

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

954,086.

Patented Apr. 5, 1910.

3 SHEETS—SHEET 1.

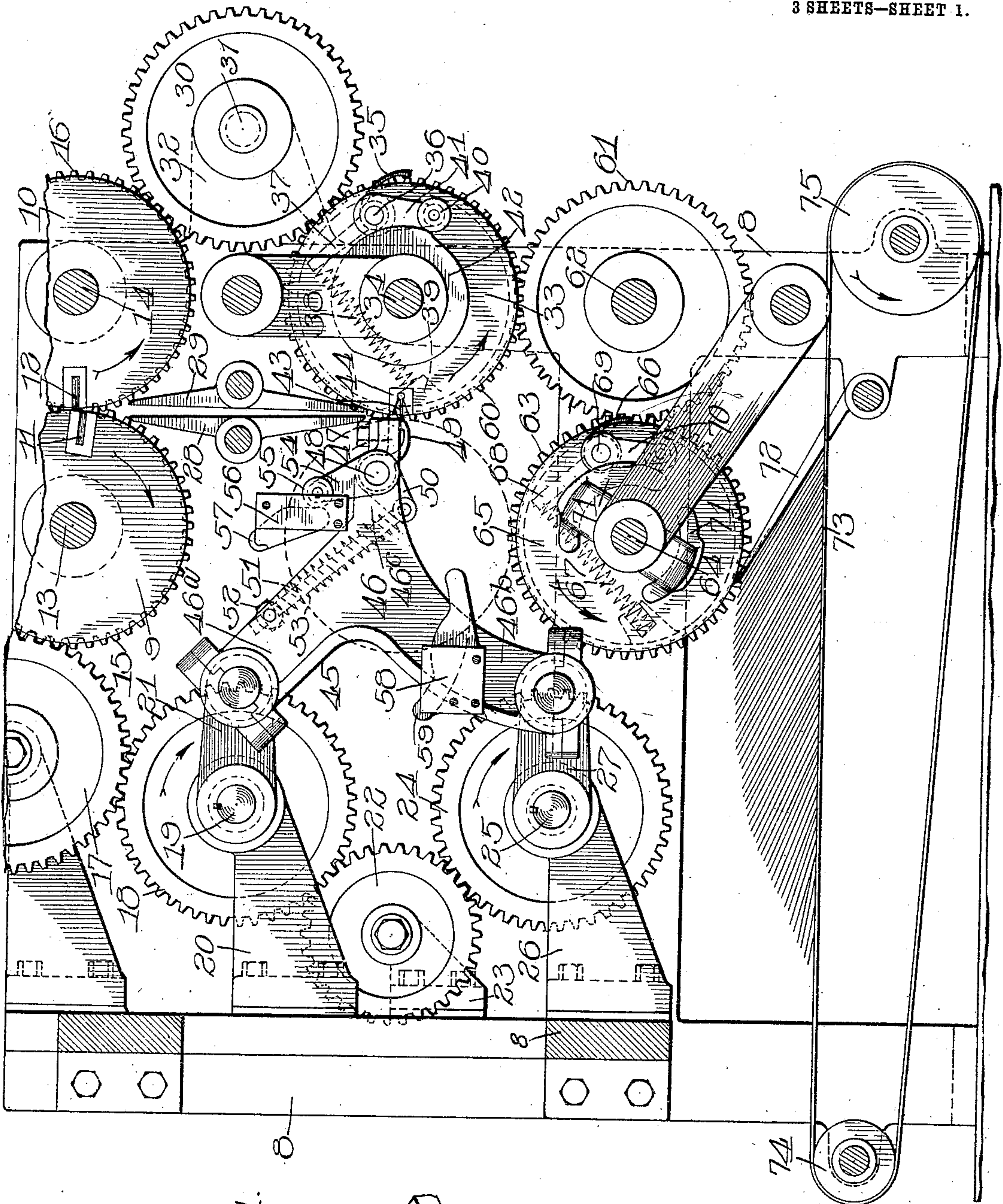


Fig. 1.

Witnesses:
J. A. D. Perry
J. W. D. Fuerns Jr.

