

No. 637,598.

Patented Nov. 21, 1899.

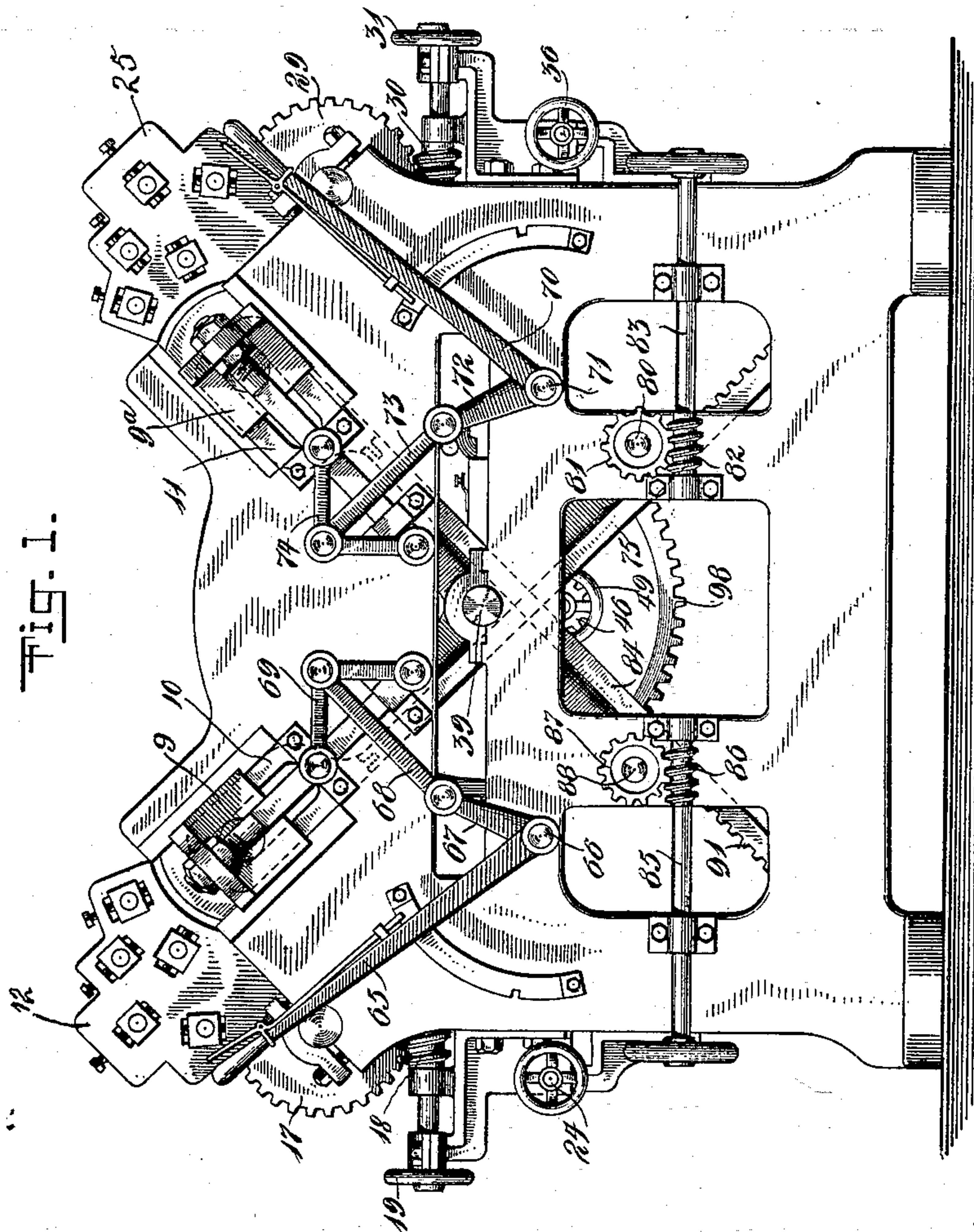
E. HETT.

MECHANISM FOR MAKING PRINTING SURFACES.

(Application filed Jan. 3, 1899.)

(No Model.)

