

S. G. GOSS.
 PNEUMATIC FOLDING MECHANISM FOR PRINTING PRESSES.
 APPLICATION FILED DEC. 12, 1908.

936,711.

Patented Oct. 12, 1909.

6 SHEETS—SHEET 1.

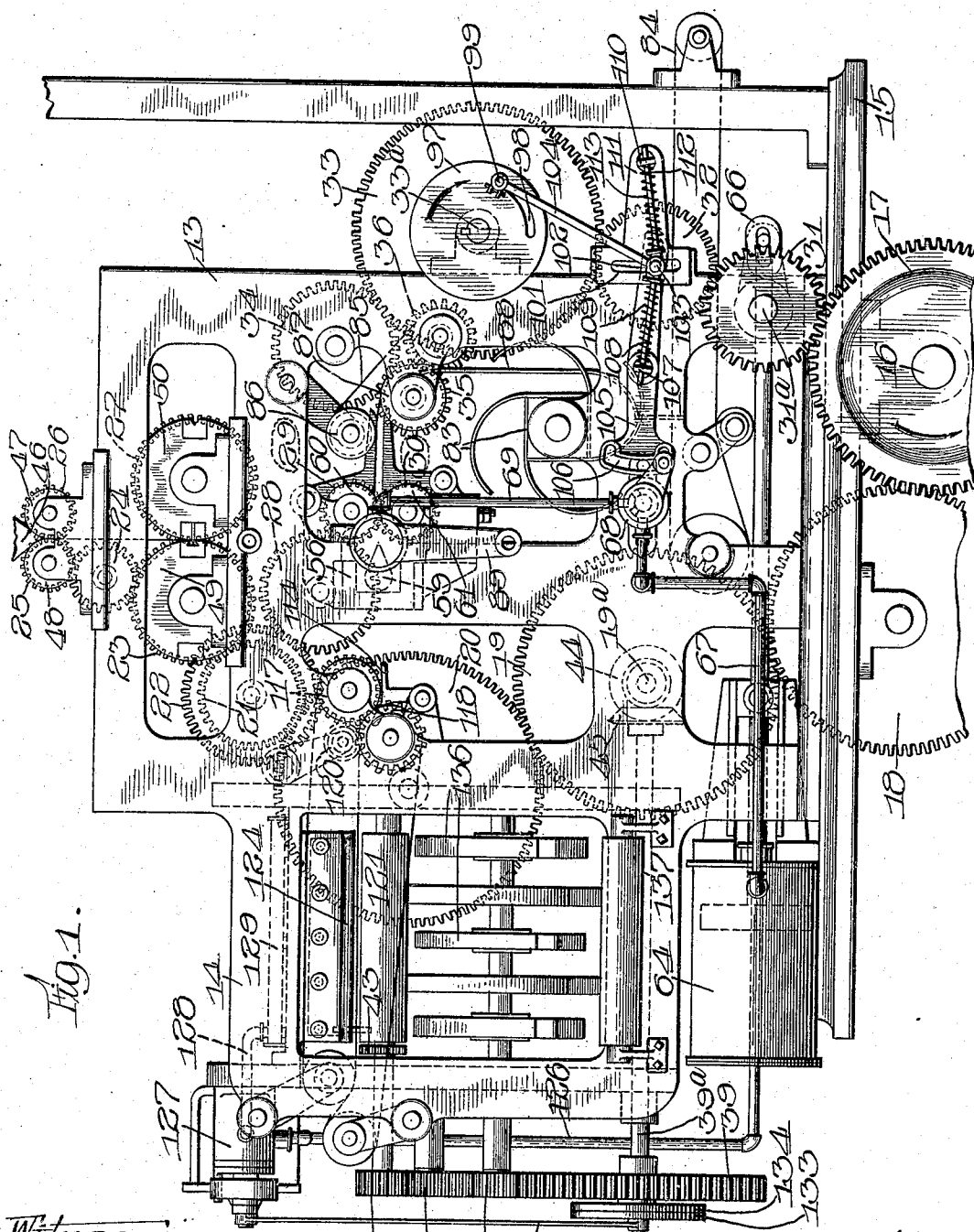


Fig. 1.

Witnesses:
 J. P. Perry
 J. V. Donatus & Co.