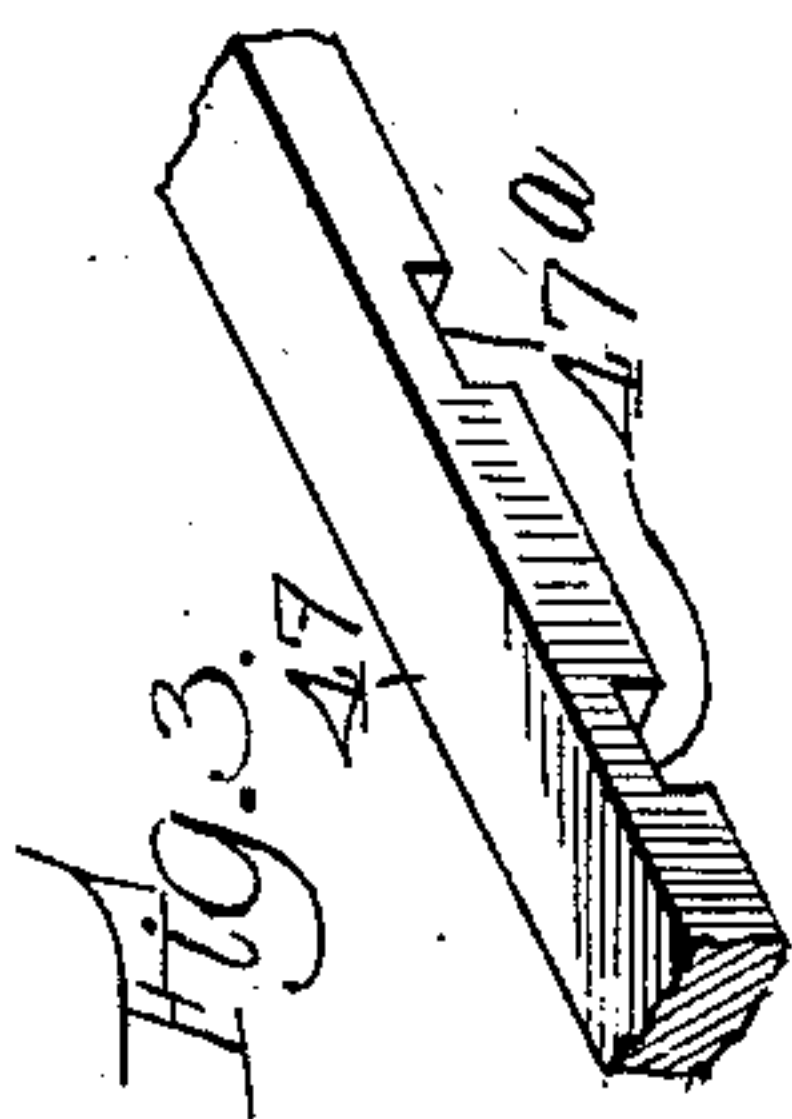


Fig. 3.