8 Sheets—Sheet 1.



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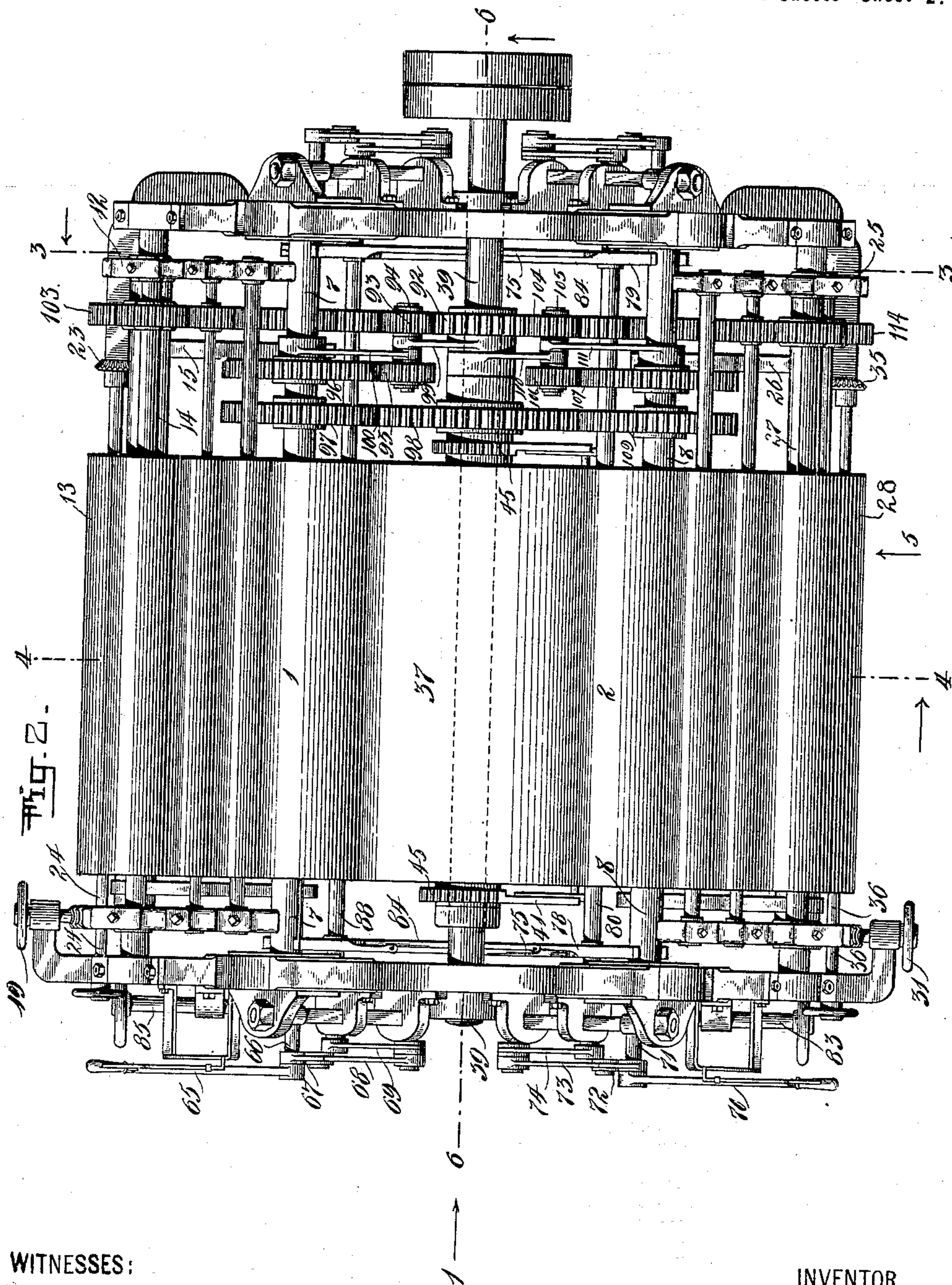
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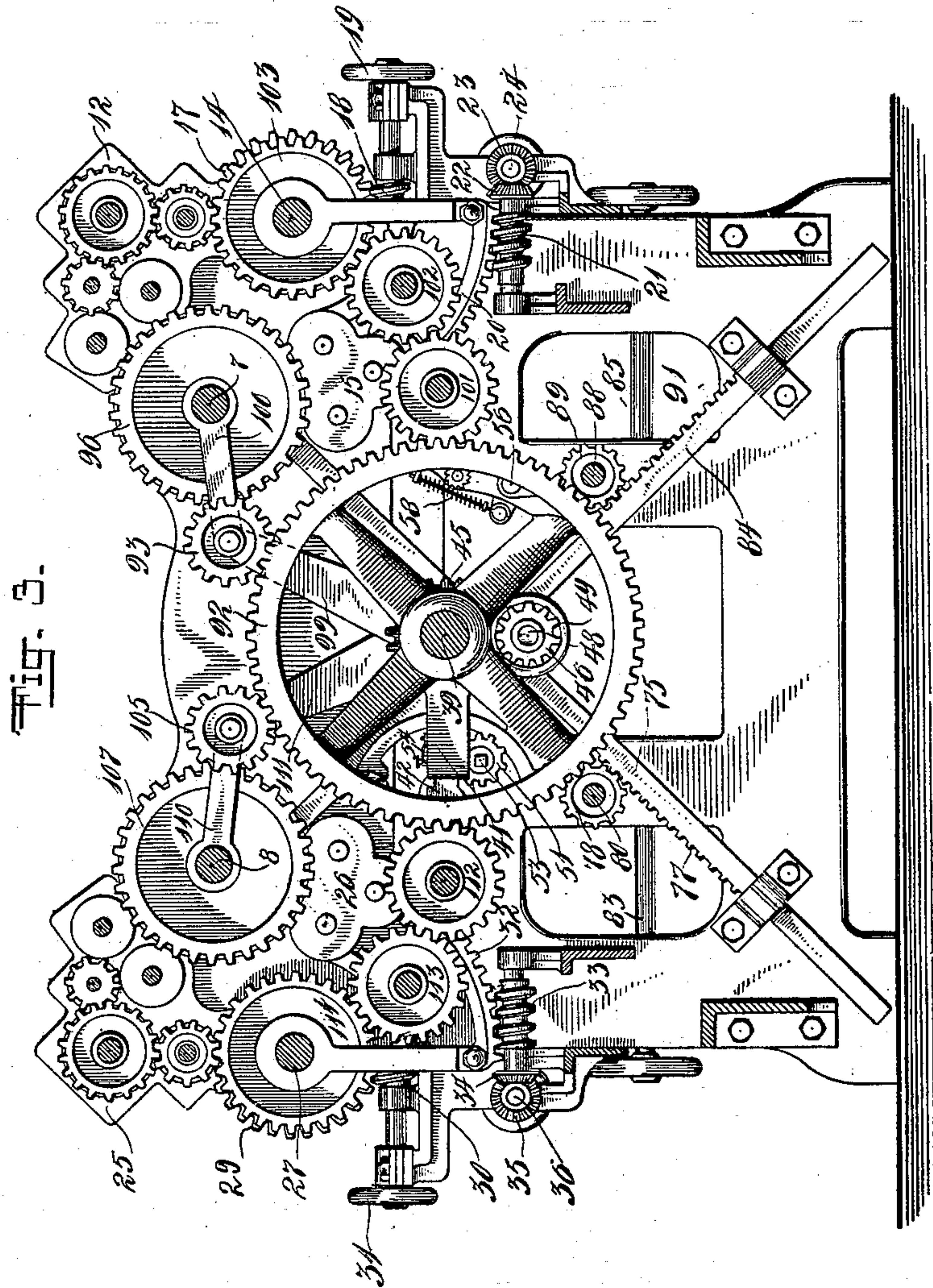