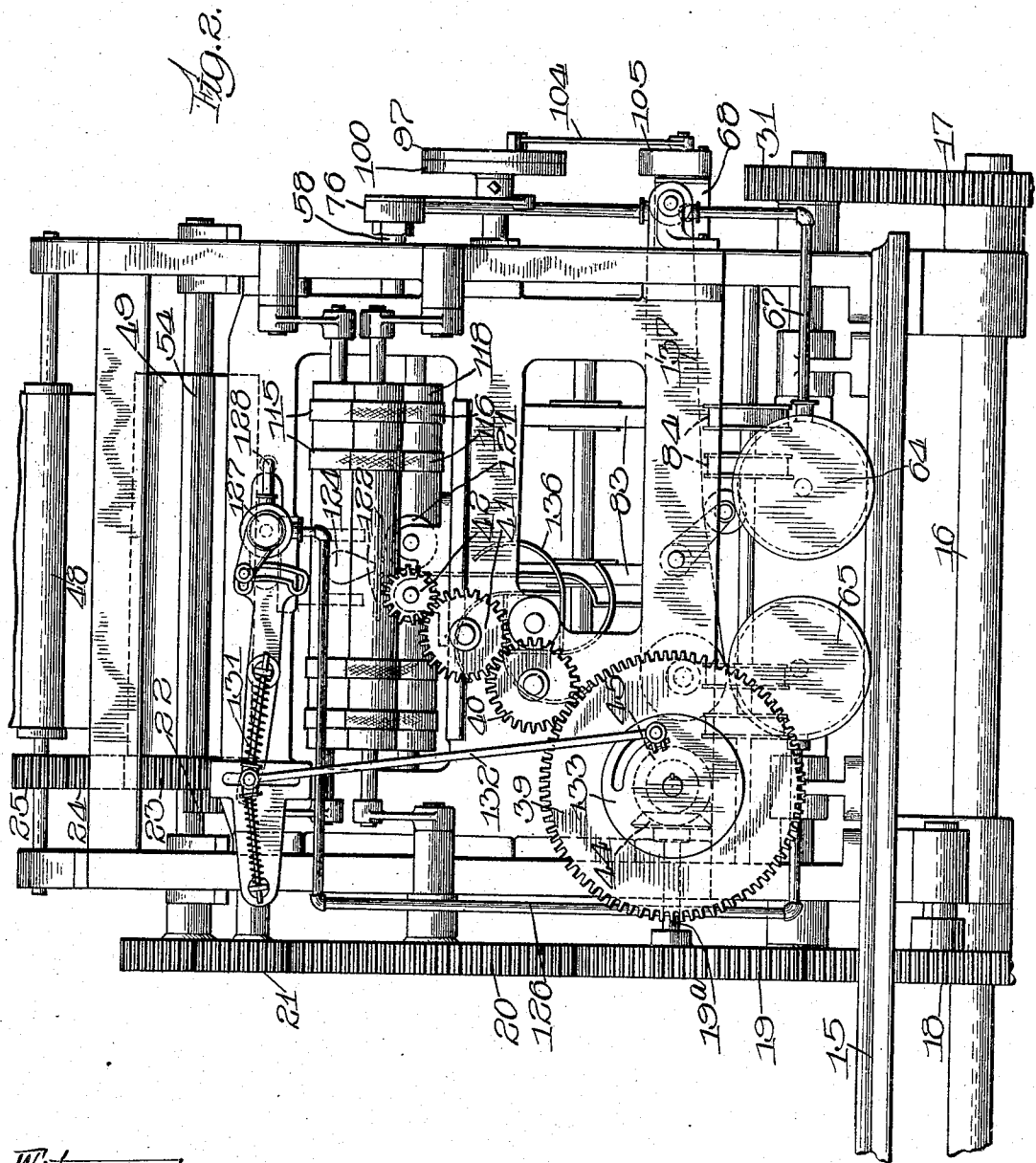
Inventor:
 Samuel G. Goss
 By Bond, Adams, Rickard & Jester

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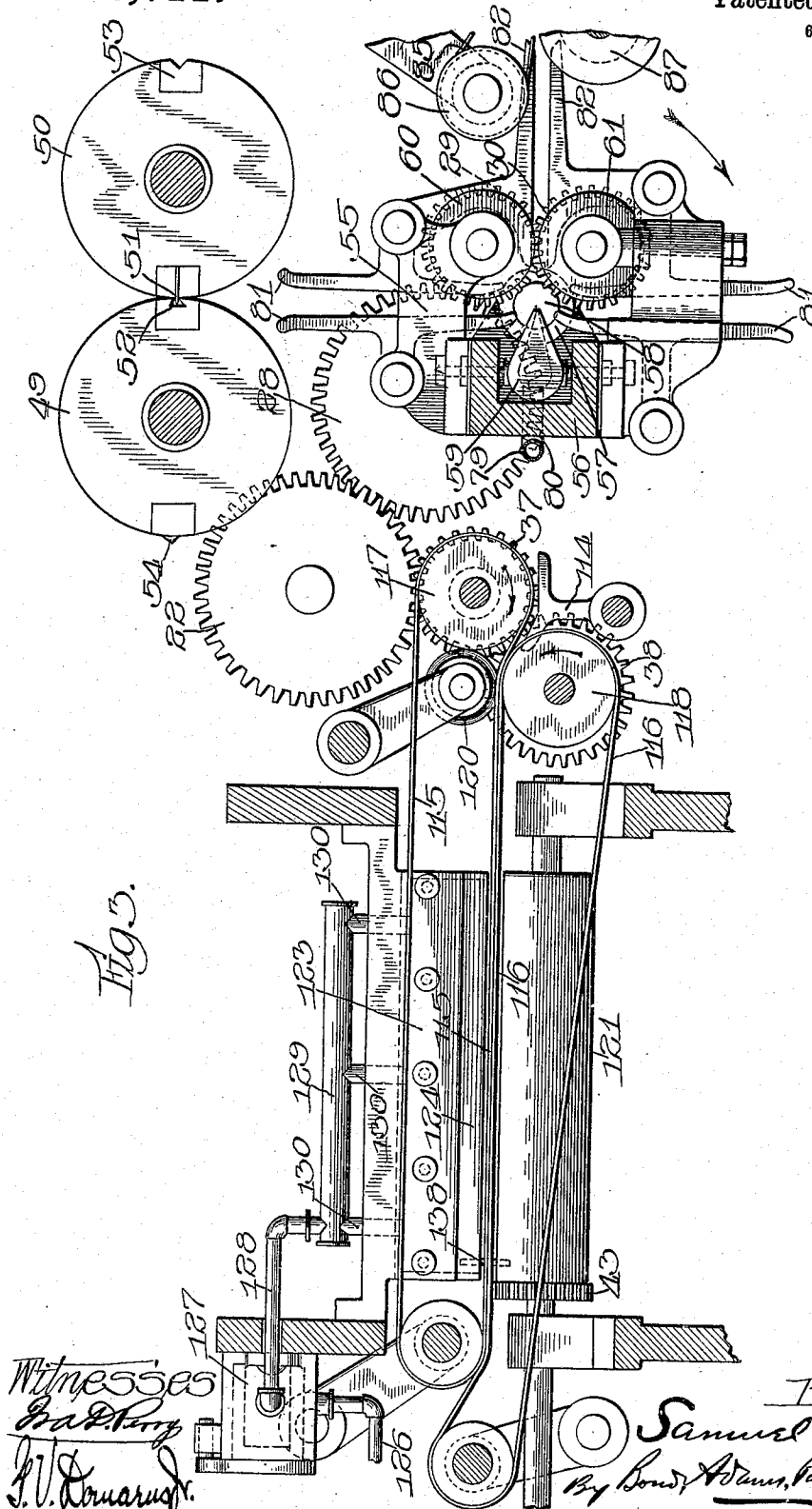
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Witnesses
 E. A. King
 J. V. Lomax.