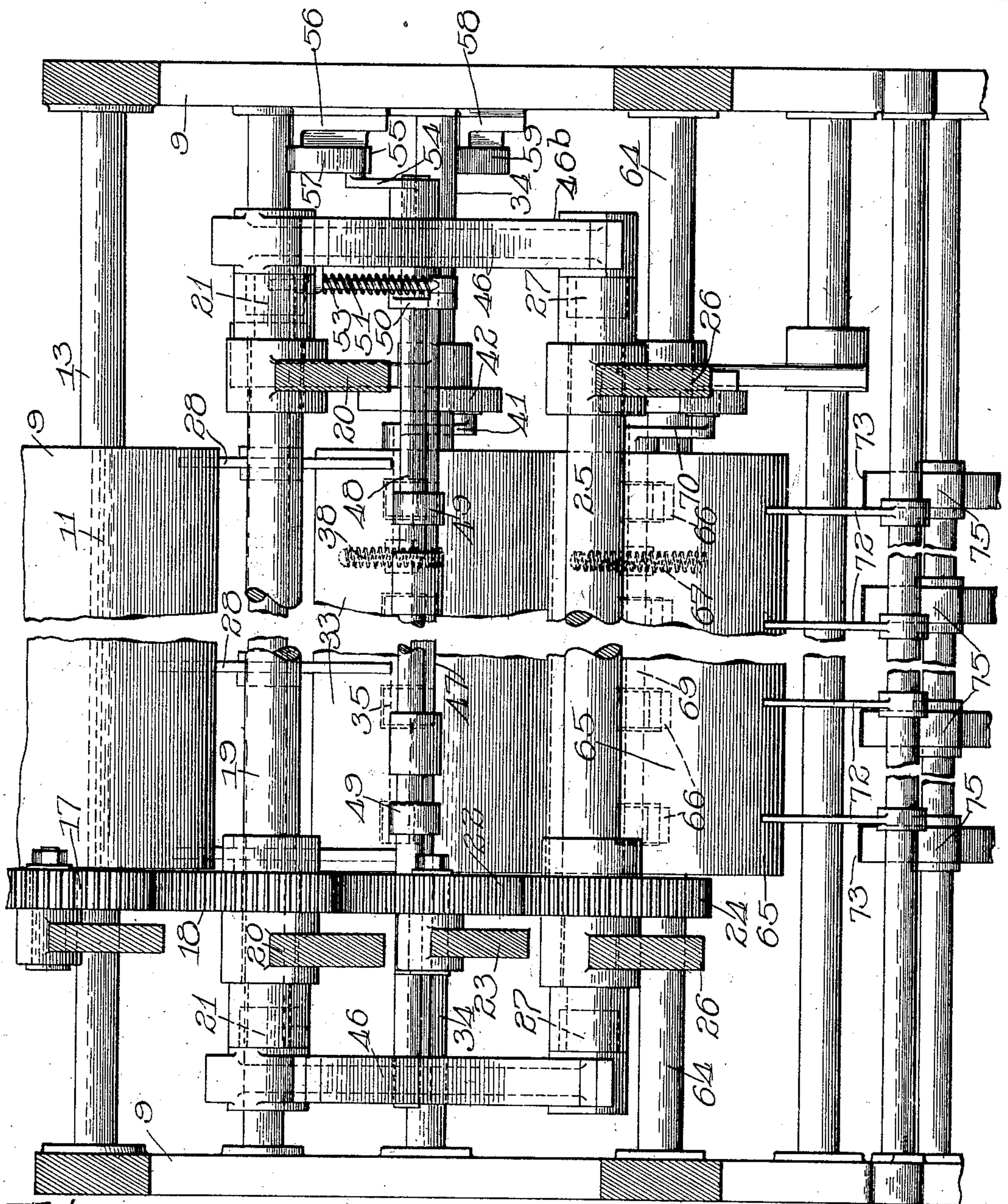
Inventor:
Samuel G. Goss
By Adams, McKim & Jackson
Attys.

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3 SHEETS—SHEET 2.



Witnesses:
G. D. Rogers
G. D. Druecker Jr.

Fig. 2.

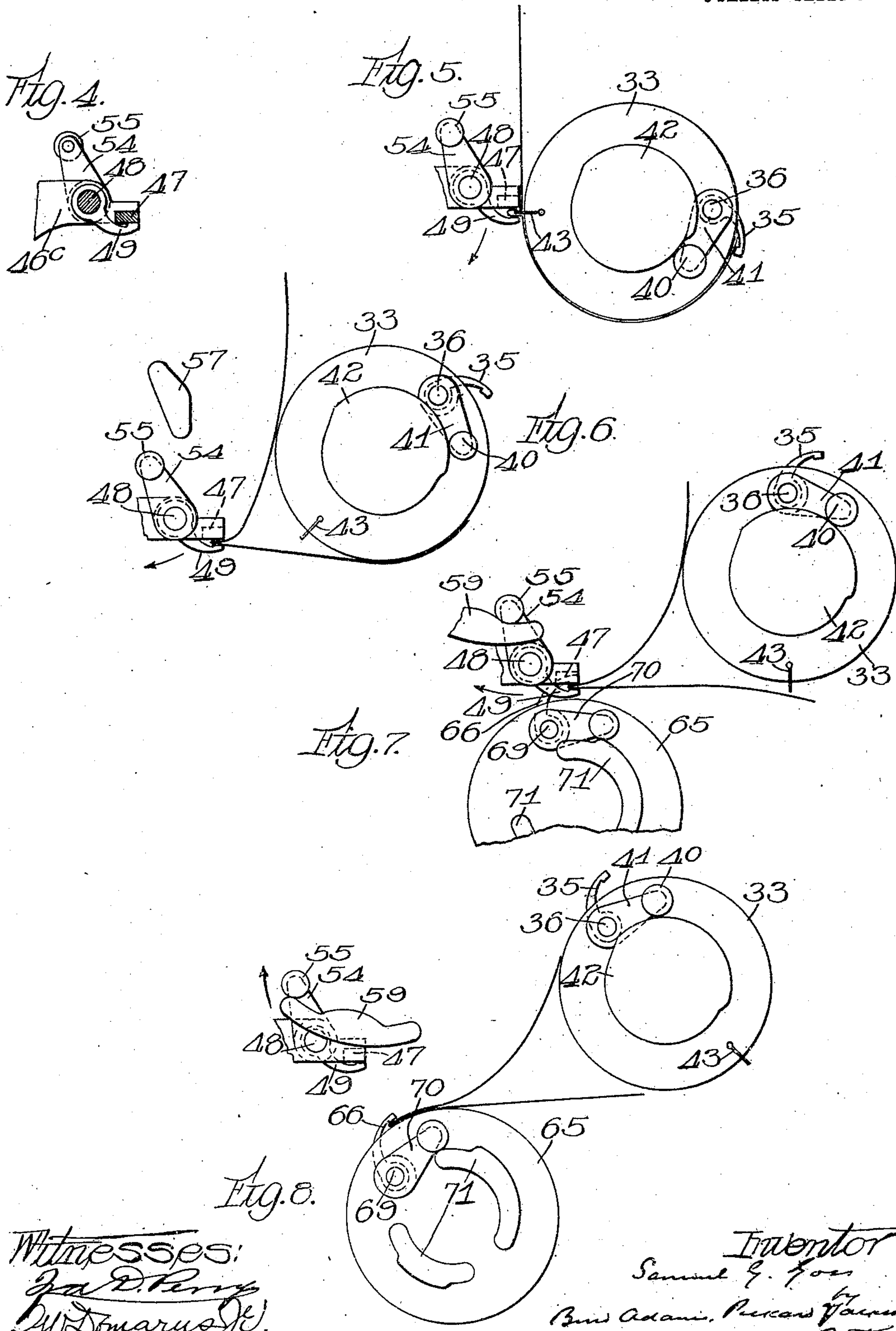
Inventor:
Samuel G. Goss
By Andrew B. Graham, Attorney

