H. M. BARBER.

VARIABLE SIZE SHEET FOLDING, CUTTING, AND DELIVERING MECHANISM.

APPLICATION FILED APR. 12, 1907.

978,537.

Patented Dec. 13, 1910.

6 SHEETS—SHEET 1.

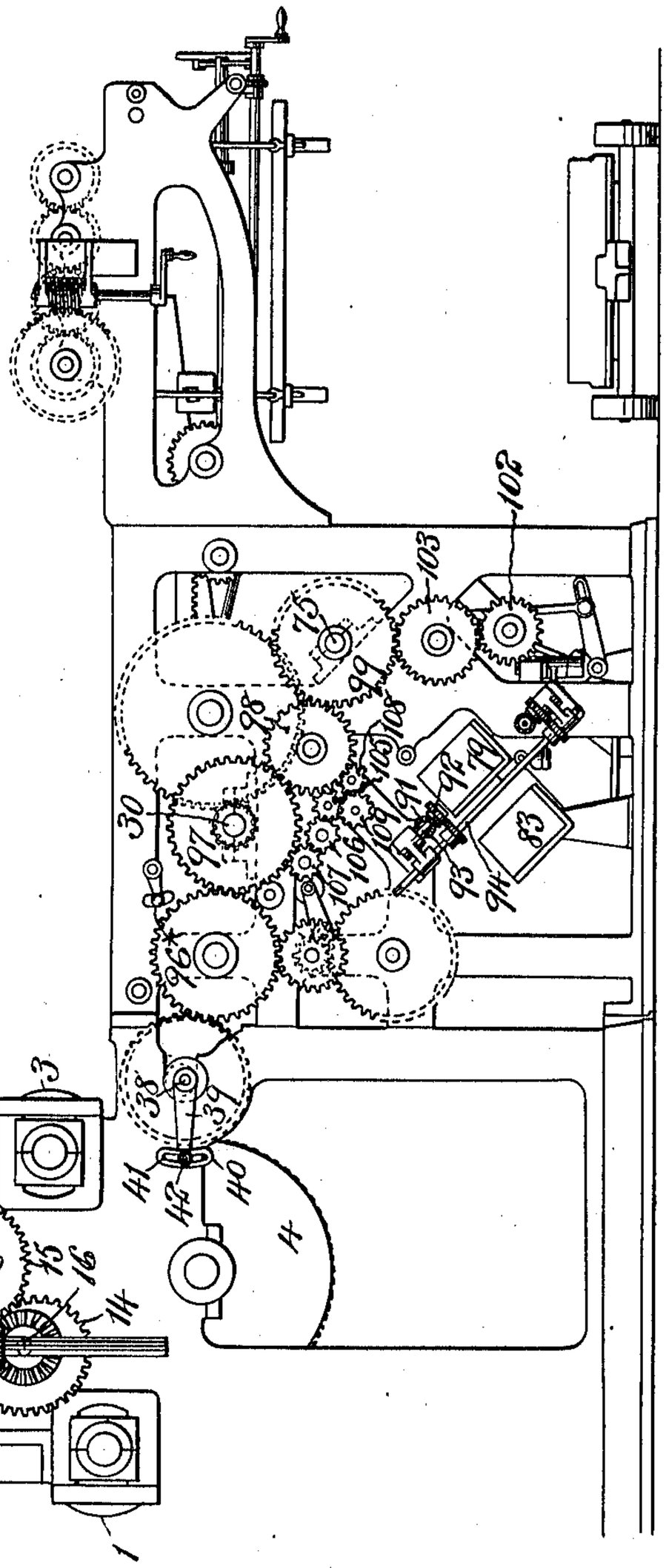

Fig. 1.

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Henry Thieme.

Inventor:
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by attorneys
Brown & Ward

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6 SHEETS—SHEET 2.

