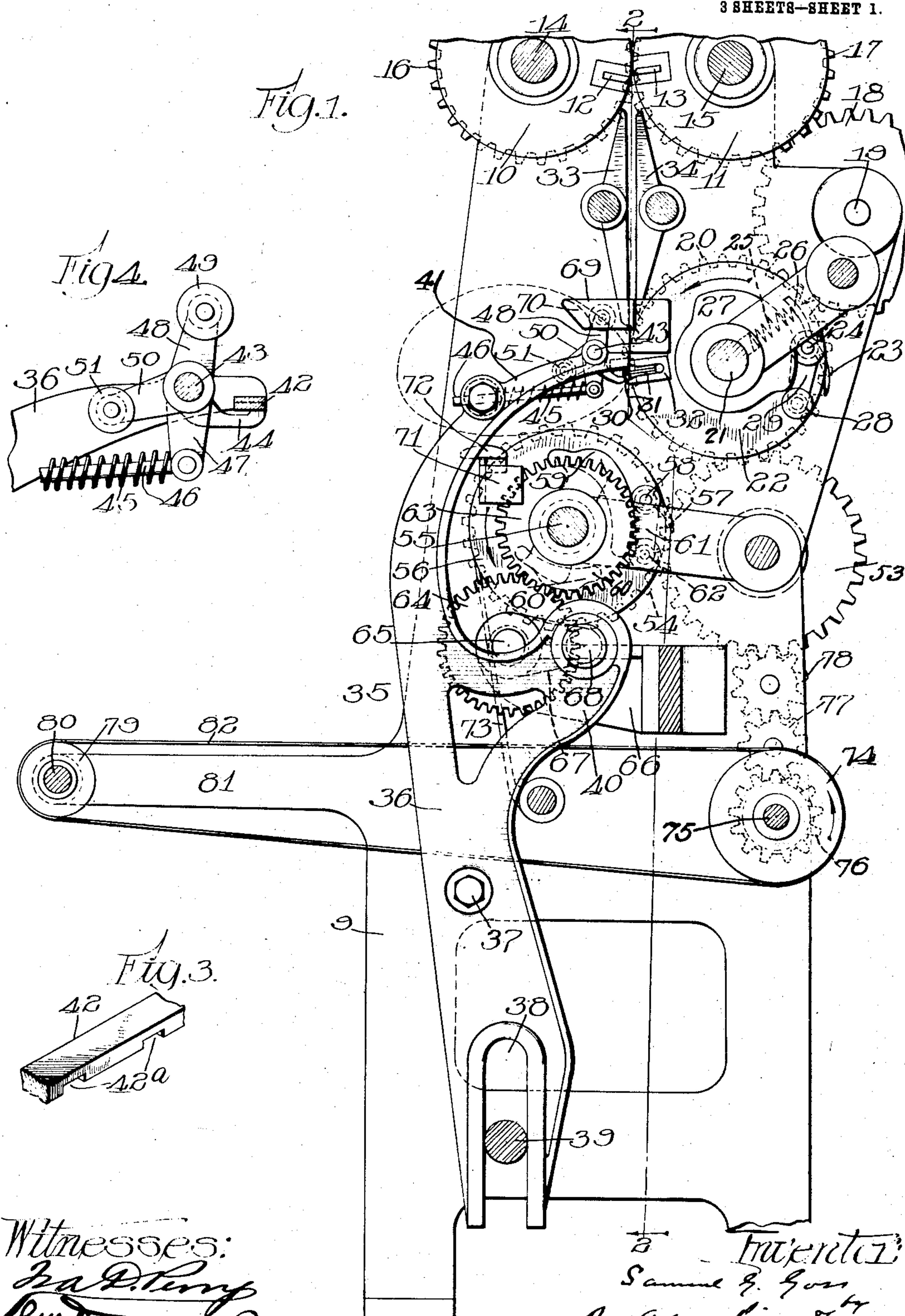


954,087.

S. G. GOSS.
FOLDING MACHINE.
APPLICATION FILED MAY 20, 1909.

Patented Apr. 5, 1910.

