normally below the plane of the supporting surface for the paper sheet and rockable on an axis transverse of the paper sheet to fold

the sheet upon itself while held by the clamping means, other folding members on opposite sides of the first folding member when moved to produce the first fold in the paper, holding fingers in coactive relation to respective ones of the second-named folding means and normally underlying the first-named folding means when in the initial position, and operating means movable to actuate the clamps, the folding means and the holding fingers in predetermined sequence.

8. A machine for folding sheets of paper provided with a surface for supporting a sheet of paper, clamp members for engaging the sheet of paper along the line of the first fold to be produced, a folding leaf in position to normally underlie the sheet of paper and movable to fold the sheet of paper upon itself along an intermediate line defined by the clamp members, other folding leaves on opposite sides of the first-named leaf when in the position to which it is actuated to produce the first fold in the sheet of paper and movable into overlying relation to said leaf when so situated, holding fingers movable into overlying relation to the first leaf and in coöperative relation to the paper sheet as folded by the second-named leaves, and means for causing the actuation of the clamps into clamping position, the first leaf into folding position, one of the second-named leaves into folding position, one of said holding fingers into holding relation to the folded sheet, the other one of the second-named leaves into folding position, and the other one of said fingers into holding position, all in the order named.

9. A folding machine provided with a surface for receiving a sheet of paper, clamping members for engaging the sheet of paper on opposite sides at a point about midway of its length, means for moving the clamping fingers into clamping relation and subsequently moving them out of clamping relation to the sheet of paper, a folding leaf for engaging a sheet of paper and folding it upon itself along the line of the clamping members, operating means for the folding leaf for moving it into folding relation, and there holding it temporarily and after the clamping members have returned to normal position, holding fingers in normal underlying relation to the folding leaf, another folding leaf to one side of the first-named leaf when in the actuated position, means for moving the second-named leaf into overlying relation to the first-named leaf to fold the already folded paper thereupon, said actuating means being constructed to release the second-named folding leaf to return to normal position immediately after actuation, means for moving one of the holding fingers into holding relation to the second folded portion of the paper to there retain it after the second leaf has released it, a third folding leaf movable in a direction opposite to that of the second leaf, means for effecting such movement and a return of the third leaf to normal position after actuation, and means for actuating the second holding finger to holding relation to that portion of the paper sheet folded by the third folding leaf.

10. A folding machine, provided with a surface for receiving a sheet of paper, clamping members for engaging the sheet of paper on opposite sides at a point about midway of its length, means for moving the clamping fingers into clamping relation and subsequently moving them out of clamping relation to the sheet of paper, a folding leaf for engaging a sheet of paper and folding it upon itself along the line of the clamping members, operating means for the folding leaf for moving it into folding relation, and there holding it temporarily and after the clamping members have returned to normal position, holding fingers in normal underlying relation to the folding leaf, another folding leaf to one side of the first-named leaf when in the actuated position, means for moving the second-named leaf into overlying relation to the first-named leaf to fold the already folded paper thereupon, said actuating means being constructed to release the second-named folding leaf to return to normal position immediately after actuation, means for moving one of the holding fingers into holding relation to the second folded portion of the paper to there retain it after the second leaf has released it, a third folding leaf movable in a direction opposite to that of the second leaf, means for effecting such movement and a return of the third leaf to normal position after actuation, and means for actuating the second holding finger to holding relation to that portion of the paper sheet folded by the third folding leaf, the operating means for the named parts being constructed to cause the return of the first leaf and the holding fingers to normal position.

11. A folding machine, provided with a surface for receiving a sheet of paper, clamping members for engaging the sheet of paper on opposite sides at a point about midway of its length, means for moving the clamping fingers into clamping relation and subsequently moving them out of clamping relation to the sheet of paper, a folding leaf for engaging a sheet of paper and folding it upon itself along the line of the clamping members, operating means for the folding leaf for moving it into folding relation, and there holding it temporarily and after the clamping members have returned to normal position, holding fingers in normal underlying relation to the folding leaf, another folding leaf to one side of the first-named leaf when in the actuated position, means for moving the second-named leaf into over-

lying relation to the first-named leaf to fold the already folded paper thereupon, said actuating means being constructed to release the second-named folding leaf to return to normal position immediately after actuation, means for moving one of the holding fingers into holding relation to the second folded portion of the paper to there retain it after the second leaf has released it, a third folding leaf movable in a direction opposite to that of the second leaf, means for effecting such movement and a return of the third leaf to normal position after actuation, and means for actuating the second holding finger to holding relation to that portion of the paper sheet folded by the third folding leaf, the operating means for the named parts being constructed to cause the return of the first leaf and the holding fingers to normal position, and the paper receiving surface of the machine and the first-named leaf having spaced portions for permitting the grasping of the folded sheet by the fingers of the hand for removal of the sheet from the machine.

12. A machine for folding sheets of paper, comprising a supporting casing having a depression near one end and a plateau in line therewith near the other end with depressions on opposite sides of the plateau, a folding leaf normally housed in the first-named depression and hinged at the end adjacent to the plateau, other folding leaves normally housed in the other depressions and hinged along the edges adjacent to the plateau to move over the plateau on axes perpendicular to the axis of the first-named leaf, and holding fingers normally housed in the first-named depression beneath the first-named leaf and movable into overriding relation to the plateau near the side edges thereof.