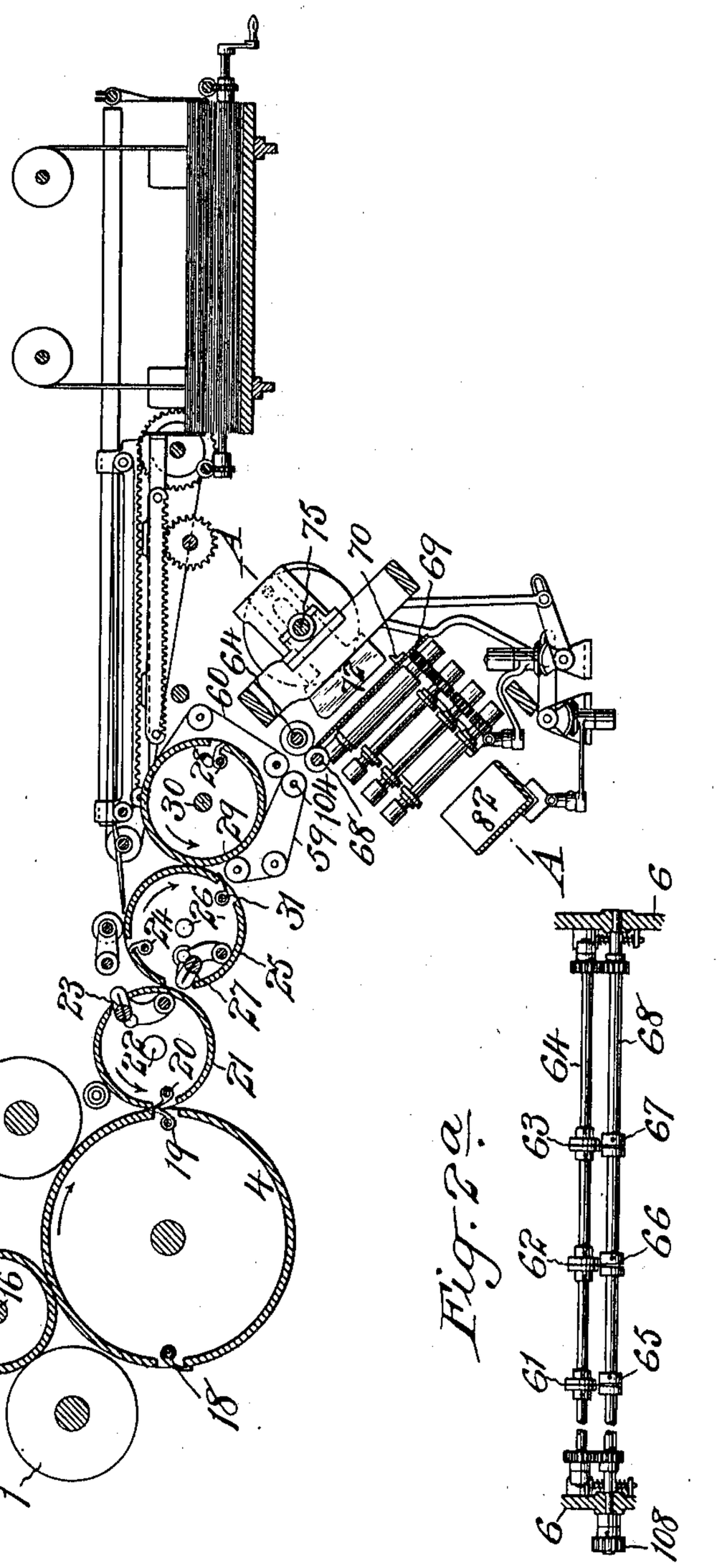

Fig. 2.

Fig. 2a.

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6 SHEETS—SHEET 3.

Fig. 3.

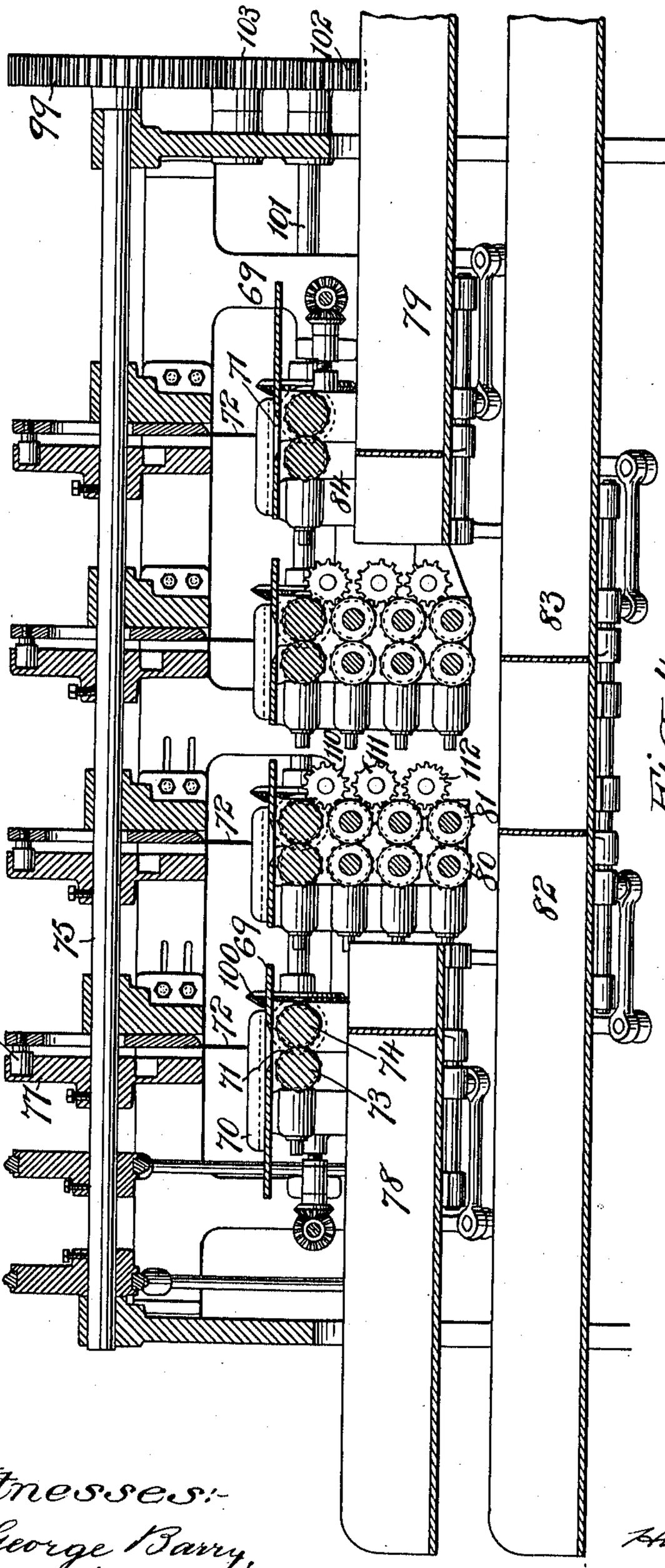
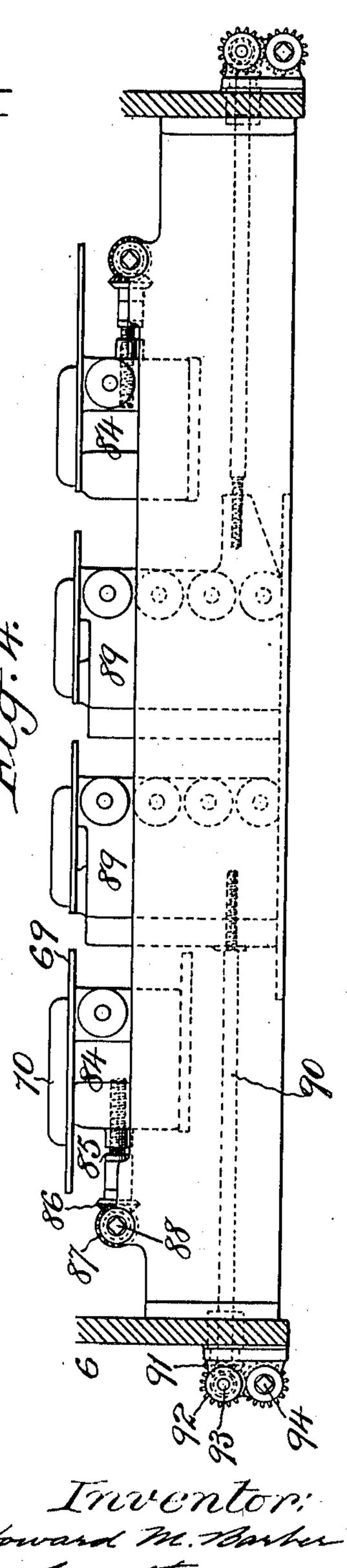


Fig. 4.