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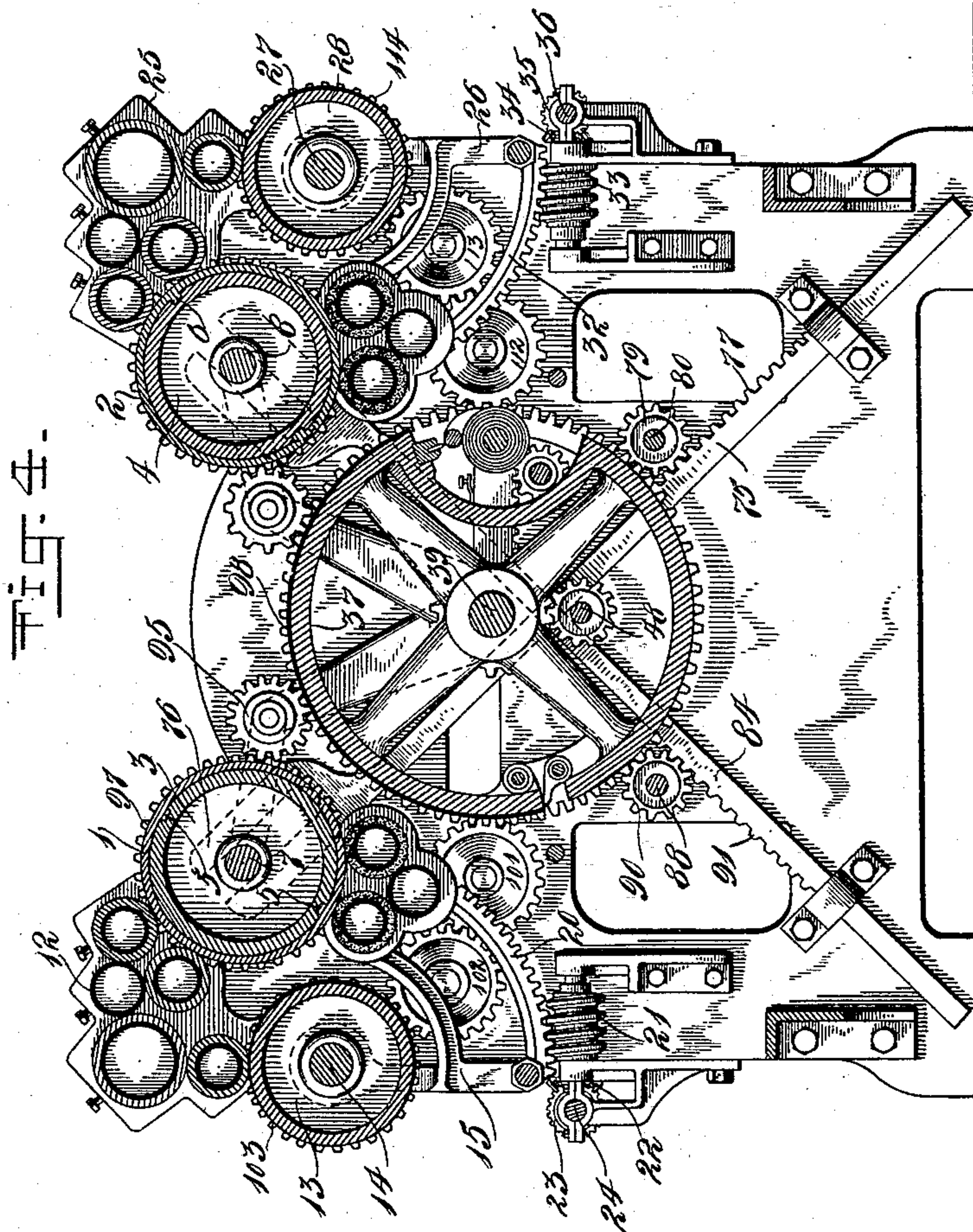
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8 Sheets—Sheet 4.