3 SHEETS—SHEET 1.



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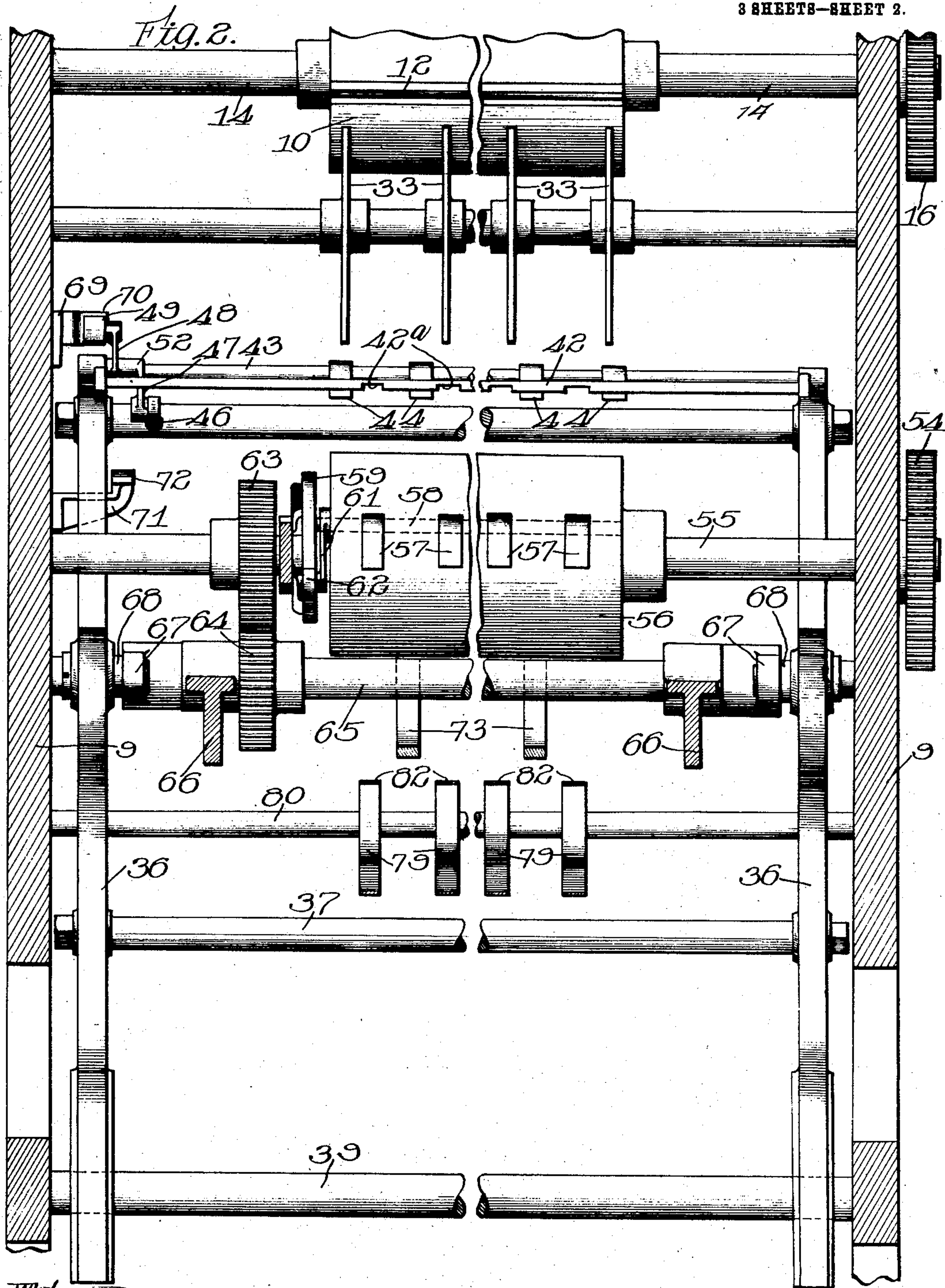
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3 SHEETS—SHEET 2.