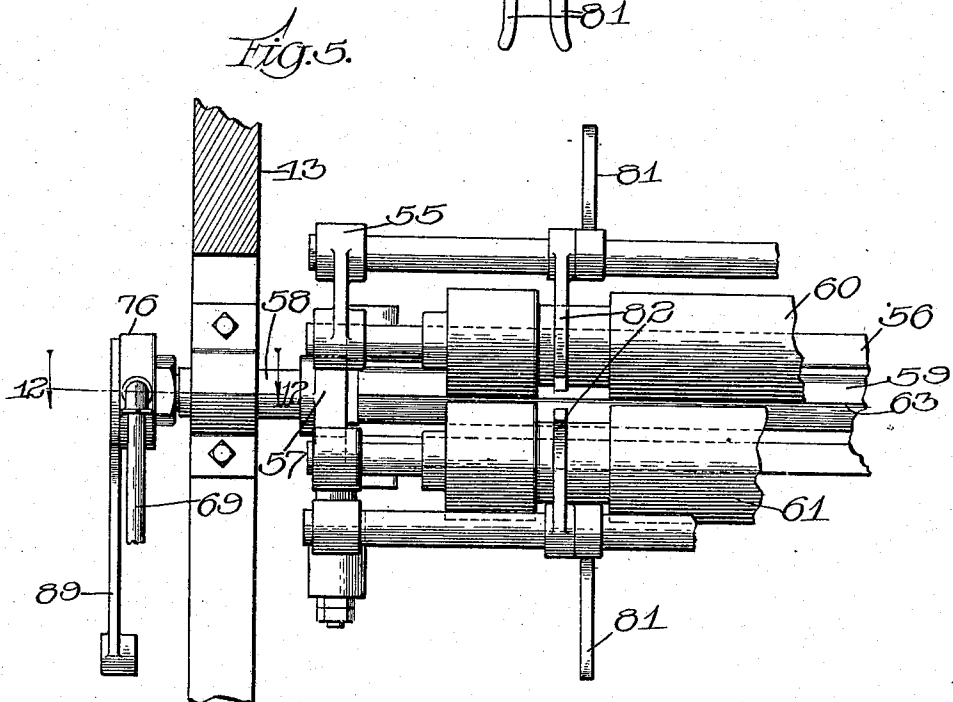
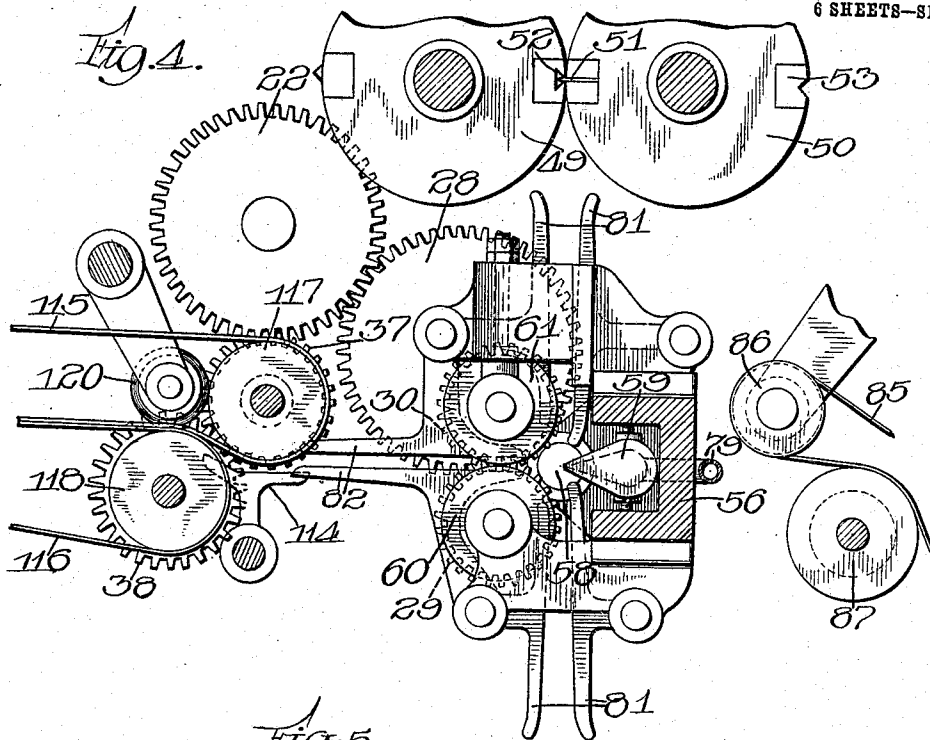
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6 SHEETS—SHEET 4.