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3 SHEETS—SHEET 3.



Witnesses:
J. D. Perry
J. W. Dumas Jr.

Inventor:
Samuel G. Goss
By Adam, Pears & Goss
Attys.

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.

954,086.

Specification of Letters Patent.

Patented Apr. 5, 1910.

Application filed May 20, 1909. Serial No. 497,286.

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.

To that end, my invention consists generally of a moving carrier, preferably a rotary carrier, which is provided with gripper mechanism adapted to engage the lead end of the sheet and release it at the proper time, and with a folding-blade which, as the sheet is carried around, comes opposite the fold line to assist in making the fold, and a co-operative frame carrying gripper jaws, one of which is fixed in the frame and the other movable with relation to the fixed jaw; and in providing mechanism which will swing the frame toward and away from the moving carrier, preferably in a curved path, in such a way that when the frame is moved toward the carrier the gripper jaws will seize the paper between them and the folding-blade in a line substantially radial to the curve of the travel of the moving carrier and of the frame, and as the frame moves away from the carrier will move the sheet held between the gripper jaws into a position adapted to be engaged by delivery mechanism.

ism, with the gripper jaws substantially tangential at that point to their path of travel and in such a position that the folded edge may be engaged by the delivery mechanism.

In the drawings,—Figure 1 is a side elevation with one side of the framework cut away to expose the parts; Fig. 2 is an end elevation seen from the left in Fig. 1; Fig. 3 is an enlarged detail, being an isometric view of a portion of the bar which forms the fixed member of the gripping jaws, showing the recesses for the passage of the grippers; Fig. 4 is a detail, being a section through a portion of the front end of the moving frame to show the construction of the gripper jaws; and Figs. 5, 6, 7 and 8 are diagrammatic illustrations showing the parts and the sheet of paper in several successive positions.

Referring to the drawings,—8 indicates the framework of any convenient form and description.

9—10 indicate cutting-cylinders provided, respectively, with cutting-knives 11 and 12. These cutting-cylinders are preferably, as shown, of a circumference equal to the length of a sheet of paper. The cutting-cylinders are mounted in the framework upon shafts 13—14 which are journaled in the frame and driven from any suitable source of power (not shown). The cutting-cylinders are geared together by means of gears 15—16.

17 indicates an idler-gear mounted in the framework and meshing with the gear 15.