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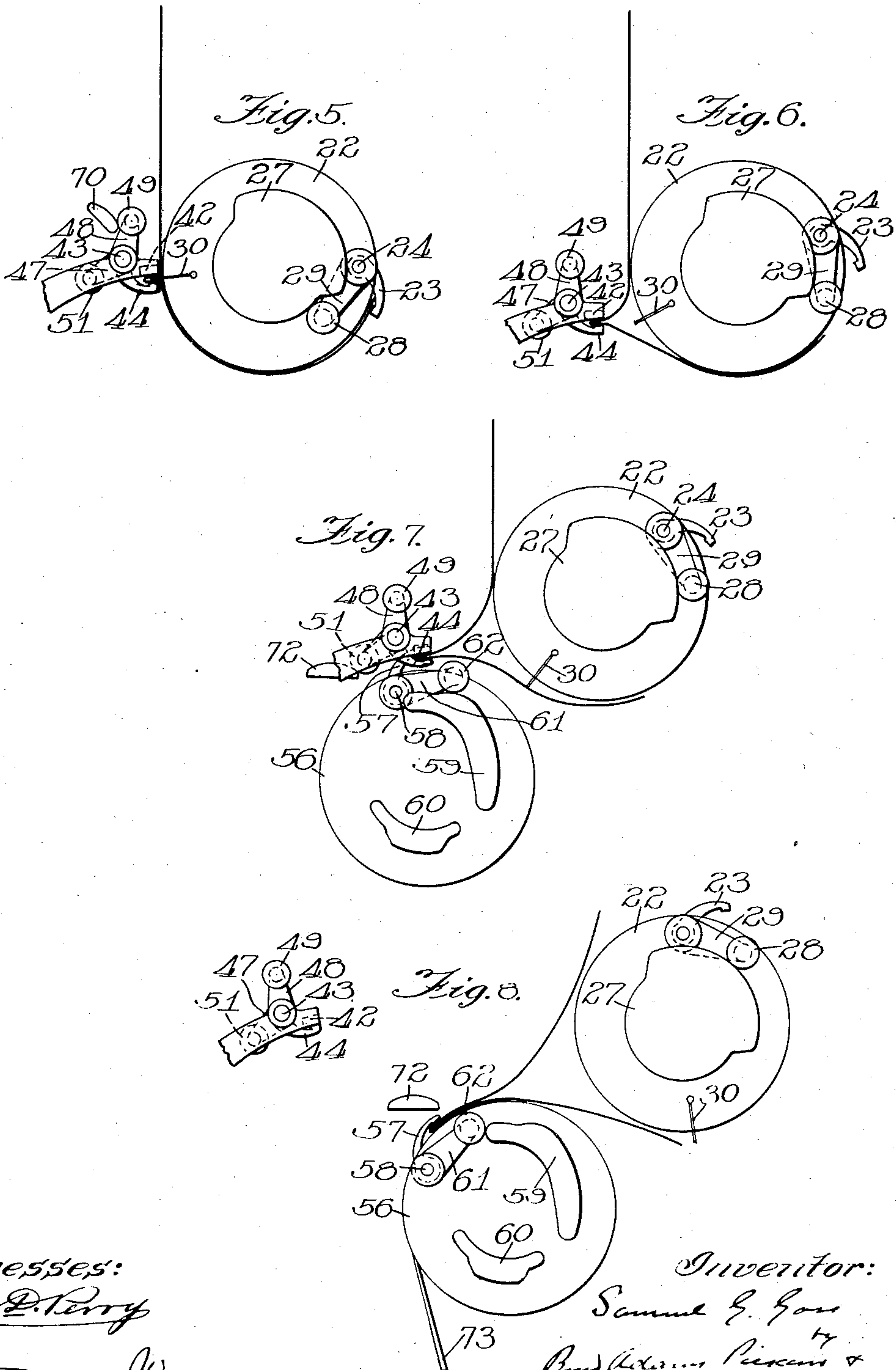
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

SAMUEL G. GOSS, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE GOSS PRINTING PRESS COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

FOLDING-MACHINE.

954,087.

Specification of Letters Patent.

Patented Apr. 5, 1910.

Application filed May 20, 1909. Serial No. 497,287.

To all whom it may concern:

Be it known that I, SAMUEL G. GOSS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Folding-Machines, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to folding mechanism for printing presses, and its object is to provide a new and improved folding machine in which printed sheets may be folded transversely of their line of travel without forcing them between folding rollers or similar devices, which especially in the finer kinds of printed work, such as magazines and similar publications, is objectionable because of its liability to cause the printed matter to smut or crock.