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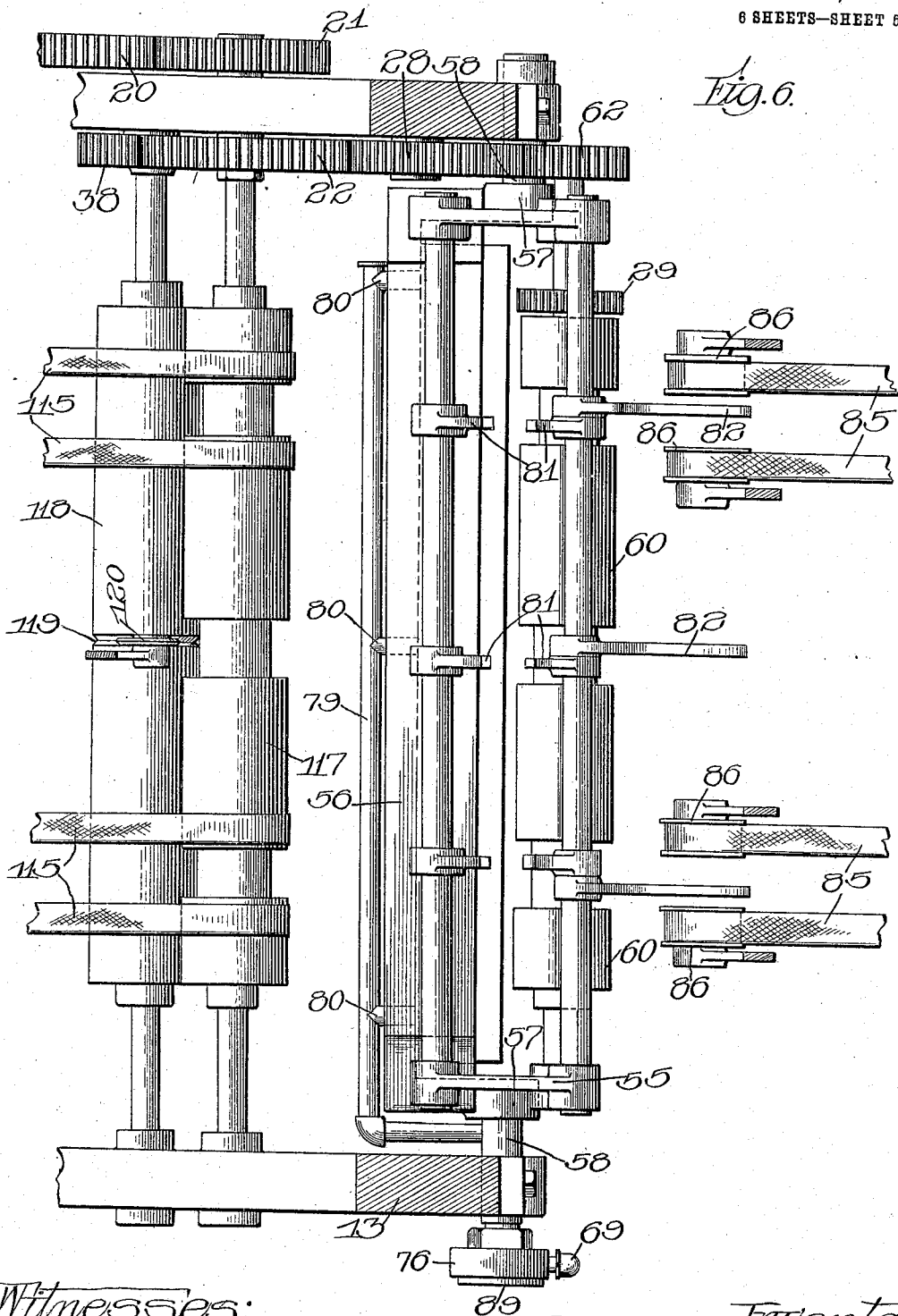
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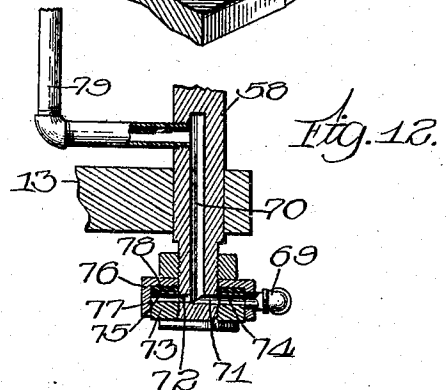
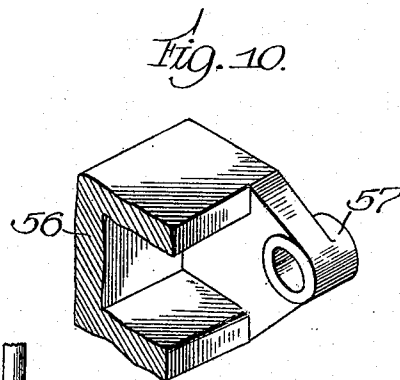
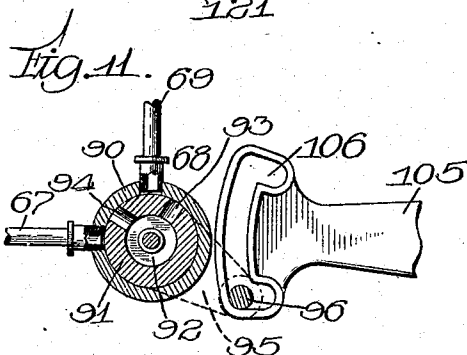
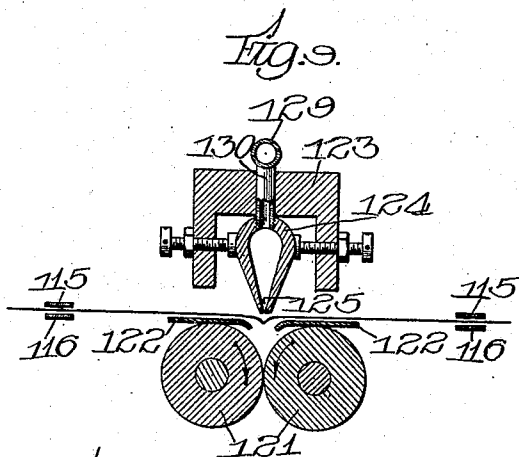
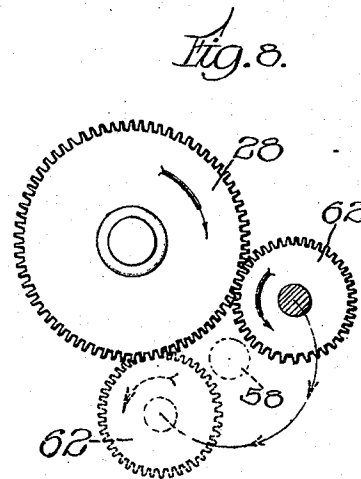
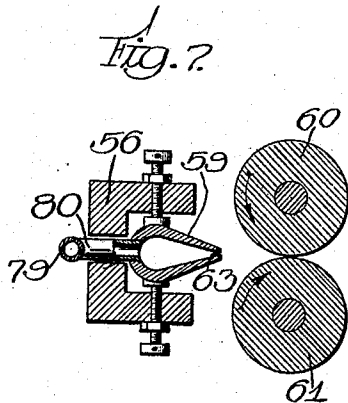
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 6 SHEETS—SHEET 8.