18 indicates a gear meshing with the gear 17 and secured to a shaft 19 which is journaled in suitable brackets, as 20, in the framework. The shaft 19 is provided at each end with crank-arms 21 which are keyed, or otherwise secured, to the outer ends of the shaft 19 inside of the sides of the frame 8.

22 indicates an idler-gear mounted in a suitable bracket, as 23, on the frame and meshing with the gear 18.

24 indicates a gear meshing with the gear 22, which gear 24 is mounted upon a shaft 25 which is journaled in suitable brackets, as 26, in the frame and carries at each end crank-arms 27 keyed, or otherwise secured, thereto.

28—29 indicate guides, which are mounted below the cutting-cylinders 9—10 tangentially thereto and serve to guide the sheet of paper downward to the folding mechanism.

30 indicates an idler-gear, which is mounted upon a stub-shaft 31 carried in a suitable bracket, as 32, and meshing with the gear 16.

33 indicates a rotary carrier, which is mounted upon a shaft 34 journaled in the frame. The carrier may be either cylindrical, as shown, or a skeleton carrier, or any other well-known form of rotary carrier.

35 indicates grippers of the well-known type and description, which are mounted upon a rock-shaft 36 in the interior of the carrier 33. The grippers are normally held closed by means of an arm 37 on the rock-shaft 36 and a spring 38 bearing upon said arm and upon a suitable lug, as 39, in the interior of the carrier, and are opened and closed by means of a roller 40 on an arm 41 on the rock-shaft 36 and a cam 42 fixed on the shaft 34. As these grippers and cam are constructed in the usual way and operate in the well-known manner, no further description is needed, except to say that the cam operates to open the grippers against the action of the spring 38 at a suitable time, as hereinafter described.

43 indicates a folding-blade, which is fixed in a recess in a block 44 mounted on the surface of the carrier. As is shown in Fig. 1, the recess is V-shaped and spread apart at its outer edge in order to permit the engagement of the gripping jaws hereinafter described with the knife and the paper between them.

45 indicates a carrier, which, in the construction shown, is a frame, composed of end-members 46 and a cross-bar 47, which cross-bar 47 operates as one of the gripping-jaws, as hereinafter described. As is best shown in Fig. 3, this bar 47 is provided on its under side with a number of cross recesses 47^a to permit the passage through them of the grippers 66 on the delivery mechanism hereinafter described. The end-members 46 are preferably somewhat of a Y-shape and provided with arms 46^a, 46^b and 46^c. The arms 46^a and 46^b of each end-member are pivotally connected, respectively, to the outer ends of the crank-arms 21 and 27, and the arms 46^c projecting toward the carrier 33 are connected by means of the cross-bar 47, as above described, which is fixed to the outer ends of the arms 46^c and operates as one of the gripping-jaws.

48 indicates a rock-shaft, which is rotatably mounted in the arms 46^c, near their outer ends and behind the cross-bar 47.

49 indicates gripper-jaws, which are secured to the rock-shaft 48 and which, extending forward, curve under the bar 47 so that when brought into contact therewith, as hereinafter described, they may grip the fold of a sheet of paper between them and the cross-bar. The gripper-jaws 49 are normally yieldingly held in contact with the

under surface of the cross-bar by means of an arm 50 on the rock-shaft 48, upon the end of which is pivotally mounted a rod 51, which, extending upward and backward, as shown in Fig. 1, passes at its outer end through a perforated head 52 which is pivotally mounted in the arm 46^a of one of the end-members 46. A spiral spring 53 surrounding the rod 51 and bearing at one end on the under side of the head 52 and at the other upon the arm 50 tends to force the arm downward, thus holding the gripper-jaws 49 normally yieldingly in contact with the bar 47.

54 indicates an arm, which is secured to one end of the rock-shaft 48 outside of one of the end-members 46 and carries at its upper end a roller 55.

56 indicates a block, which is secured to the inner side of one of the side bars of the frame 8 and carries upon its inner surface a cam member 57, whose cam surface is best shown in dotted lines in Fig. 1.

It will be readily understood from the above description that as the cranks 21 and 27 are rotated in the direction indicated by arrows in Fig. 1 the entire frame 45 will be swung in a circle toward and away from the cylinder so that the gripper-jaws will travel in a circular path indicated by a dotted circle in Fig. 1.