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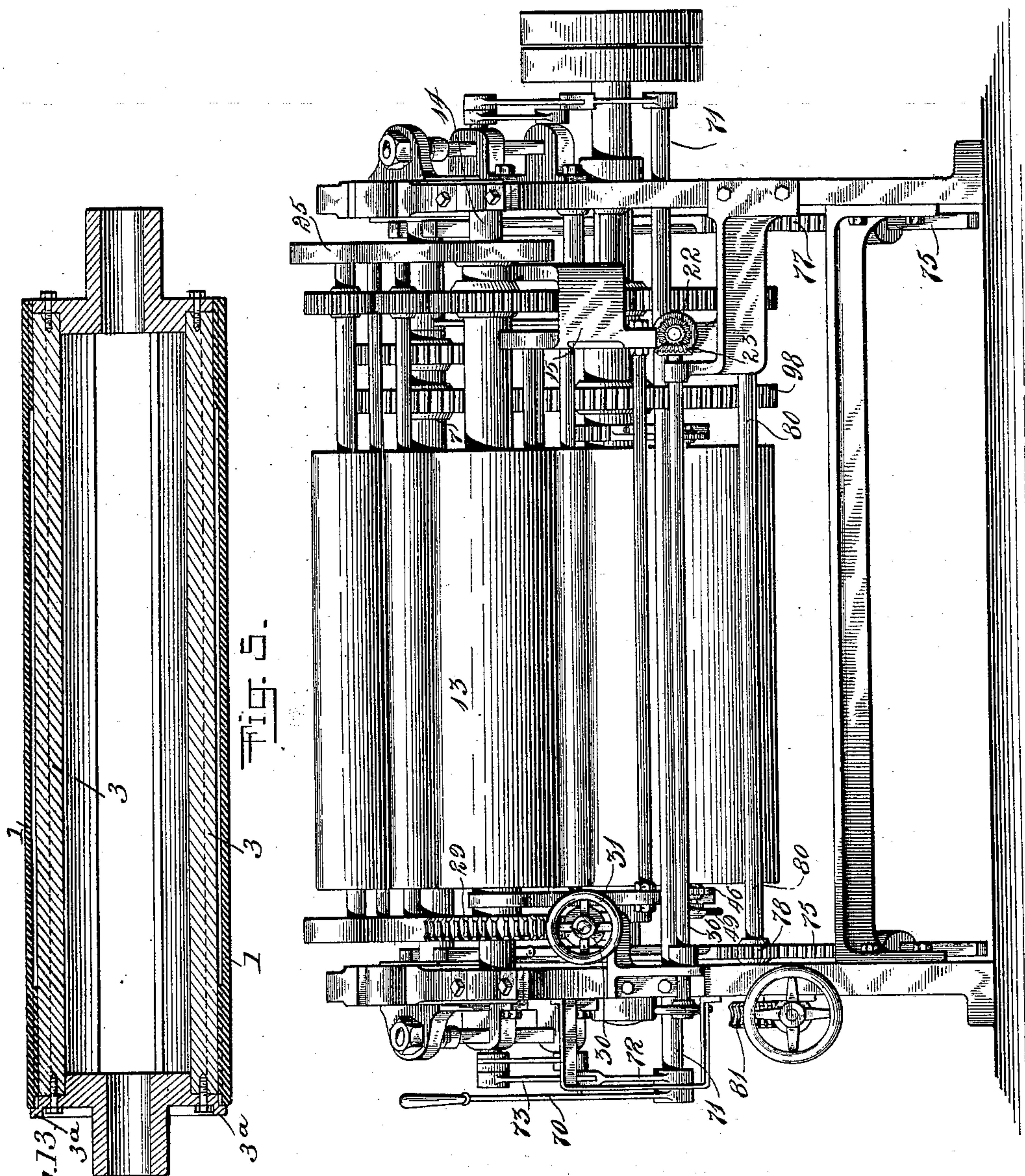


Fig. 13.