More particularly still it has for its object an improvement in the species of transverse folding mechanism in which the sheets carried by a moving carrier having a folding-blade are folded by means of gripping jaws which engage the fold line of a sheet between them and the folding-blade and, mounted on suitable mechanism, take the sheets from the carrier as they move away from it and deliver the sheets folded, without the aid of folding rolls, to some suitable delivery mechanism.

My invention has for a further object the improvement of folding mechanisms of the character above described in sundry details hereinafter pointed out.

In the drawings,—Figure 1 is a side elevation with one of the side frames removed to expose the working parts; Fig. 2 is a section taken on line 2—2 of Fig. 1; Fig. 3 is an enlarged detail of a portion of the fixed folding jaw, showing the slots in which the grippers on the rotary carrier pass; Fig. 4 is an enlarged detail, being a vertical section through a forward end of the moving frame, showing the details of the fixed and movable gripping jaw mechanism; Figs. 5, 6, 7 and 8 are diagrammatic views, showing the successive positions of the parts and of the sheet of paper.

Referring to the drawings,—9 indicates the frame of the folder.

10—11 indicate rotary cutting-cylinders, respectively, with cutting-knives 12 and 13 and mounted upon shafts 14—15 journaled

in the framework and driven in any suitable manner (not shown). The cutting-cylinders are geared together by gears 16—17 mounted, respectively, on the shafts 14—15. The cutting-cylinders operate in the well-known way and need no further description.

18 indicates an idler-gear mounted on a suitable stub-shaft, as 19, in the framework of the machine and meshing with the gear 16.

20 indicates a gear secured upon the outer end of a shaft 21 journaled in the frame of the machine.

22 indicates a rotary carrier, which is provided with grippers 23 which are mounted upon a rock-shaft 24 in the rotary carrier and are operated in the usual manner to seize and release the lead end of a sheet of paper. As these operate in the well-known manner, it is sufficient to indicate that the grippers are normally held closed by a spring 25 operating on an arm 26 on the rock-shaft 24 and are opened by a cam 27 operating upon a roller 28 on an arm 29 on the rock-shaft 24. The timing of this operation will be hereinafter described.

30 indicates a folding-knife, which is fixed in a suitable slot 31 in a block 32 fixed in the cylinder 22 and running longitudinally thereof. The folding-knife 30 projects a suitable distance upon the periphery of the carrier.

33—34 indicate guides located below the cutting-cylinders 10—11 and serving to direct a sheet of paper downward to the carrier.

35 indicates a swinging frame, which consists of end members 36 and suitable cross-braces, as 37. The lower ends of the members 36 are provided with slots 38 which engage and ride up and down upon a bar 39 fixed in the frame and extending across it from side to side. The end members 36 are provided with arms 40 and 41. The upper arm 41, as best shown in Fig. 1, preferably curves upward and toward the rotary carrier 22.

42 indicates a bar, which is fixed between the upper and outer ends of the arms 41 of the end members 36, extending across between them from one to the other and which forms a fixed jaw of gripping mechanism or jaws hereinafter described.

43 indicates a rock-shaft, which is journaled in the arms 41 a suitable distance back of the cross-bar or fixed jaw 42.

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44 indicates gripper-jaws, which are fixed upon the rock-shaft 43 and extending forward are adapted to engage the under surface of the fixed jaw 42 for the purposes hereinafter described. These movable jaws 44 are normally held in yielding engagement with the fixed jaw 42 by means of a spiral spring 45 surrounding a rod 46 which is pivotally connected at one end with an arm 47 on the rock-shaft 43 and at the other end passes through a suitable perforated lug on the inner surface of one of the end members 36.

48 indicates an arm, which is secured to the rock-shaft 43, near one end thereof, and carries upon its upper end a roller 49.

50 indicates another arm secured to the rock-shaft 43 and carrying upon its outer end a roller 51. These two arms, as best shown in Fig. 1, are preferably formed integral with a collar 52 secured to the rock-shaft 43. The purpose of these arms will be hereinafter described.

53 indicates a gear, which is mounted upon a suitable stub-shaft on the frame 9 and meshes with the gear 20.

54 indicates a gear meshing with the gear 53 and mounted on a shaft 55 which is journaled in the frame of the machine.