58 indicates a block, which is secured to the inside of one of the side members of the frame 8 and carries upon its interior surface a cam-member 59 whose cam surface is shown best by a dotted line in Fig. 1. These two blocks 56 and 58 with the cams carried thereby are so located in the path of the travel of the frame that as the frame is swung in a circular path the roller 55 on the arm 54 will be brought successively into contact with the cams. For instance, as the rock-shaft 48 reaches the uppermost portion of the circle of its travel the roller will come into contact with the top of the cam-member 57 and, riding down a portion of the cam surface, will be moved relatively forward so as to rock the rock-shaft 48 and open the gripper-jaws. Passing farther along the cam surface the roller runs inward to the position shown in Fig. 1, in which the springs again close the jaws. The timing of this movement will be hereinafter described. As the frame 45 moves farther, the roller 55 is brought into contact with the cam 59 and, riding along its surface, is moved so as to swing the rock-shaft to again open the grippers, permitting the springs to again close them as soon as the roller has passed away from the cam. The timing of this movement will be hereinafter described.

60 indicates a gear secured to the carrier shaft 34 and meshing with the gear 30.

61 indicates an idler-gear meshing with the gear 60 and mounted upon a suitable

stub-shaft, as 62, in the frame of the machine.

63 indicates a gear, which is secured to a shaft 64 journaled in the frame of the machine and meshing with the gear 61.

65 indicates a delivery cylinder, which is carried on the shaft 64 and is provided with grippers 66 normally held closed by spiral springs 67 operating against an arm 68 which is secured on a rock-shaft 69 on which said grippers are mounted. The grippers are opened at a suitable time, as hereinafter described, by means of arms 70 on the rock-shaft 69 and cams 71 on the shaft 64 of the delivery cylinder 65. As these grippers and the operating cams and arms may be of any well-known form and description, further description of their structure is believed to be unnecessary. The timing of the movements will be hereinafter described.

72 indicates stripper-arms, which bear against the surface of the delivery cylinder and are mounted in the framework in the usual manner and operate to strip the folded sheets from the delivery cylinder in the well-known manner and deliver them to slow-moving tapes 73 carried by driven rollers 74—75 in the general and well-known manner.

The operation of the above-described mechanism is as follows: The printed web being fed from any suitable source of printing mechanism (not shown) between the cutting-cylinders 9 and 10 is carried downward toward the guides 28 and 29 and cut at the proper point by the knives 11 and 12 in the usual manner. The motion is so timed that as the lead end of the sheet comes down to the periphery of the carrier the grippers 35, which have up to this point been held open by the cam 42, close upon the lead end of the sheet and carry it around with the carrier. In the meanwhile the frame is being carried around in its curved path, as above described, by the crank-arms. As the parts reach the position shown in Fig. 1, the gripper-jaws come opposite to the folding-blade 43 which, in the form shown, is diametrically opposite the grippers 35, and the jaws 49, which have just previously to this been opened by the action of the cams 57 above described, are shut upon the bar 47 by the operation of the spring 53, the roller 55 having moved upon the cam 57 so as to permit this, as above described. The sheet at the fold line, which in the construction shown is the middle of the sheet transversely, is seized between the gripper-jaws and the knife, marking and forming the transverse fold. The grippers 35 at this moment are opened by the action of the cam 42 so as to free the lead end of the sheet, and the gripper-jaws traveling around in the path of the dotted circle shown in Fig. 1 move in a curve downward and away from

the carrier, thereby pulling the sheet by its transverse fold line away from and freeing it from the carrier. It will be noticed that as the gripper-jaws travel in the curved path, one of them being fixed in the frame, they take successive positions constantly parallel to each other, so that by the time they have reached the lowest portion of the curve they are substantially tangential thereto and the folded edge of the sheet is traveling at that moment in a path tangential to this curved line. Three successive positions of the sheet are indicated in Figs. 5, 6 and 7. When the gripper-jaws have reached the lowest portion of the curve of their travel, as shown in Fig. 7, the delivery cylinder has moved into the position also shown in Fig. 7, at which moment the grippers 66, passing through slots 47^a on the bar 47, are just being freed from the cam and are ready to close upon the folded edge of the sheet. The roller 54 also, it will be seen, is just engaging the cam portion of the cam member 59 so as to open the gripper-jaws 49 and free the sheet. At the next moment of travel the gripper-jaws 49 have relaxed their hold upon the fold of the sheet and the grippers 66 have engaged the folded end, carrying the sheet around with the delivery cylinder 65. As the lead end of the folded sheet reaches the upper ends of the strippers 72, the cam 71 operates in the well-known manner to open the grippers and release the folded edge of the sheet, and the strippers 72, operating in the well-known manner, strip the folded sheet from the cylinder and deliver it to the slow-moving tapes 73, which moves it in the well-known manner out of the way for the next succeeding sheet.