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6 SHEETS—SHEET 4.

Fig. 5.

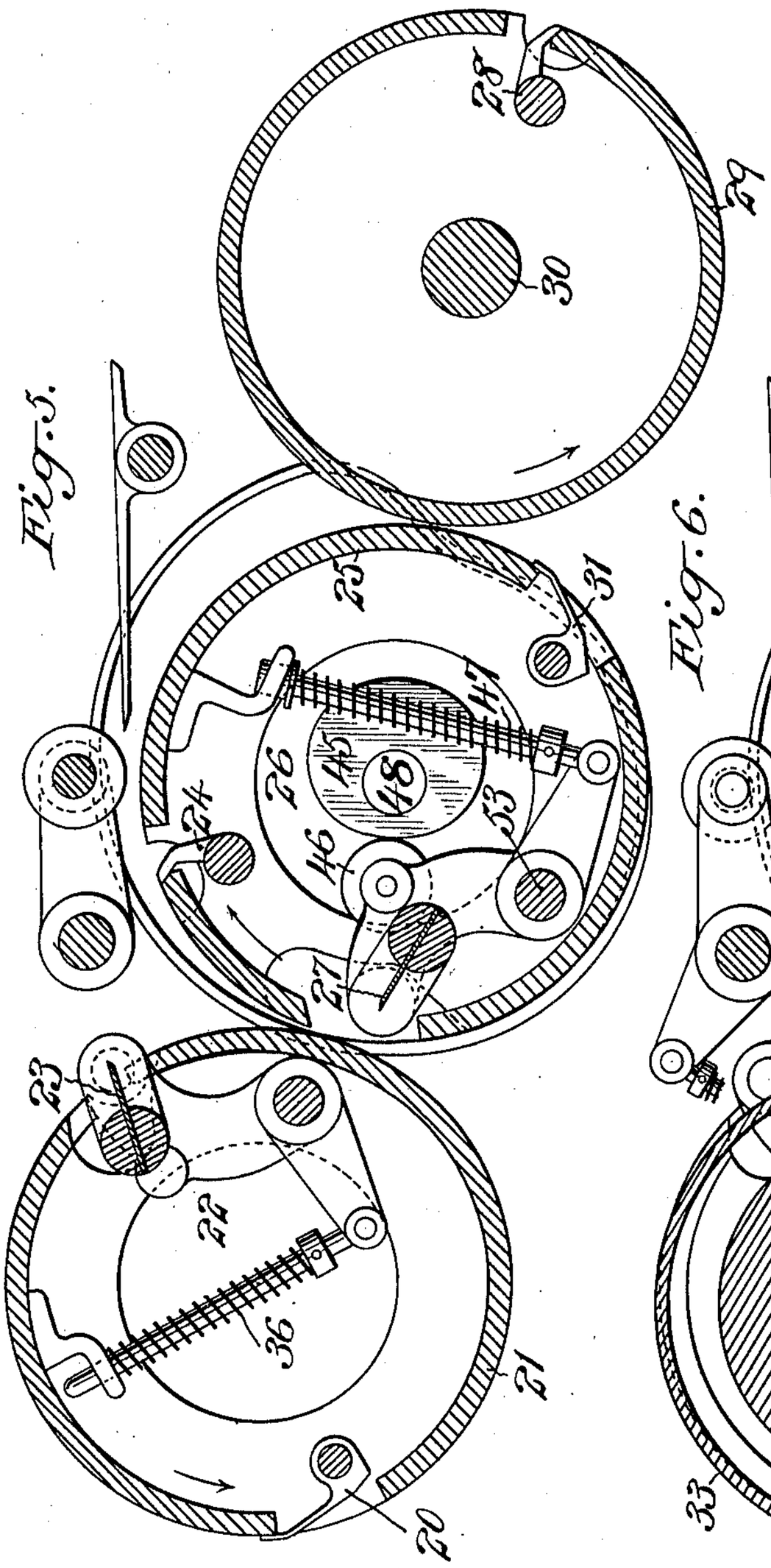
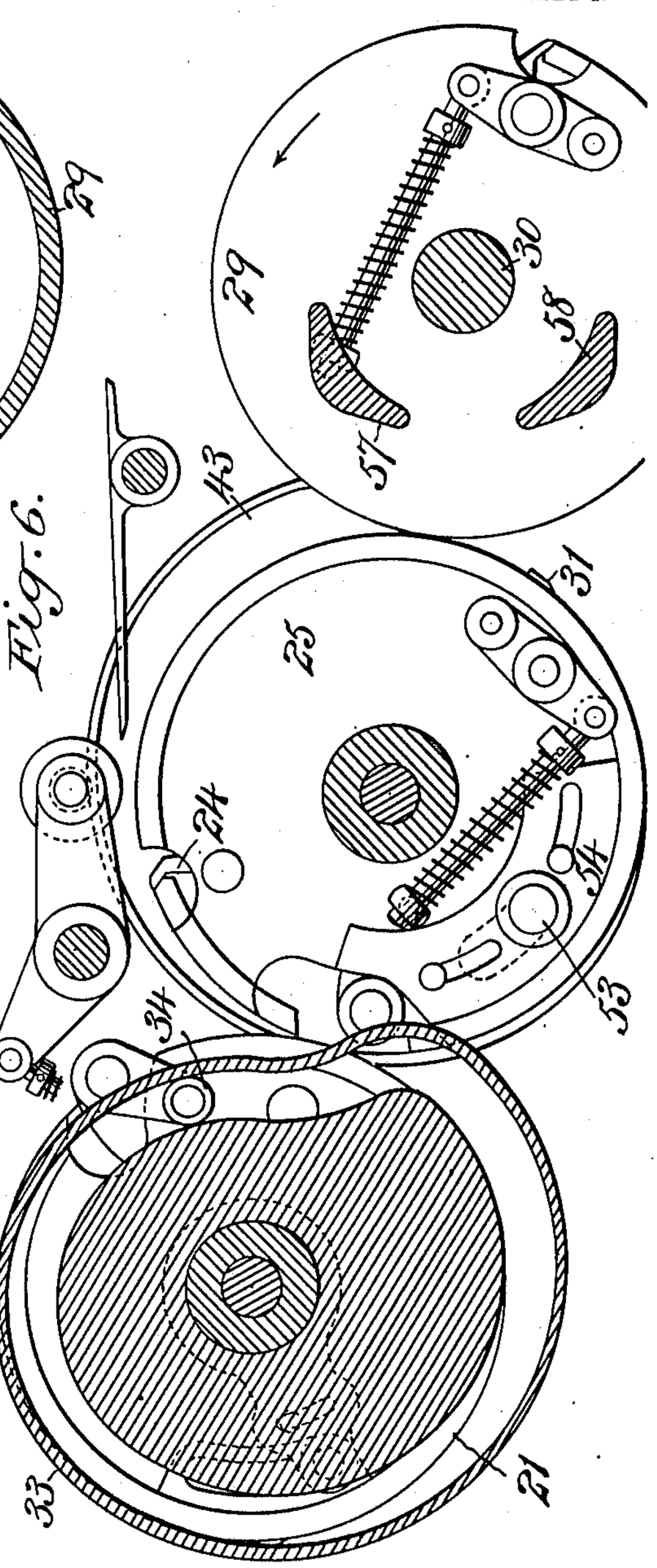