56 indicates a delivery cylinder, which is mounted on the shaft 55. The delivery cylinder is provided with the usual grippers 57 which are mounted upon a rock-shaft 58 in the delivery cylinder 56 and are operated in the usual manner by cams 59—60 and the rock-arm 61 and roller 62. As these operate in the usual manner, it is believed it is unnecessary to describe the details of their operating mechanism more fully, the timing of their operation being described hereinafter.

63 indicates a gear on the shaft 55 exterior to the delivery cylinder 56 and meshing with a gear 64 on a shaft 65 which is journaled in suitable brackets as 66 on the frame of the machine. The shaft 65 is shorter than the distance between the end members 36 of the frame 35 and carries upon each end crank-arms 67. These crank-arms 67 are connected by suitable crank-pins, as 68, with the arms 40 of the end members 36 of the frame 35, in which the crank-pins are suitably journaled. The gears 63 and 64 are of the same number of teeth, and it will be obvious that when the crank-shaft 65 is rotated the frame 35 will be swung by the operation of the crank-arms, the slots in the ends 38 rising and falling upon the bar 39 and the jaws at the upper end being thereby caused to describe a curve of a generally elliptical shape shown by dotted lines in Fig. 1. This mechanism is so adjusted, that the jaws are swung in said curve so as to bring them at the proper time into operative relation with the folding-blade 30 and then swing the jaws down-

ward and away from the carrier toward the delivery cylinder, which is also placed in operative relation to the curve of the swing of the jaws in order to receive the folded sheet therefrom, as hereinafter described.

69 indicates a bracket, which is secured to the inner face of one of the side members 9 of the frame and carries, projecting inwardly therefrom, a cam-member 70 which is adapted to engage the roller 49 of the arm 48 to operate the gripper-jaws, as hereinafter described.

71 indicates a bracket secured to and projecting inward from the inner surface of one of the side members 9 of the frame and carrying a cam-member 72 thereon which lies in the path of the roller 51 in order to operate the same, as hereinafter described.

73 indicates strippers, which are secured to the framework 9 and extending upward contact the surface of the delivery cylinder 56 to strip the sheet therefrom, as hereinafter described.

74 indicates rollers secured upon a shaft 75 journaled in the framework of the machine and driven by means of gears 76—77—78, the latter meshing with the gear 53.

79 indicates rollers mounted upon a shaft 80 journaled in a bracket 81 extending from the framework of the machine.

82 indicates slow-moving tapes which pass over the rollers 74 and 79 and operate in the usual manner to carry away the sheets delivered to them from the delivery cylinder by the strippers 73.

Figs. 5 to 8 show, as has been said, the successive positions of the operative folding parts and the sheet of paper. As illustrated thereby and as described above, the operation is as follows:—The paper delivered from any suitable printing mechanism (not shown) passes between the cutting-cylinders 10 and 11, where it is severed into sheets in the usual manner by the knives 12 and 13. Guided downward by the guides 33—34, the lead end of the sheet is seized by the grippers 23 on the rotary carrier 22 and is carried around thereby as said carrier rotates in the direction indicated by the arrow. The cutting-cylinders 10 and 11 and the carrier 22 are preferably, as shown, of a circumference equal to one sheet length. When, therefore, the grippers have reached the position shown in Fig. 1, by the rotation of the carrier 22, the folding-blade is in the position shown in said figure, engaging the paper along the fold line—which, in the construction shown, will be the middle of the sheet—and pushing it slightly outward from the carrier. The movement of the frame 35 is so timed that just at this moment the arm 41, traveling in the curve above described, will be thrust forward into its position close to the carrier 22, and the roller