I have shown the radius of the crank-arms 21, the radii of the cutting-cylinders 9—10, the carrier 33 and the delivery-cylinder 65, as being of all the same length, whereby the circumference of the several cylinders is equal to one sheet length, and the frame travels in such a path that the gripper-jaws travel in a circle whose circumference is the same as that of the cutting-cylinders, rotary carrier and delivery cylinder, so that the devices operate once for each rotation. This is the form in which I prefer to use them, but it will be obvious that the diameters might be respectively changed so as to operate a different number of times without departing from the spirit of my invention.

I have shown the delivery cylinder, as well as the rotary carrier, in the form of a cylinder, but it is obvious that they may be skeleton cylinders, or any other well-known form of carrier or delivery cylinder.

It will be seen from the above description that one of the jaws being fixed to the frame and the other jaw only being movable with

relation to the fixed jaw, the frame being moved in such a way as to cause the gripper-jaws to travel in a curved path, which in the form of construction shown is in a circle, the successive positions of the gripper-jaws are parallel with each other. That is to say they always point in the same direction throughout the entire travel, or what is really of importance, throughout that portion of their travel which lies between a point a suitable distance before they begin their engagement with the folding-blade and a point at which they deliver the folded sheet to the carrier. This enables the jaws to properly engage the sheet over the folding-blade and to engage it in the most advantageous position—namely, in a position substantially radial to the curve of their travel and to the rotary carrier—and to come into their delivery position with reference to the delivery cylinder at a point at which they are substantially tangential to the curve of their travel and to the path of the grippers on the delivery cylinder. This enables them both to engage the paper at the point most advantageous for engagement and to be in a position to discharge it to the delivery cylinder at the point most advantageous; and this is done without any complicated cams or guides, or other mechanism, which would turn the grippers relatively to the carrier on which they are carried, as is necessary where such grippers are carried on a rotary cylinder, or similar device, rotating about its center.

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

1. In combination, a rotary member, a folding-blade carried thereby, a non-rotary carrier, gripper-jaws on said carrier and adapted when said carrier is moved into operative relation with said folding-blade to grip a sheet of paper over said folding-blade and to hold the gripped edge of the paper between them when withdrawn from said blade, and mechanism adapted to swing said non-rotary carrier toward and away from said rotary member.

2. In combination, a moving carrier adapted to engage the lead end of a sheet of paper, a folding-blade mounted thereon, a non-rotary carrier, gripper-jaws on said non-rotary carrier and adapted when said non-rotary carrier is moved into operative relation with said moving carrier to grip a sheet of paper over said folding-blade and to hold the gripped edge of the paper between them when withdrawn from said blade, and means for moving said non-rotary carrier toward and away from said moving carrier.

3. In combination, a rotary member, a fixed folding-blade carried thereby, a non-rotary carrier, gripper-jaws on said carrier and adapted when said carrier is moved into operative relation with said folding-blade to

grip a sheet of paper over said folding-blade, and mechanism adapted to swing said non-rotary carrier toward and away from said rotary member.

4. In combination, a moving carrier adapted to engage the lead end of a sheet of paper, a non-reciprocatory folding-blade mounted thereon, a non-rotary carrier, gripper-jaws on said non-rotary carrier and adapted when said non-rotary carrier is moved into operative relation with said moving carrier to grip a sheet of paper over said folding-blade, and means for moving said non-rotary carrier toward and away from said moving carrier.

5. In combination, a rotary member adapted to engage the lead end of a sheet of paper, a folding-blade carried thereby, a non-rotary carrier, mechanism adapted to swing said non-rotary carrier toward and away from said rotary carrier, gripper-jaws on said carrier adapted when said carrier is moved into operative relation with said folding-blade to grip a sheet of paper over said folding-blade and further adapted when said carrier is moved away from said rotary member to release their grip and deliver the sheet folded edge first, and mechanism adapted to receive said folded edge direct from said gripper-jaws.

6. In combination, a rotary member, a folding-blade thereon, a non-rotary carrier, a fixed gripper-jaw on said non-rotary carrier, a movable jaw adapted to cooperate with said fixed jaw to grip a sheet of paper over said folding-blade, and means for moving said non-rotary carrier toward and away from said rotary member and into and out of operative relation with said folding-blade.