Fig. 6.



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978,537. **Patented Dec. 13, 1910.**

6 SHEETS—SHEET 5.

Fig. 8.

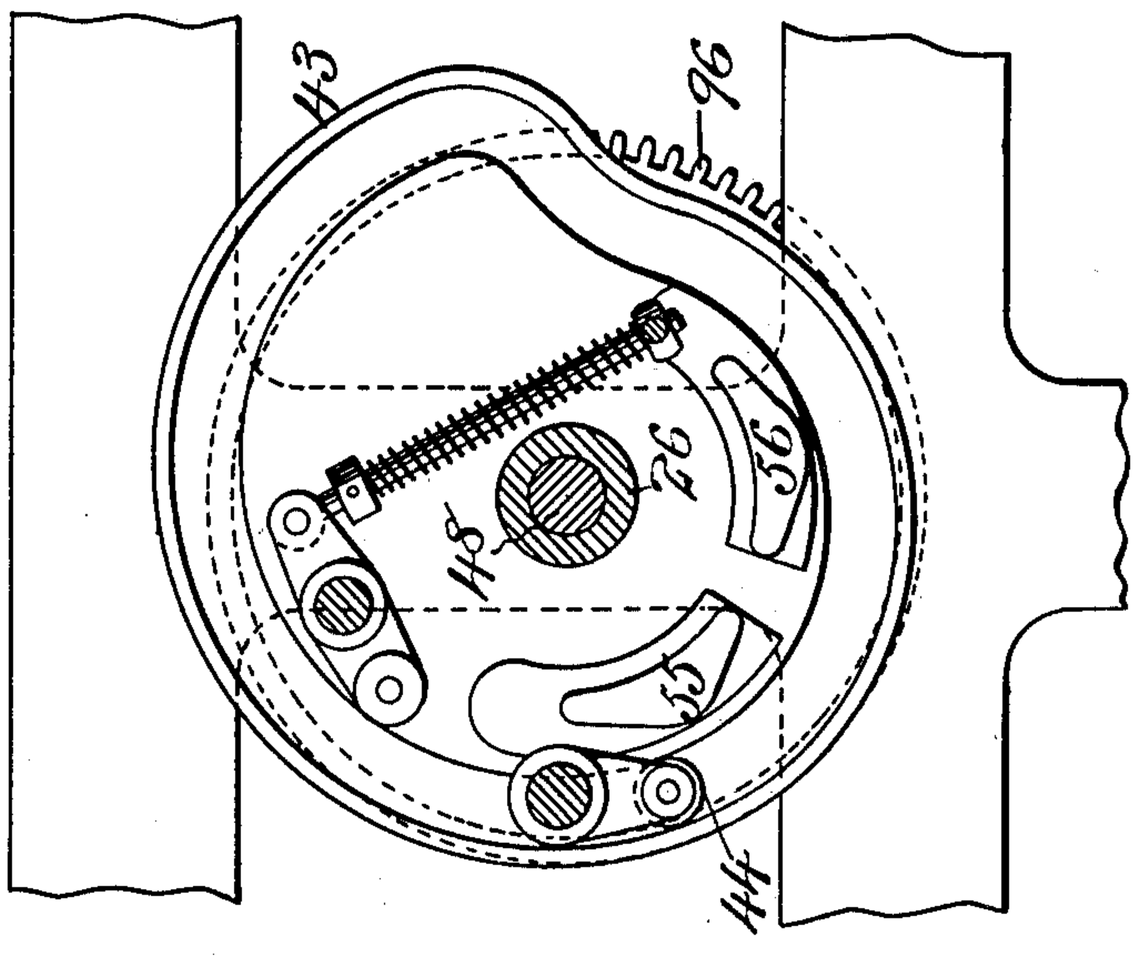
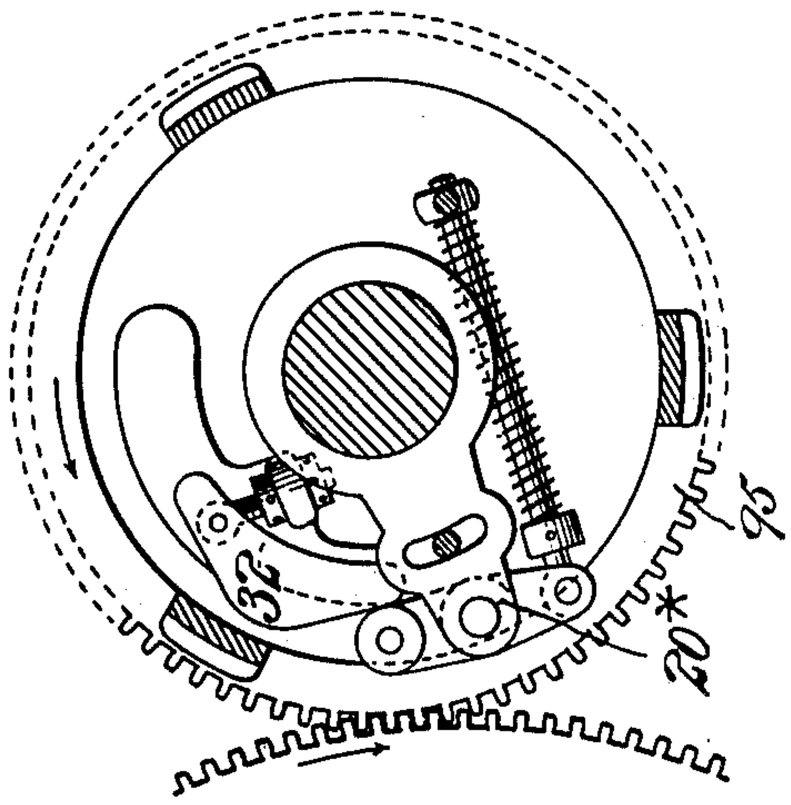