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Inventor:
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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.

PNEUMATIC FOLDING MECHANISM FOR PRINTING-PRESSES.

936,711.

Specification of Letters Patent.

Patented Oct. 12, 1909.

Application filed December 12, 1908. Serial No. 467,178.

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 Pneumatic Folding Mechanism for Printing-Presses, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to folding mechanism for printing presses and particularly to improvements in folding mechanism, by which the paper is thrown into the bite of the folding rollers by the action of compressed air, of the general character shown and described by me in my application for Letters Patent, Ser. No. 462,489, now pending.

The object of my invention is to provide new and improved pneumatically-operated folding mechanism for printing presses and particularly to improve upon the type of folding mechanism shown and described in my said pending application, Ser. No. 462,489.

More particularly still the object of my invention is to provide new and improved folding mechanism by means of which the folded sheets, given one cross fold, commonly known as the "commercial fold", may be directed into a delivery apparatus designed to deliver them in this condition, or may be directed into a second folding and delivery mechanism which will produce a second fold, commonly known as the "mailing fold" and deliver them in that condition.

A further object of my invention is to improve upon pneumatically-operated folding mechanism in sundry details hereinafter pointed out.

In the drawings,—Figure 1 is a front elevation of the folder embodying my invention; Fig. 2 is a side elevation, seen from the left in Fig. 1; Fig. 3 is an enlarged detail, being a front elevation of the two folding mechanisms, showing the mechanism for giving the first fold in position to deliver the sheets with the commercial fold; Fig. 4 is an enlarged detail, being a view of the same parts as are shown at the right in Fig. 3, showing the mechanism for giving the commercial fold arranged to direct the folded

sheet into the second folding mechanism for giving it a third fold; Fig. 5 is an enlarged detail, being a broken-away end view of the parts seen from the right in Fig. 3; Fig. 6 is an enlarged detail, being a top or plan view of the mechanism for giving the first transverse fold and of the guide rollers which direct the transversely-folded sheet into the mail folding mechanism; Fig. 7 is an enlarged detail, being a vertical section through a portion of the folding mechanism for giving the first transverse or commercial fold,—being a vertical section through the box, blow-pipe and folding rolls; Fig. 8 is an enlarged detail, being a view of the gear which drives the upper folding roll on the first transverse folding mechanism and of the gear on the frame by which it is driven, showing in dotted lines the second position of the folding roll gear when the frame for supporting the folding mechanism is turned to direct the sheets in the other direction; Fig. 9 is an enlarged detail, being a vertical section through the box, blow-pipe and folding rolls of the mechanism for giving the third or mail fold; Fig. 10 is an enlarged detail, being an isometric view of one end of the box supporting the blow-pipe; Fig. 11 is an enlarged detail, being a section through one of the operating valves controlling the air; and Fig. 12 is an enlarged detail, being a section on line 12—12 of Fig. 5.

Referring to the drawings,—13 indicates the main folder frame and 14 the secondary folder frame, which are mounted on a bed-plate 15.

16 indicates the driving-shaft of the folder, upon which is mounted the main driving-gear 17. The main driving-shaft 16 extends through the press to the other side and has upon its other end a gear (not shown) of the same size as the main driving-gear 17. This gear upon the other end of the driving-shaft 16 lies directly behind the main driving-gear 17 in Fig. 1 and behind the other gearing shown at the left in Fig. 2, and therefore does not appear in the drawings. As it is simply an ordinary driving-gear which operates to drive the other gears hereinafter described it will be readily understood without illustration.

19, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29;

30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 and 43 indicate gears which are mounted on suitable shafts journaled in the framework 13—14 and by means of which the other parts hereinafter described are driven. The gear 18 meshes with and is driven by the gear (not shown) on the end of the drive-shaft 16 opposite to the end on which the main driving-gear 17 is mounted.

44 indicates a beveled gear mounted upon a shaft 19^a of the gear 19 which gear 44 meshes with a beveled gear 45 which is mounted upon the shaft 39^a of the gear 39.

46 (Fig. 1) indicates the point of the ordinary V-shaped former over which the paper is fed between folding rolls 47—48 to receive its first or longitudinal fold. As this V-shaped former is of the well-known type and description and forms no part of my present invention I have not shown it more fully and think it unnecessary to describe the same.