Fig. 5.

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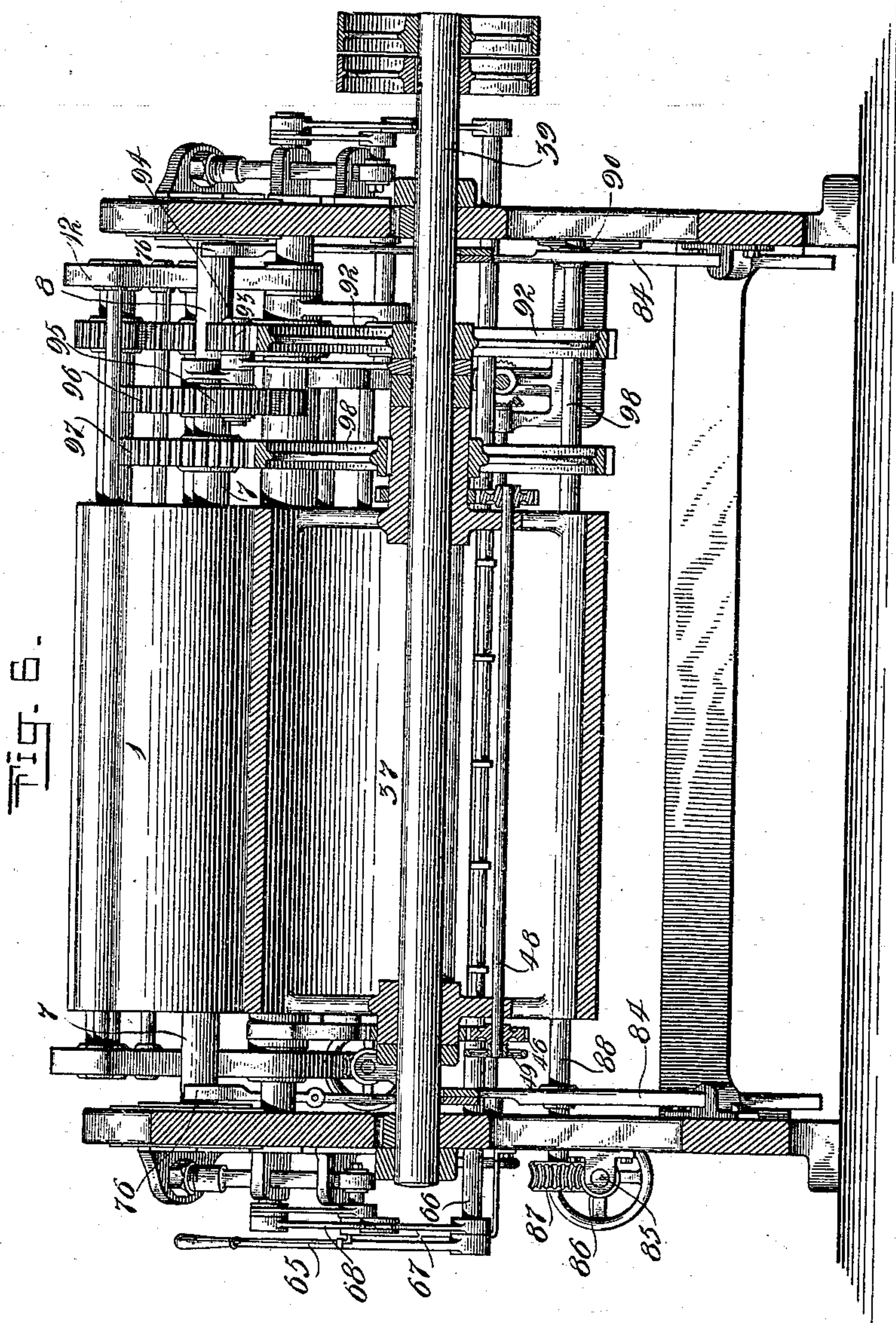
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(Application filed Jan. 3, 1899.)

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8 Sheets—Sheet 6.



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Fig. 6.