Fig. 7.



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APPLICATION FILED APR. 12, 1907.

978,537. **Patented Dec. 13, 1910.**

6 SHEETS—SHEET 6.

Fig. 10.

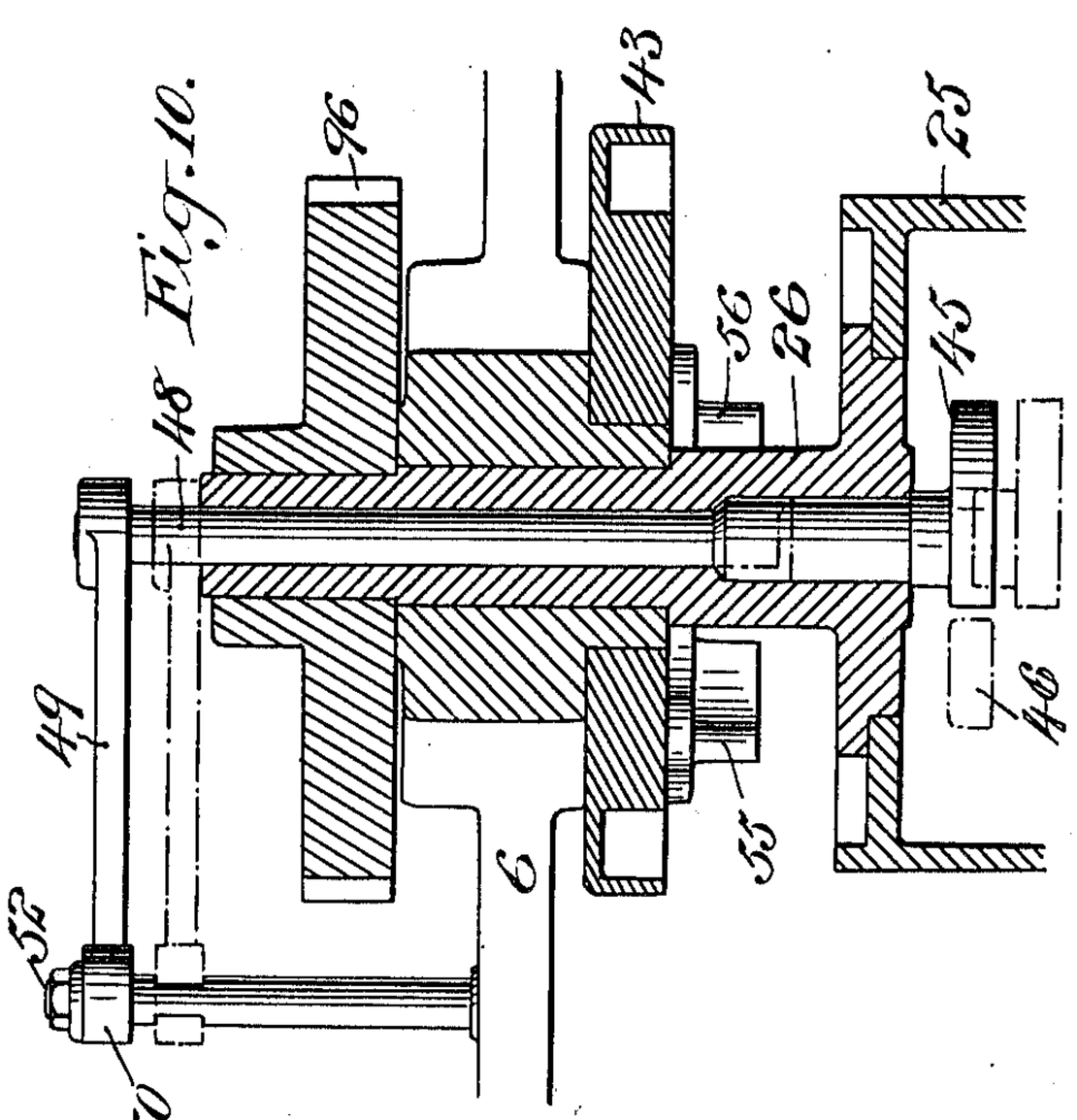


Fig. 10a.

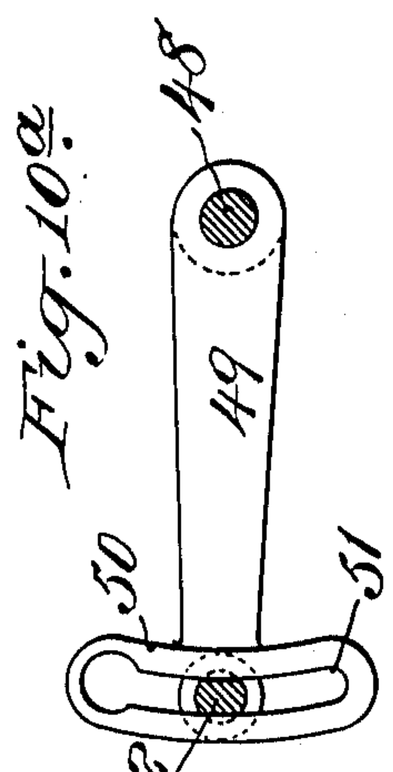


Fig. 9a.