49—50 indicate cutting cylinders between which the paper longitudinally folded over the former passes down to the first cross-folding mechanism hereinafter described. The cutting cylinder 50 is provided with a knife 51 which coöperates with a groove 52 to transversely sever the web of paper, and the cutting cylinders, as shown, are preferably, in the form in which I embody my present invention, of a circumference equal to one sheet length. The knife 51 and the groove 52 are carried by the usual removable blocks which are of the well-known form and construction carried by the cutting cylinders in the usual manner, as is best shown in Fig. 4 of the drawings. One of these cutting cylinders—as 50—diametrically opposite the cutting knife 51 is provided with a groove 53 which coacts with a crease marker 54 on the other cylinder diametrically opposite the cutting groove 52 to form a crease midway between the ends of the severed sheet to mark and start the first transverse fold. The cross marker 54 and groove 53 are also mounted upon and carried by removable blocks of the same form and construction and mounted in the cylinders 49 and 50 in the same way as the blocks carrying the cutting knife and groove 51 and 52.

Referring to Figs. 3, 4 and 6, where these parts are best shown, 55 indicates a frame in which is rigidly secured a box 56 which, by means of suitable bearings 57 (see also Fig. 10), is secured at each end to stud shafts 58 journaled in the frame of the machine. The frame and the box thus form a united structure which may be turned on the stud shafts 58 so as to face in either direction shown in Fig. 3 or that shown in Fig. 4.

The box 56 is open toward the interior of the frame 55 and supports within it a blow-

pipe 59 which faces the bite of folding rollers 60—61 which are journaled in the frame 55 and are carried around with it. Upon the shaft of the upper roller 60 is secured at one end a gear 62 which meshes with the gear 28 (see Figs. 3, 6 and 8). The folding rollers themselves are geared to run together by means of the gears 29 and 30 above referred to and rotate, of course, in the direction indicated by arrows on Fig. 7. The blow-pipe 59, which is preferably of a somewhat horseshoe shape but narrow at its blowing edge is of a length corresponding generally with the length of the folding rollers 60—61 and is provided at its edge which faces the bite of these rollers with a narrow discharge opening 63 whereby when a quick blast of compressed air is forced through the opening 63 the crease previously formed in the paper when the sheet is in proper position will be forced between the bite of the folding rollers 60—61 and the sheet folded in the manner hereinafter described.

64—65 indicate air-compressing pumps which are mounted on the bed-plate 15 of the machine and are driven by suitable crank arms. For example, the pump 64 is driven by a crank arm 66 located on the shaft 31^a of the gear 31.

67 indicates a pipe which leads from the pump 64 to a rotary valve 68 mounted on the framework of the machine. This valve, so far as my present invention is concerned, may be of any approved character adapted to quickly open and shut off, but I prefer to use the type of valve shown and described in my said application Ser. No. 462,489, above referred to, and which said valve will be hereinafter described so far as is necessary for the purposes of this application.

69 indicates a pipe, which leads upward from the valve 68 and connects with the stud-shaft 58 on which the frame 55 is supported. The manner of connection is best shown in Fig. 12. The stud-shaft 58 is provided near its outer end with a central longitudinal bore 70, which near the outer end of the stud-shaft turns at right angles into borings 71—72 diametrically opposite each other and extending to the surface of the stud-shaft 58.

73 indicates a ring, which is screwed upon the outer end of the stud-shaft 58 and is provided with diametrically disposed openings 74—75 which register with the openings 71—72.

76 indicates a packing-box, which is revolvably mounted upon the stud-shaft 58 outside of the framework and provided with a peripheral flange 77 which bears air tight upon the periphery of the ring 73.

78 indicates packing, which is interposed between the ring 73 and the packing-box 76.

It will be obvious from the above description that any air which is admitted by the valve into the pipe 69 will pass into the boring 70.

79 indicates a pipe, the end of which is screwed into said stud shaft 58 and communicates at its inner end with the opening 70. By means of a plurality of short pipes 80 the pipe 79 is connected with the blow-pipe 59 so that compressed air admitted into the pipe 79 will pass into the blow-pipe and out through its discharge orifice.

81 indicates guides, which are vertically disposed when the frame 55 is in operative position and which operate to guide the sheet of paper passing downward between the cutting cylinders into proper position between the orifice of the blow-pipe 59 and the folding rollers.

82 indicates guides mounted on the frame 55 with the passage between them in register with the bite between the folding rollers 60—61, which guides when turned to the right as in Fig. 3 are adapted to direct the sheet of paper between the folding rollers in what is known as a "commercial fold" to the S-fly delivery 83 and slow-moving tapes 84 by means of ordinary tapes 85 on rollers 86—87 and by means of the ordinary guide 88. As this S-fly delivery, slow-moving tapes, guide and guide tapes are well known and form no part of my present invention, it is believed it is unnecessary to describe them further here. The guides 82, when turned to the left as in Fig. 4, direct the folded sheet of paper into the second folding apparatus for giving to the paper a third fold as hereinafter described. The frame 55 is turned upon its bearings, above described, by means of a handle 89 (see Figs. 1 and 5) which, rotating the frame a half a revolution in the direction shown by the arrow in Figs. 3 and 8, will cause the guides 82 to face either to the right as shown in Fig. 3, or to the left as shown in Fig. 4.

The valve 68, which is shown in detail in Fig. 11, is preferably, as was said above, of the kind and mode of operation shown and described in detail in my above-named application Ser. No. 462,489, and as claims have been made upon it in said application it does not by itself form a part of my present application. To generally describe its operation, however, and referring to Figs. 1 and 11, 90 indicates a valve casing into which open the tubes or air pipes 67 and 69. 91 indicates a rotary valve member inclosed in the cylindrical casing 90 and provided with a central opening 92 and discharge openings 93—94 opening therefrom to the periphery of the valve 91. The discharge openings 93—94 are so placed that when the valve 91 is turned they will simul-

taneously be brought into and then out of register with the openings of the pipes 67—69 into the casing 90. 95 indicates a valve-stem, which is secured to the outer end of the rotary valve 91 exterior to the casing 90 and provided on its outer end with a pin 96.