13. A machine for folding sheets of paper, comprising a supporting casing having a depression near one end and a plateau in line therewith near the other end with depressions on opposite sides of the plateau, a folding leaf normally housed in the first-named depression and hinged at the end adjacent to the plateau, other folding leaves normally housed in the other depressions and hinged along the edges adjacent to the plateau to move over the plateau on axes perpendicular to the axis of the first-named leaf, and holding fingers normally housed in the first-named depression beneath the first-named leaf and movable into overriding relation to the plateau near the side edges thereof, the first-named depression having a deepened portion at that end remote from the plateau and the first-named folding leaf having an entering recess at the end remote from its hinged end with said recess matching the deepened portion of the first-named depression.

14. A machine for folding sheets of paper, comprising a supporting casing having a depression near one end and a plateau in line therewith near the other end with depressions on opposite sides of the plateau, a folding leaf normally housed in the first-named depression and hinged at the end adjacent to the plateau, other folding leaves normally housed in the other depressions and hinged along the edges adjacent to the plateau to move over the plateau on axes perpendicular to the axis of the first-named leaf, and holding fingers normally housed in the first-named depression beneath the first-named leaf and movable into overriding relation to the plateau near the side edges thereof, the first-named depression having a deepened portion at that end remote from the plateau and the first-named folding leaf having an entering recess at the end remote from its hinged end with said recess matching the deepened portion of the first-named depression, the machine being also provided with clamping members at the sides movable into line with the line of fold produced by the first-named folding leaf for clamping the paper in place during the production of the first fold.

15. A machine for folding sheets of paper, comprising a supporting casing having a depression near one end and a plateau in line therewith near the other end with depressions on opposite sides of the plateau, a folding leaf normally housed in the first-named depression and hinged at the end adjacent to the plateau, other folding leaves normally housed in the other depressions and hinged along the edges adjacent to the plateau to move over the plateau on axes perpendicular to the axis of the first-named leaf, and holding fingers normally housed in the first-named depression beneath the first-named leaf and movable into overriding relation to the plateau near the side edges thereof, the first-named depression having a deepened portion at that end remote from the plateau and the first-named folding leaf having an entering recess at the end remote from its hinged end with said recess matching the deepened portion of the first-named depression, the machine being also provided with clamping members at the sides movable into line with the line of fold produced by the first-named folding leaf for clamping the paper in place during the production of the first fold, said clamping members being provided with operating means for moving them into transverse relation to a placed paper sheet and then into clamping relation to said sheet.

16. A machine for folding sheets of paper, comprising a supporting casing having a depression near one end and a plateau in line therewith near the other end with depressions on opposite sides of the plateau, a fold-

ing leaf normally housed in the first-named depression and hinged at the end adjacent to the plateau, other folding leaves normally housed in the other depressions and hinged along the edges adjacent to the plateau to move over the plateau on axes perpendicular to the axis of the first-named leaf, and holding fingers normally housed in the first-named depression beneath the first-named leaf and movable into overriding relation to the plateau near the side edges thereof, the first-named depression having a deepened portion at that end remote from the plateau and the first-named folding leaf having an entering recess at the end remote from its hinged end with said recess matching the deepened portion of the first-named depression, the machine being also provided with clamping members at the sides movable into line with the line of fold produced by the first-named folding leaf for clamping the paper in place during the production of the first fold, said clamping members being provided with operating means for moving them into transverse relation to a placed paper sheet and then into clamping relation to said sheet, and said machine being provided at the end remote from the first folding leaf with adjustable gages for determining the position of the sheet preparatory to the folding operations.

17. A paper folding machine provided with paper clamping members, folding members, paper holding members coactively related to the folding members, rock arms connected to respective ones of the clamping, folding and holding members for actuating them, a rotatable series of cams one for each rock arm and shaped and positioned about the axis of rotation to actuate the rock arms and members connected thereto in predetermined timed relation, and a rockable manipulating member connected to the rotatable series of cams for actuating them.

18. A paper folding machine provided with paper clamping members, folding members, paper holding members coactively related to the folding members, rock arms connected to respective ones of the clamping, folding and holding members for actuating them, a rotatable series of cams one for each rock arm and shaped and positioned about the axis of rotation to actuate the rock arms and members connected thereto in predetermined timed relation, and a rockable manipulating member connected to the rotatable series of cams for actuating them, said rockable manipulating member having spring means constraining it to an initial position, and a clutch connection for translating rocking movements of the manipulating member into rotating movements of the rotatable series of cams.

19. A paper folding machine, comprising a casing having a surface adapted to receive a sheet of paper, clamping, folding and holding members carried by the casing in position to act upon the sheet of paper to fold it in different directions, a series of rock arms each connected to a respective clamping, folding or holding member, a rotatable series of cams, a common shaft carrying the cams each in operative relation to a respective rock arm, the rock arms and cams being located within the casing, a rock shaft in the casing provided with a manipulating handle exterior thereto, and a spring tending to maintain the rock arm and rock shaft in an initial position and yieldable to manipulation of the rock arm, and gearing and clutch connections between the rock shaft and the cam shaft for imparting rotation to the cam shaft by rocking movements of the rock shaft.

20. In a paper folding machine, a casing provided with a paper holding face having tapering recesses or depressions therein, folding members normally housed in the recesses with hinge connections at the deeper ends of the recesses on which the folding members are eccentrically mounted, and means for swinging the folding members on the hinge connections into substantial parallelism with the paper holding face of the casing.

21. A machine for folding paper sheets upon themselves, comprising a rockable folding leaf having a normal tendency toward the inactive position, other folding leaves movable oppositely toward the first folding leaf when in the active position, holding means for engaging the folded portions of the paper sheet to retain them in engagement with the first folding leaf, and means for operating the parts in timed relation and for releasing them to return to initial position at the completion of the folding operations.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

WEBSTER MONROE PHILLIPPIE.

Witnesses:
A. MAYO,
GUY C. HARDING.