7. In combination, a moving carrier, adapted to engage the lead end of a sheet of paper, a folding-blade carried thereby, a non-rotary carrier, a fixed gripper-jaw on said non-rotary carrier, a relatively-movable gripper-jaw adapted to cooperate with said fixed gripper-jaw to engage a sheet of paper on said folding-blade, and mechanism adapted to move said non-rotary carrier toward and away from said moving carrier to bring said gripper-jaws into and out of engagement with said folding-blade and for causing said gripper-jaws, while in engagement with said folding-blade, to move in the same direction therewith.

8. In combination, a rotating member, a folding-blade secured thereto, a frame, a gripper-jaw fixed on said frame, one or more movable gripper-jaws adapted to cooperate with said fixed jaw to engage a sheet of paper between them and said folding-blade, and means for moving said frame toward and away from said carrier and maintaining said fixed gripper-jaw constantly pointing in the same direction in space.

9. In combination, a moving carrier

adapted to engage the lead end of a sheet of paper and provided with a folding-blade, a non-rotary frame in operative relation to said carrier, mechanism for moving said frame in a curved path toward and away from said carrier, a gripper-jaw fixed to said frame, one or more gripper-jaws carried by said frame and movable with relation to said fixed jaw, and mechanism for operating said movable grippers to engage a sheet of paper between said movable and fixed jaws and said folding-blade when said frame is moved forward toward said carrier into operative relation therewith and to open said movable jaws to discharge the folded edge of the sheet therefrom after said frame has moved away from said carrier.

10. In combination, a moving carrier adapted to engage the lead end of a sheet of paper and provided with a folding-blade, a non-rotary frame in operative relation to said carrier, mechanism for moving said frame in a curved path toward and away from said carrier, a gripper-jaw fixed to said frame, one or more gripper-jaws carried by said frame and movable with relation to said fixed jaw, mechanism for operating said movable gripper-jaws to engage a sheet of paper between said movable and fixed jaws and said folding-blade when said frame is moved forward toward said carrier into operative relation therewith and to open said movable jaws to discharge the folded edge of the sheet therefrom after said frame has moved away from said carrier, and delivery mechanism adapted to engage the folding edge of said sheet as the same is freed from said gripper-jaws and remove the sheet therefrom and deliver the same.

11. In combination, a rotary carrier adapted to engage the lead end of a sheet of paper and provided with a folding-blade, crank-shafts, crank-arms on said crank-shafts, means for operating the same, a frame carried on said crank-arms and movable thereby in a curved path toward and close to said rotary carrier and then away from the same, gripper-jaws carried on said frame and adapted to engage a sheet of paper between them and said folding-blade, and mechanism for operating said jaws to close the same upon said folding-blade and

to open the same after said frame has moved away from said rotary carrier.

12. In combination, a rotary carrier adapted to engage the lead end of a sheet of paper and provided with a folding-blade, crank-shafts, crank-arms on said crank-shafts, means for operating the same, a frame carried on said crank-arms and movable thereby in a curved path toward and close to said rotary carrier and then away from the same, a fixed jaw on said frame, one or more movable jaws carried by said frame and movable into and out of operative relation with said fixed jaw, and mechanism operated by the movement of said frame to close said movable jaw upon said fixed jaw with said folding-blade between them when said frame is moved into operative relation with said carrier and to open said movable jaws when said frame is moved away from said carrier.

13. In combination, a rotary carrier adapted to engage the lead end of a sheet of paper and provided with a folding-blade, crank-shafts, crank-arms on said crank-shafts, means for operating the same, a frame carried on said crank-arms and movable thereby in a curved path toward and close to said rotary carrier and then away from the same, a fixed jaw on said frame, one or more movable jaws carried by said frame and movable into and out of operative relation with said fixed jaw, mechanism operated by the movement of said frame to close said movable jaws upon said fixed jaw with said folding-blade between them when said frame is moved into operative relation with said carrier and to open said movable jaws when said frame is moved away from said carrier, a delivery cylinder in position with relation to said frame, grippers on said delivery cylinder adapted to engage the folded edge of the sheet as the same is being freed from said movable jaws, and mechanism for operating said grippers to engage and free the lead end of said sheet on said delivery cylinder.

SAMUEL G. GOSS.

Witnesses:

C. E. PICKARD,
ALBERT H. ADAMS.