49 passing off the cam 70 will cause the movable jaws 44 to close by the operation of the spring 45 and will cause the sheet of paper to be embraced between said jaws and the folding-blade along the fold line. As the movement of the parts continues and the frame is swung back away from the carrier, the gripper-jaws move downward along the dotted curved line indicated away from the carrier, pulling the sheet of paper engaged between them away from the carrier and bringing its folded edge engaged between the gripper-jaws into operative relation with the periphery of the delivery cylinder 56. Just at this time the roller 51 engages the cam-member 72 and riding on the same rocks the shaft 43 and opens the jaws 44. The cam mechanism which operates the grippers in the delivery mechanism is so timed that at this moment the grippers 57 close upon the fold edge of the sheet delivered to this position by the gripper-jaws on the frame, and the rotation of the delivery carrier continuing the sheet is carried around the delivery carrier until its folded or lead edge comes in contact with the strippers 73. The cam 60 is so placed that just at this moment the grippers 57 will be opened, and the sheet thus released from the delivery cylinder will be delivered, folded transversely, to the slow-moving tapes by which it is carried along in the usual manner to give place to the next sheet. As the movement continues and the jaws are carried along the dotted curved line, before they reach the position shown in Fig. 1 the roller 49 comes in contact with the cam 70 and riding on the cam causes the rock-shaft 43 to be rocked to open the movable jaws into position to engage the sheet of paper with the folding-blade, as above described,—the roller being freed from the cam so as to permit the movable jaws 44 to again close at the time the parts reach the position shown in Fig. 1.

It will be seen from the above description that as the swinging frame moves and the folding jaws are carried around on the curve above described, inasmuch as one gripper jaw is fixed in the frame, these gripper jaws will take successive positions constantly parallel with each other, and thus at the moment that the jaws engage the sheet of paper between them and the folding-blade they are engaged in a position substantially radial to the travel of the rotary carrier and to the curve of their own movement, and preserving their parallelism in their successive movements are, at the time that the sheet of paper is engaged by the carrier, holding the sheet in a position substantially tangential to the curve of their own movement. Thus the swinging frame and its movement as above described enables the folding jaws to seize the sheet of paper in the most advantageous position and release

it in a position most advantageous to be seized by the delivery mechanism.

The bar 42, as is best shown in Fig. 3, is provided with transverse notches 42^a on its under side, permitting the passage past the bar of the grippers 57 on the delivery cylinder 56 just before the engaging movement of the grippers takes place.

While I have shown the rotary carrier and delivery cylinder in the form of cylinders, it will, of course, be understood that they may be either in the form shown or in the form of skeleton cylinders, or in any other well-known and equivalent form of moving carrier and delivery cylinder, without in any way departing from the spirit of my invention.

One of the advantages of the structure shown and described herein lies in the fact that the motion of the frame which carries the gripping-jaws is such that the gripping-jaws travel in an oval curve whose longer axis is substantially in line with the radius of the rotary carrier at the time of the engagement of the fold line of the paper by the gripping-jaws. As has been said, the gripping-jaws travel in this curve in such a way that throughout their whole line of travel, or what is important, throughout that portion of their travel which lies between a point shortly before they engage the paper on the folding-blade and the point at which they reach the position to deliver the sheet to the delivery cylinder, they face continually in the same direction in space. Traveling, therefore, in an oval curve, whose longer axis, as has been said, is in line with the radius of the carrier which passes through the folding-blade at the point of engagement, they approach the engaging point in a path which is more directly toward the cylinder than if they travel in a circle, and at the time of their engagement with the folding-blade they are traveling in the same direction therewith and at the same surface speed, and as they withdraw from the folding-blade they are traveling away from the carrier in a curve which leads them more sharply from the carrier than if they traveled in a circle. This facilitates their engagement with the blade so as to seize the paper between them over the blade, and also assists in the carrying of the paper more favorably away from the carrier. In addition to the advantages of engaging the paper at a point when their position is substantially radial to the curve of their travel and to the rotary carrier and delivering the paper to the delivery cylinder at a point at which they are substantially tangential to the curve of their travel and to the curve of the delivery cylinder, they do this without any complicated mechanism adapted to turn them relatively to the path of the cylinder, as would be the case if they were mounted

upon the ordinary rotating cylinder or similar device.

What I claim as my invention and desire to secure by Letters Patent is,—

5 1. In combination, a moving member, a folding-blade carried thereby, a frame, gripper-jaws on said frame adapted to grip a sheet of paper between them and said folding-blade when said frame is moved into
10 operative relation with said moving member, and means for moving said frame to cause said gripper-jaws to travel into and out of operative relation with said moving member in an oval path whose longer axis is in the
15 line of its movement toward said moving member.