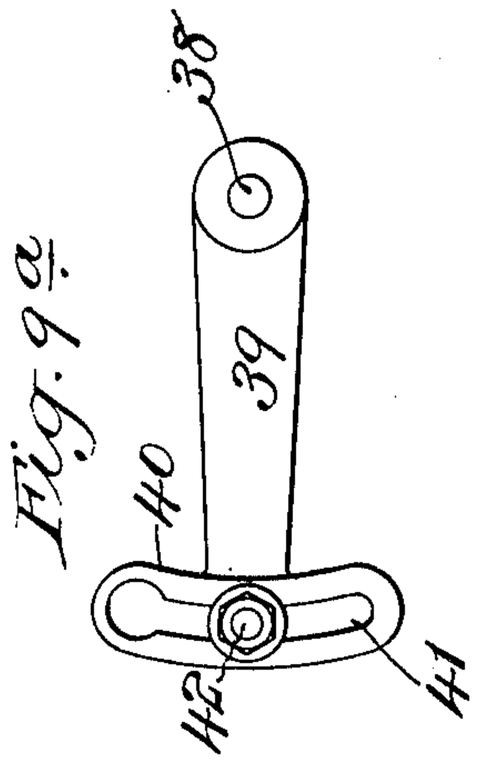
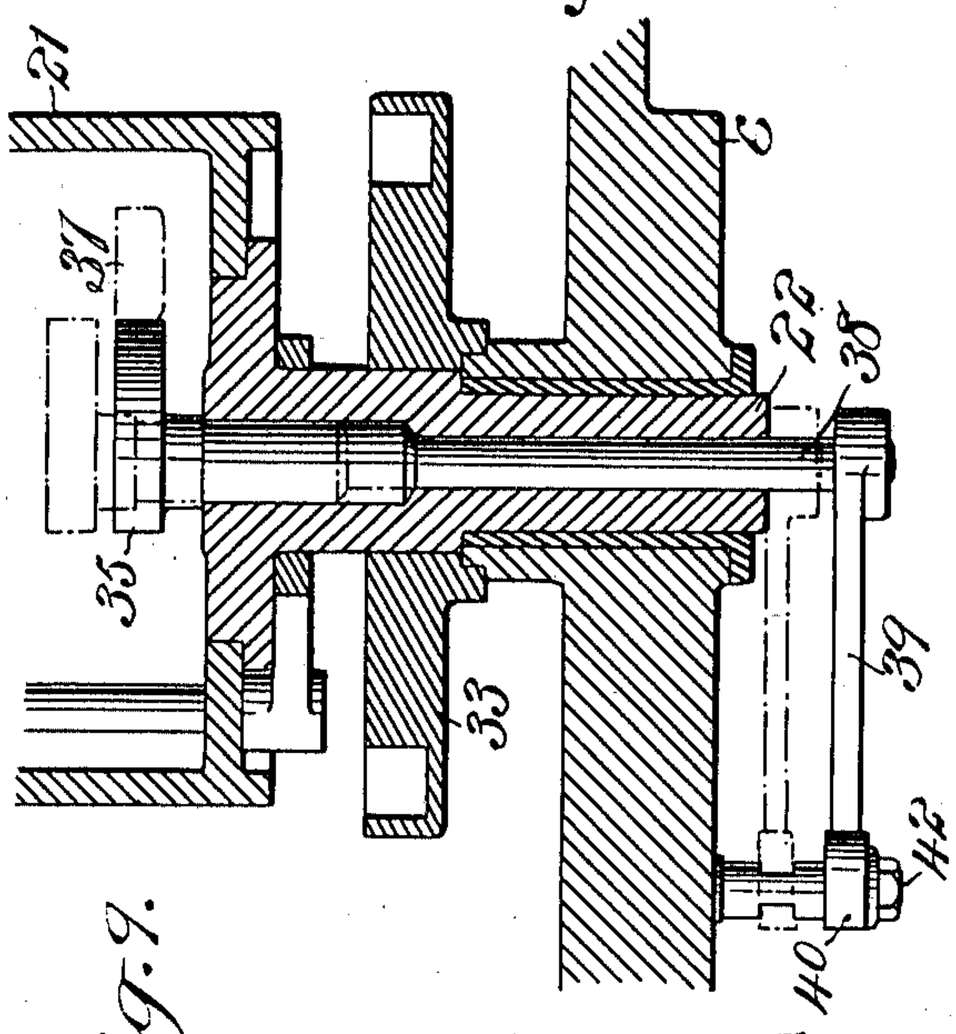


Fig. 9.



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Inventor:
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UNITED STATES PATENT OFFICE.

HOWARD M. BARBER, OF STONINGTON, CONNECTICUT, ASSIGNOR TO C. B. COTTRELL & SONS COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

VARIABLE-SIZE-SHEET FOLDING, CUTTING, AND DELIVERING MECHANISM.

978,537. Specification of Letters Patent. Patented Dec. 13, 1910.

Application filed April 12, 1907. Serial No. 367,747.

To all whom it may concern:

Be it known that I, HOWARD M. BARBER, a citizen of the United States, and resident of Stonington, in the county of New London and State of Connecticut, have invented a new and useful Improvement in Variable-Size-Sheet Folding, Cutting, and Delivering Mechanism, of which the following is a specification.

My invention consists broadly in a variable size sheet folding, cutting and delivering mechanism arranged to submit the variable size sheets to folding and cutting operations and delivering them in signatures to a predetermined point.

My invention more particularly consists in mechanisms arranged to submit the variable size sheets as they are delivered one by one from a suitable source such, for instance, as a rotary printing press, to a first fold, a second fold, then cutting the folded sheets into four sections and finally folding the sections and delivering them in four sixteen-page signatures.

The several parts of the mechanism to be hereinafter described are so arranged that they may be readily adjusted to operate upon sheets of variable sizes.

In the accompanying drawings I have represented a rotary printing press of the perfecting type, to which press variable size sheets are fed from a mechanism which will only be generally described herein as such mechanism forms the subject-matter of an application filed by me February 23, 1906, Serial No. 302,395 for variable size sheet cutting and feeding mechanism. I have also shown in connection with said printing press, mechanism arranged to deliver variable size sheets therefrom flat to a receiving board, which mechanism will not be specifically described herein as it forms the subject-matter of an application filed by me of even date herewith, Serial No. 367748, entitled "Variable size flat sheet delivery mechanism."