Referring to Figs. 1 and 2, 97 indicates a disk, which is keyed to the shaft 33^a of the gear 33, the disk 97 being at the front and the gear at the rear end of said shaft 33^a. The disk 97 is provided with an arc-shaped slot 98 concentric with the disk, in which moves a pin 99 which is secured to a disk 100 (see Fig. 2) loosely mounted upon the shaft 33^a. 101 indicates a support, which is secured to the frame 13 and is provided with a vertical slot 102. 103 indicates a block which is slidingly mounted in the slot 102 and is connected by a link 104 to the pin 99. 105 indicates an arm which is pivotally mounted near its center on the framework 13 and is provided with a slot 106 at one end which engages the pin 96 on the crank arm 95 of the valve-stem. The other end is pivotally connected with the sliding block 103. 107 indicates a block which is rotatably mounted on the arm 105 at its pivotal point. 108 indicates a pin which is slidingly mounted at one end in the rotatable block 107 and at the other end is pivotally connected with the sliding block 103, a spiral spring 109 being interposed between them. 110 indicates a support, which is rotatably mounted upon an arm 111 of the support 101. 112 indicates a pin, one end of which is slidingly mounted in the rotatable block 110 through a suitable opening therein, and the other end is pivotally connected with the sliding block 103, a spiral spring 113 being interposed.

The operation of these devices is as follows: The disk 97, being driven in the direction indicated by the arrow in Fig. 1, is carried around until the end of the slot 98 contacts with the pin 99 which is then carried around with it, the sliding block 103 being moved in the slot 102 by means of the link 104 and moving, of course, the lever 105 and the pins 108 and 112, the slot 106 on the end of the lever 105 traveling upward on the pin 96. As soon as the block, however, has reached such a position that the spring-seated pins pass centers, the springs immediately operate in the manner of a toggle-joint lever to instantly and quickly throw the block to the end of the slot, either upward or downward according to the direction in which they are moving. The parts being so adjusted that just at the time when the pins are at centers the end of the slot 106 in the lever 105 contacts the pin 96, the valve will be instantly given a partial rotation by the sudden further

movement of the parts above described, causing the openings in the valve to come into register with the pipes in the valve casing, admitting compressed air through the valve
 5 and into the blow-pipe, as above described, and almost instantly closing again. The advantages of this valve mechanism are that it operates rapidly so that the action of the air in forcing the sheet between the folding
 10 rollers may be instantaneous and also that at whatever point the press stops the valve is always closed. It is believed that the operation of the valve will be understood for the purposes of this application from the
 15 above description without further detail. It, as has been said, forms no part of my present invention, being shown and claimed in said pending application, and so far as my present invention is concerned any valve having
 20 a suitable operation might be used in its place.

The operation of the parts so far described is as follows: The frame 55 being turned so that the guides 82 may face in the direction
 25 shown in Fig. 3, the paper, longitudinally folded as above described, passes between the cutting cylinders where the sheet is creased midway between its ends and severed. The parts are so adjusted that at the moment the
 30 sheet is transversely severed the middle of the sheet with its transversely-creased edge is opposite the bite of the folding rollers 60—61. At this moment the valve 68 opens and the compressed air supplied by the pump
 35 64 causes an instantaneous and strong blast to issue from the blow-pipe in the form of a thin sheet of air, which striking the transversely-creased central line of the sheet throws it into the bite of the folding rollers,
 40 between which the sheet is folded and delivered to the S-fly, as above described. The paper thus delivered will have a longitudinal fold from coming over the former and one transverse fold—that is to say, will be
 45 folded in what is known as a "commercial fold."

Referring particularly to Figs. 3, 4 and 6, 114 indicates guides which, when the guides 82 are in the position shown in Fig. 4, are
 50 adapted to receive the sheet and guide it between tapes 115—116 which are mounted, respectively, on rollers 117 and 118, and which are driven by the gears 37—38. The roller 118 is provided with a central crease
 55 119 which coöperates with a creasing roller 120 to centrally crease the sheets delivered from the guides 82 in the manner herein-after described. 121 indicates folding rollers, which are mounted in the secondary
 60 framework 14 and are driven by gears 42—43. 122 (see Fig. 9) indicates guide-plates, which are mounted above the rollers 121 with the opening between them in alignment with the bite of the folding rollers 121.

Referring to Figs. 3 and 9, where these parts 65 are best shown, 123 indicates a box or casing which is mounted in the secondary folder frame 14 above and with its opening facing the folding rollers 121. 124 indicates a
 70 blow-pipe which is mounted in the casing 123 with its discharge opening opposite the bite of the folding rollers 121. The blow-pipe 124 is the same shape as the blow-pipe 59 above described, and is provided at its
 75 projecting edge with a narrow slit or opening 125 adapted to discharge a thin sheet of air between the folding rollers 121.

Referring to Figs. 1, 2 and 3, 126 indicates a pipe which leads upward from the pump 65 and opens into a rotary valve 127. 128 80 indicates a pipe which opens from the valve 127 into a pipe 129, which by means of short pipes 130 communicates with the interior of the blow-pipe 124 so that when the valve 127 is operated air under pressure will be dis- 85 charged into the blow-pipe 124 and out of the slot 125 between the folding rollers 121. The valve 127 is preferably exactly like the valve 68 above described and operates in the same manner—that is to say, by means of 90 toggle-joint lever mechanism 131 operated by a link 132 and plates 133—134. As these parts operate precisely as the corresponding parts in the valve hereinabove described, and by themselves form no part of my present 95 invention, it is believed that it is not necessary to further describe them here. 136 indicates the usual S-fly, which delivers the sheets folded by the rolls 121 to slow-moving 100 tapes 137. As this delivery mechanism forms no part of my present invention and any other well-known form may be used I believe it is unnecessary to describe the same here.