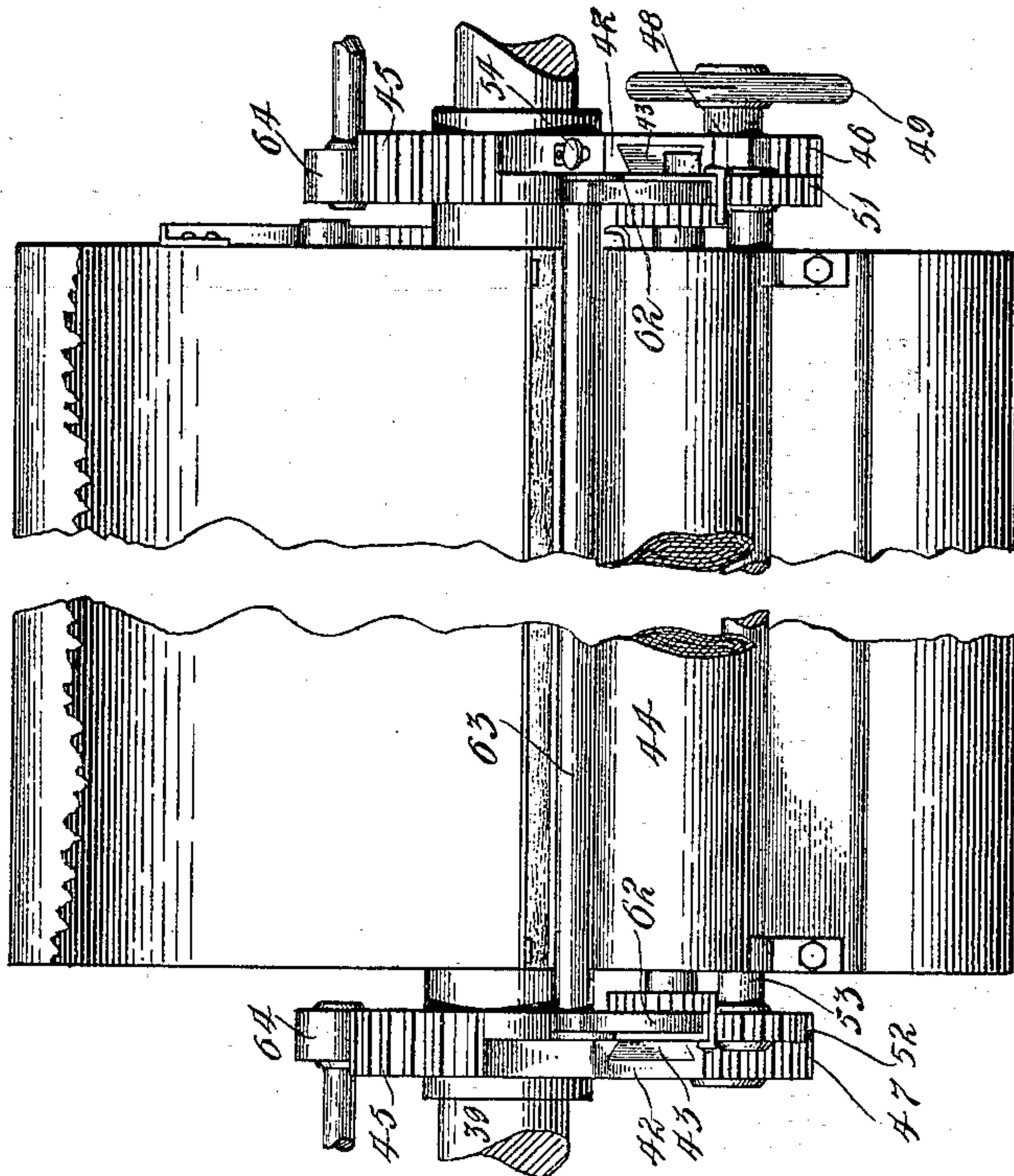