My present invention is devoted to the mechanism for folding, cutting and delivering variable size sheets in signatures as hereinbefore stated.

A practical embodiment of my invention is represented in the accompanying drawings in which—

Figure 1 is a view in side elevation of a rotary printing press, showing means for cutting variable size sheets from a web and feeding the same in perfect register to the printing press, mechanism for collecting, cutting and folding the variable size sheets as they come from the press and also mechanism for delivering the variable size sheets flat from the press on to a receiving board; Fig. 2 is a detail vertical section through the same, Fig. 2ª is a detail front view of the sheet slitters; Fig. 3 is a transverse section on an enlarged scale, through the sheet folding and delivery mechanism taken in the plane of the line A—A of Fig. 2; Fig. 4 is a detail outside view of the same; Fig. 5 is an enlarged detail section through the tucking cylinder, the folding and tucking cylinder and the second folding cylinder Fig. 6 is a detail section showing the cam for controlling the floating movement of the tucking cylinder blade and the cams for controlling the opening of the folding grippers on the second folding cylinder; Fig. 7 is a detail section showing the cam for opening the grippers on the tucking cylinder. Fig. 8 is a detail section showing the cam for controlling the floating of the blade on the combined folding and tucking cylinder and the cams for opening the folding grippers on said cylinder. Fig. 9 is a detail section showing the mechanism for operating the cam for controlling the outward movement of the tucking blade on the tucking cylinder; Fig. 9ª is a detail view of the means for adjusting the position of the cam; Fig. 10 is a detail section showing the means for operating the cam for controlling the outward movement of the blade on the folding and tucking cylinder, and Fig. 10ª is a detail view showing the means for adjusting the position of the cam.

The first plate cylinder is denoted by 1 and its impression cylinder by 2. The second plate cylinder is denoted by 3 and its impression cylinder by 4. Variable size sheets are fed to the printing cylinders in the present instance by providing a vertically adjustable carriage 5 mounted in the side frames 6, which carriage carries the web feeding rolls 7, 8, 9, 10 and the rotary cutters 11, 12. A cylinder 13 for feeding the variable size sheets from the cutters to the first impression cylinder 2 is mounted in the side frames 6 and is driven at varying surface speeds through lobed gears 14, 15, from the shaft 16 of the first impression

cylinder. The second impression cylinder 4 is provided with two sets of grippers, 18, 19, which are arranged to transfer the advance edges of the sheets successively one at a time to the set of grippers 20 carried by the tucking cylinder 21 of my improved variable size sheet folding, cutting and delivering mechanism. The shaft of this tucking cylinder 21 is denoted by 22 and it is mounted in suitable bearings in the side frames 6. The tucking cylinder 21 is provided with a tucking blade 23 which is arranged to coact with a set of folding grippers 24 carried by the folding and tucking cylinder 25. The shaft 26 of this folding and tucking cylinder 25 is mounted in suitable bearings in the side frames 6. This folding and tucking cylinder 25 is also provided with a tucking blade 27 which is arranged to coact with a set of folding grippers 28 carried by the second folding cylinder 29. The shaft 30 of this second folding cylinder is mounted to rotate in suitable bearings in the side frames 6. A set of grippers 31 on the folding and tucking cylinder 25 is utilized when the mechanism is used in connection with a variable size flat sheet delivery but is not used in my present mechanism.

A stationary cam 32 is arranged in position to open the set of grippers 20 to release the sheet as it is being folded off on to the cylinder 25, the said cam being so located that the grippers 20 will at the same time that they release one sheet, receive another sheet from the next succeeding set of grippers on the second impression cylinder of the press. The support 20* for the grippers 20 is rotatively adjustable so as to cause the cam 32 to open the grippers at the proper time for a predetermined length of sheet delivered from the second impression cylinder. A box cam 33 is arranged in position to receive the truck roll 34 of the tucking blade 23 for controlling the floating of the said blade. A rotatively adjustable cam 35 is located within the cylinder 21 in position to impart the outward movement to the tucking blade 23 against the tension of its spring 36, the truck roller 37 of the said tucking blade being shown in dotted lines in Fig. 9. The spindle 38 of this cam 35 extends through the shaft 22 and is provided with an arm 39 which has a crosshead 40 provided with a transversely elongated slot 41 through which extends a stationary locking bolt 42 for securing the cam in the desired position to operate the tucking blade 23 at the proper time for sheets of various sizes.

A box cam 43 is arranged in position to receive the truck roll 44 of the tucking blade 27 of the combined folding and tucking cylinder for floating the said blade. A rotatively adjustable cam 45 is located within the cylinder 25 in position to engage the truck roll 46 of the tucking blade 27 to impart the outward movement to the said tucking blade against the tension of its spring 47. The spindle 48 of this cam 45 extends through the shaft 26 and is provided with an arm 49 having a transverse head 50 provided with a transversely elongated slot 51 through which a stationary locking bolt 52 extends for securing the cam in the proper position to impart the outward movement to the tucking blade 27 at the proper time to fold off sheets of various sizes. The rock shaft 53 of this tucking blade 27 is mounted in a rotatively adjustable plate 54 for bringing the tucking blade into the proper position with respect to its folding grippers 28 on the second folding cylinder 29.

A stationary cam 55 is arranged in position to open the folding grippers 24 at the proper time to receive the tucking blade 23 and a stationary cam 56 is arranged in position to open the grippers 24 at the proper time to release the folded sheet as the tucking blade 27 tucks the folded sheet into the folding grippers 28. A stationary cam 57 is arranged in position to open the folding grippers 28 to receive the tucking blade 27 and a second stationary cam 58 is arranged in position to open the folding grippers 28 to deliver the sheet after its second fold between the sheet carrying tapes 59, 60.