2. In combination, a rotary carrier adapted to engage the lead end of a sheet of paper and provided with a folding-blade
20 on its periphery, a swinging frame, gripper-jaws carried by said frame and adapted when the same is moved into operative relation with said carrier to grip a sheet of paper between them and said folding-blade,
25 and means for swinging said frame to cause said gripper-jaws to travel into and out of operative relation with said carrier in an oval path whose longer axis is in the line of its movement toward and away from said
30 carrier.

3. In combination, a rotary carrier adapted to engage the lead end of a sheet of paper and having a folding-blade on its periphery, a swinging frame, a gripper-jaw fixed
35 on said frame, one or more gripper-jaws carried on said frame and movable into and out of operative relation with said fixed jaw, means for swinging said frame to cause said gripper-jaws to travel into and out of operative relation with said carrier in an oval path whose longer axis is in the direction of its travel toward and from said carrier, mechanism for operating said gripper-jaws to engage a sheet of paper between them
45 over said folding-blade when moved by said swinging frame into operative relation with said carrier, and means for opening said gripper-jaws to release the fold edge of said paper from said gripper-jaws after the same is moved out of operative relation with
50 said carrier.

4. In combination, a moving carrier adapted to engage the lead end of a sheet of paper and provided with a folding-blade, a frame, gripper-jaws on said frame adapted to grip
55 a sheet of paper between them and said folding-blade when said frame is moved into operative relation with said carrier, means for moving said frame to cause said gripper-jaws to travel into and out of operative relation with said carrier in an oval path whose longer axis is in the line of its movement toward said carrier, and delivery mechanism adapted to engage the fold edge of
60 said sheet of paper as the same is being re-

leased from said gripper-jaws and deliver said sheet of paper.

5. In combination, a rotary carrier adapted to engage the lead end of a sheet of paper and having a folding-blade on its periphery, a swinging frame, a gripper-jaw fixed on said frame, one or more gripper-jaws carried on said frame and movable into and out of operative relation with said fixed jaw, means for swinging said frame to cause
70 said gripper-jaws to travel into and out of operative relation with said carrier in an oval path whose longer axis is in the direction of its travel toward and from said carrier, mechanism for operating said gripper-jaws to engage a sheet of paper between them over said folding-blade when moved by said swinging frame into operative relation with said carrier, means for opening
75 said gripper-jaws to release the fold edge of said paper from said gripper-jaws after the same is moved out of operative relation with said carrier, and delivery mechanism adapted to engage the fold edge of said sheet of paper as the same is being released from
80 said gripper-jaws and deliver said sheet of paper.

6. In combination, a supporting frame, a rotary carrier mounted in said supporting frame and adapted to engage the lead end of a sheet of paper and provided with a folding-blade, a frame provided with end members each provided with an engaging slot, a bar on said frame adapted to engage said slot, a shaft, crank-arms on said shaft journaled at their outer ends in said end members at a point intermediate said slots and the upper ends of said end members, said crank arms being adapted by their motion to swing said frame into and out of operative relation with said carrier, gripper-jaws on said frame adapted to grip a sheet of paper over said folding-blade, and mechanism for operating said gripper-jaws to close them upon the paper over said folding-blade when moved into operative relation with the carrier and to open said gripper-jaws to discharge the folded edge of the sheet when said gripper-jaws are moved out of operative relation with said carrier.
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7. In combination, a supporting frame, a rotary carrier mounted in said supporting frame and adapted to engage the lead end of a sheet of paper and provided with a folding-blade, a frame provided with end members each provided with an engaging slot, a bar on said frame adapted to engage said slot, a shaft, crank-arms on said shaft journaled at their outer ends in said end members at a point intermediate said slots and the outer ends of said end members, said crank-arms being adapted by their motion to swing said frame into and out of operative relation with said carrier, gripper-jaws on said frame adapted to grip a sheet of
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paper over said folding-blade, mechanism
for operating said gripper-jaws to close
them upon the paper over said folding-blade
when moved into operative relation with
5 the carrier and to open said gripper-jaws to
discharge the folded edge of the sheet when
said gripper-jaws are moved out of opera-
tive relation with said carrier, and delivery

mechanism adapted to engage the folded
edge of the sheet as the same is released by 10
said gripper-jaws and deliver the sheet.

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