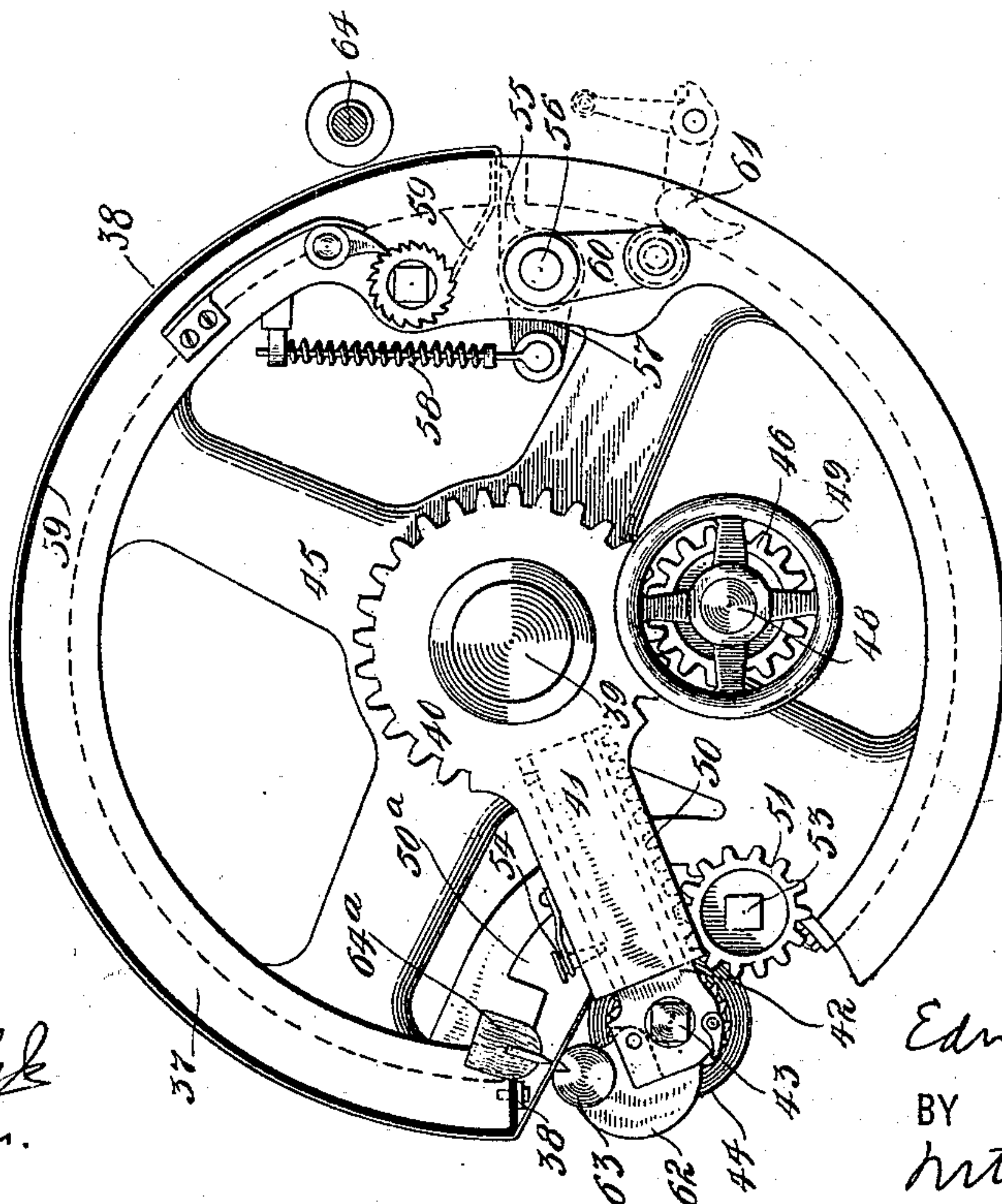