The device for cutting the twice folded sheet into a plurality of sections comprises slitters arranged in position to receive the folded sheets as they are fed from the tapes 59, 60. In the present instance I have shown three slitting disks 61, 62, 63, adjustable along their shaft 64 and arranged to coact with their adjustable slitting blocks 65, 66, 67 on the shaft 68. The folded sections are delivered from the slitters on to the inclined folding table 69 against the stops 70. Each section of the folding table is provided with a slot 71 through which the folded sheet section is conducted by a reciprocating folding blade 72 into engagement with a pair of folding rolls 73, 74. The longitudinal folding blades 72 are guided in their movement on the shaft 75 and are provided with truck rollers 76 which enter the grooves of box cams 77 fixed to rotate with the said shaft 75. The two end pairs of folding rolls 73, 74 are arranged to deliver the folded signatures directly into pockets 78, 79, while the two intermediate pairs of folding rolls are arranged to feed the signatures to a plurality of sets of delivery pulleys 80, 81, which are arranged to deliver the signatures into the pockets 82, 83. The four sets of folding rolls 73, 74 are adjusted independently of each other. The supports 84 for the said two outer pairs of folding rolls 73, 74 are adjusted by means of adjusting screws 85 having a bevel gear

engagement 86, 87 with a shaft 88 which is provided with means for the attachment of a crank not shown herein. The supports 89 for the two inner pairs of folding rolls 73, 74 and the sets of delivery pulleys 80, 81 are adjusted by means of an adjusting screw 90 having a bevel gear engagement 91, 92, with a shaft 93 which is geared to a shaft 94 having means for the attachment of a crank handle not shown herein. The longitudinally reciprocating tucking blades 72 and their operating cams may be adjusted along the shaft 75 to correspond with the adjustments of their coacting sets of folding rolls.

The train of gearing for driving the several parts of the variable size sheet folding and cutting mechanism comprises a gear 95 fixed to the tucking cylinder 21 which meshes with a gear 96 on the shaft 26 of the combined folding and tucking cylinder 25. A gear 96 carried by the shaft of the cylinder 25, meshes with a gear 97 on the shaft 30 of the second folding cylinder 29. This gear 97 drives the shaft 75 of the final folding mechanism through an idler gear 98 which meshes with a gear 99 fast on said shaft 75. The several sets of folding rolls 73, 74, are driven from bevel gears 100 on a cross shaft 101 which is provided with a gear 102 driven from an idler gear 103 meshing with the gear 99. The tapes 59 are driven by providing the shaft 104 on one of the sets of pulleys with a gear 105 which meshes with a gear 106, the gear 106 in turn meshing with a gear 107 which meshes with the gear 97.

The shaft 68 of the slitting mechanism is provided with a gear 108 which meshes with a gear 109 driven by the gear 105. The two inner sets of folding rolls 73, 74, drive their series of delivery rolls 80, 81, through intermediate gears 110, 111, 112 which form connections between the gears on the several shafts of the said rolls.

In operation, the leading edge of each sheet as it comes from the second impression cylinder is engaged by the grippers 20 of the tucking cylinder 21, the grippers being opened at the proper time by the cam 32. When the cylinder 21 has rotated a sufficient distance to bring the tucking blade 23 opposite the middle of the sheet, the tucking blade is moved outwardly to tuck the sheet into the folding grippers 24 on the combined folding and tucking cylinder 25, the grippers 24 being opened at the proper time to receive the tucking blade 23 by the stationary cam 55. At the same time, the advance edge of the sheet is released by the opening of the grippers 20 for receiving the succeeding sheet from the second impression cylinder. When the cylinder 25 has rotated a sufficient distance to bring the tucking blade 27 opposite the middle of the folded sheet, the tucking blade will be moved outwardly for tucking the folded sheet into the folding grippers 28 of the second folding cylinder 29, the said grippers 28 being opened at the proper time to receive the tucking blade 27, by the stationary cam 57. The stationary cam 56 is arranged in position to open the folding grippers 24 of the cylinder 25 at the proper time to release the folded sheet to permit its transfer to the cylinder 29. The stationary cam 58 is arranged in position to open the folding grippers 28 at the proper time to deliver the twice folded sheet between the tapes 59, 60. These tapes will deliver the twice folded sheet to the slitting mechanism where the sheet will be divided into sections. These sections are delivered to the final folding device, which folding device is arranged to fold each section at right angles to the first and second folds and deliver the folded signatures to the pockets 78, 79, 82, 83.

It will be seen that the several cams for operating the sheet grippers, the tucking blades and the folding grippers are so arranged that sheets of various sizes delivered from the press may be folded, cut and again folded as hereinabove described.

What I claim is:

1. Mechanism for folding variable size sheets comprising three cylinders, sheet engaging grippers and a tucking blade on the first cylinder, folding grippers and a tucking blade on the second cylinder, folding grippers on the third cylinder, means for adjusting the time of operation of the several coacting parts, slitters arranged to receive the twice folded sheet from the third cylinder and cut it into four sections and folding devices for imparting a fold to each of the said sections.

2. Mechanism for folding variable size sheets comprising three cylinders, sheet engaging grippers and a tucking blade on the first cylinder, folding grippers and a tucking blade on the second cylinder, folding grippers on the third cylinder, means for adjusting the time of operation of the several coacting parts, slitters arranged to receive the twice folded sheet from the third cylinder and cut it into four sections, folding devices for imparting a fold to each of the said sections and means for adjusting the folding devices independently of each other.

3. A plurality of sheet folding devices each comprising a folding blade and folding rolls, a pocket for receiving the folded sheets directly from the folding rolls of one folding device, another pocket and delivery pulleys for delivering the folded sheets from the folding rolls of another folding device into said last named pocket, and means for adjusting the folding devices independently of each other.

4. Folding mechanism consisting of two

outer and two inner folding devices each folding device comprising a folding blade and folding rolls, pockets for receiving the folded sheets directly from the folding rolls of the two outer folding devices, other pockets and delivery pulleys for delivering the folded sheets from the folding rolls of the two inner folding devices to the last named pockets.

5. Folding mechanism consisting of two outer and two inner folding devices each folding device comprising a folding blade and folding rolls, pockets for receiving the folded sheets directly from the folding rolls of the two outer folding devices, other pockets and delivery pulleys for delivering the folded sheets from the folding rolls of the two inner folding devices to the last named pockets and means for adjusting the folding devices independently of each other.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two witnesses, this 15th day of January 1907.

HOWARD M. BARBER.

Witnesses:
A. R. STILLMAN,
G. BURDICK.