The parts last above described operate as 105 follows: The frame 55 having been turned in the position shown in Fig. 4 so that the guides 82 face the bit of the tapes 115—116, the paper, longitudinally folded, creased and cut, as before, passes downward through the 110 guides 81 and is folded by the blast of air issuing from the slot 63 in the blow-pipe 59 and into the bite of the folding rolls and by the folding rolls 60—61 and is delivered by said folding rolls between the guides 82 into 115 the bite of the tapes 115—116. Thus folded once longitudinally and once transversely, the paper carried along by the tapes 115—116 is centrally creased longitudinally of its present run by the creaser 120 working in the 120 peripheral groove 119 and is carried forward by the tapes over the folding rolls 121 until its forward edge is brought into contact with a stop 138 with its crease lying opposite the bite of the folding rollers 121, as is shown in 125 Fig. 9. The parts are so timed that just at this moment the valve opens and a thin sheet of air issuing from the blow-pipe 124 im-

pinges upon the crease in the paper and forces it into the bite of the folding rollers 121 by which it is given a third fold across the line of the second fold and the paper in what is known as the "mail fold" shape is delivered to the delivery mechanism. In order that the paper may be creased in the proper direction when directed into the second folding mechanism as last-above described, it will be understood of course that the blocks which carry the creasing groove 53 and crease marker 54 will be removed and interchanged so that the creasing groove will be carried on cylinder 49 and the crease marker on cylinder 50.

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

1. In a folding machine, the combination with a frame adapted to be adjusted in either one of a plurality of positions, folding rollers mounted in said frame, and pneumatic mechanism carried on said frame and having a discharge orifice opposite the bite of said folding rolls and adapted to discharge a blast of air into the bite of said folding rollers and force a sheet of paper into the bite of said folding rollers.

2. In a folding machine, the combination with a frame, guides on said frame and means for turning said frame and guides to face in either one of a plurality of positions, of folding rollers carried by said frame in registry with said guides, and pneumatic mechanism carried on said frame and having a discharge orifice opposite the bite of said folding rolls and adapted to discharge a blast of air into the bite of said folding rolls and force a sheet of paper into the bite of said folding rollers.

3. In a folding machine, the combination with a frame, guides on said frame and means for turning said frame and guides so as to face in either one of a plurality of positions, of folding rollers carried by said frame in registry with said guides, a blow-pipe carried on said frame having an opening facing the bite of said folding rollers, and means for forcing a stream of air through said opening and force a sheet of paper into the bite of said folding rollers.

4. The combination with sheet-forwarding means, a delivery and a second folding mechanism, of a frame having guides adapted to be turned either toward said delivery or said second folding mechanism, and pneumatically-operated folding mechanism mounted on said frame and adapted to fold the sheet and deliver the same to said guides.

5. The combination with sheet-forwarding means, a delivery and a second folding mechanism, of a frame, sheet guides on said frame, said frame being adapted to be turned so that said guides may be directed either toward said delivery or said second sheet folding

mechanism, folding rollers on said frame in registry with said guides, means carried by said frame for directing a blast of air into the bite of said folding rollers, and valve mechanism for controlling said air-blowing mechanism.

6. The combination with sheet-forwarding mechanism, a delivery mechanism and a second folding mechanism having folding rollers and mechanism for directing a blast of air into the bite of said folding rollers, of a frame, guides on said frame, said frame being adapted to be turned so that said guides may face either said delivery mechanism or said second folding mechanism, folding rolls carried by said frame and adapted to fold a sheet and deliver the same to said guides, a blow-pipe adapted to deliver a blast of air into the bite of said folding rolls, and valve mechanism adapted to automatically admit compressed air to said blow-pipe when the sheet is in folding relation with respect to said folding rolls.

7. The combination with cutting mechanism, crease-forming means adapted to transversely crease a sheet of paper between its front and rear margins, sheet delivery mechanism, and a mail-fold mechanism, comprising a pair of folding rollers, a blow-pipe and means for discharging a blast of air into the bite of said rollers, of a frame, folding rollers on said frame, sheet guides on said frame in registry with said folding rollers and adapted to receive a folded sheet delivered thereby, means for delivering a blast of air into the bite of said folding rollers when the transverse crease in said sheet is in registry therewith, and means for turning said frame so that said guides may face either said delivery or said mail-folding mechanism.

8. The combination with rotary cutting mechanism, crease-forming means on said cutting mechanism adapted to transversely crease a sheet of paper between its front and rear margins, sheet delivery mechanism, and a mail-fold mechanism, comprising a pair of folding rollers, a blow-pipe and means for discharging a blast of air into the bite of said rollers, of a frame, folding rollers on said frame, sheet guides on said frame in registry with said folding rollers and adapted to receive a folded sheet delivered thereby, means for delivering a blast of air into the bite of said folding rollers when the transverse crease in said sheet is in registry therewith, and means for turning said frame so that said guides may face either said delivery or said mail-folding mechanism.

9. In a folding machine, the combination with sheet-forwarding means, a delivery, and a second folding mechanism, of a frame, folding rollers mounted in said frame, means carried by said frame for forcing a sheet of paper into the bite of said folding

rollers, and means for turning said frame so that said folding rollers may forward said sheet either to said delivery mechanism or to said second folding mechanism.

- 5 10. In a folding machine, the combination with sheet forwarding mechanism, a delivery and an additional folding mechanism, of a frame, sheet guides on said frame, means for turning said frame so that said guides
10 may face toward either said delivery mech-

anism or said additional folding mechanism, folding rollers on said frame registering with said guides, and means carried by said frame for forcing a sheet of paper into the bite of said folding rollers.

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