Fig. 7.



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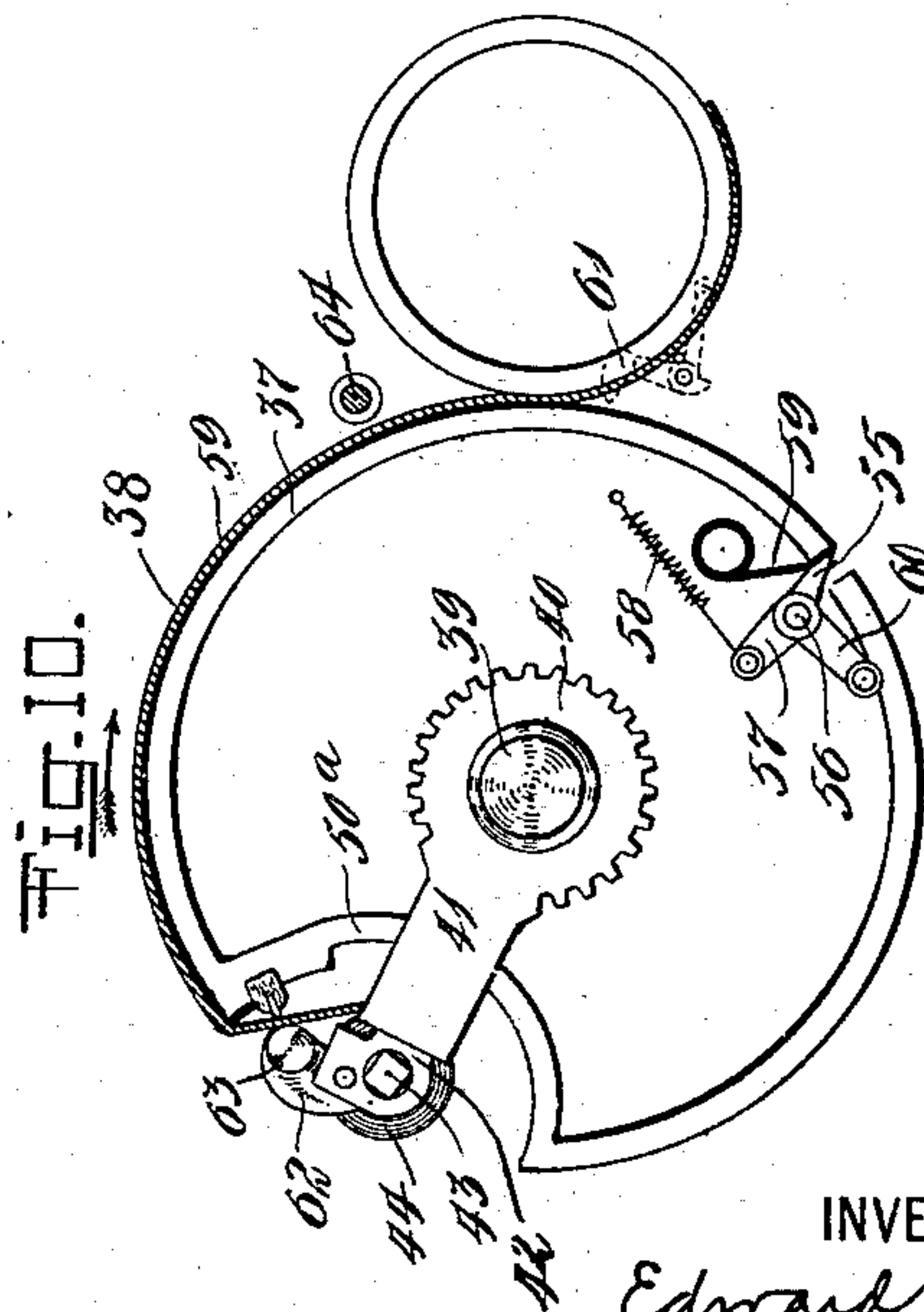
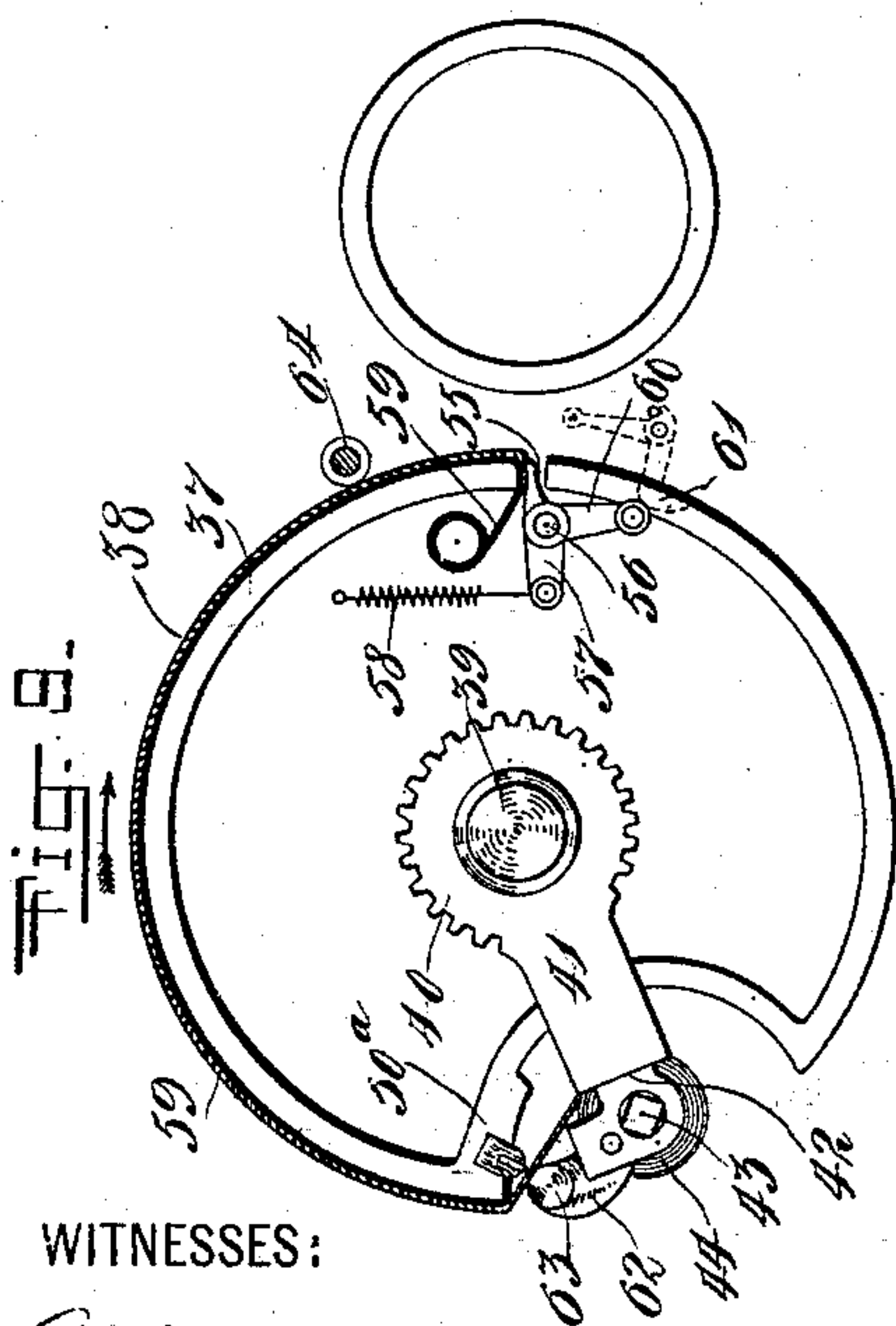
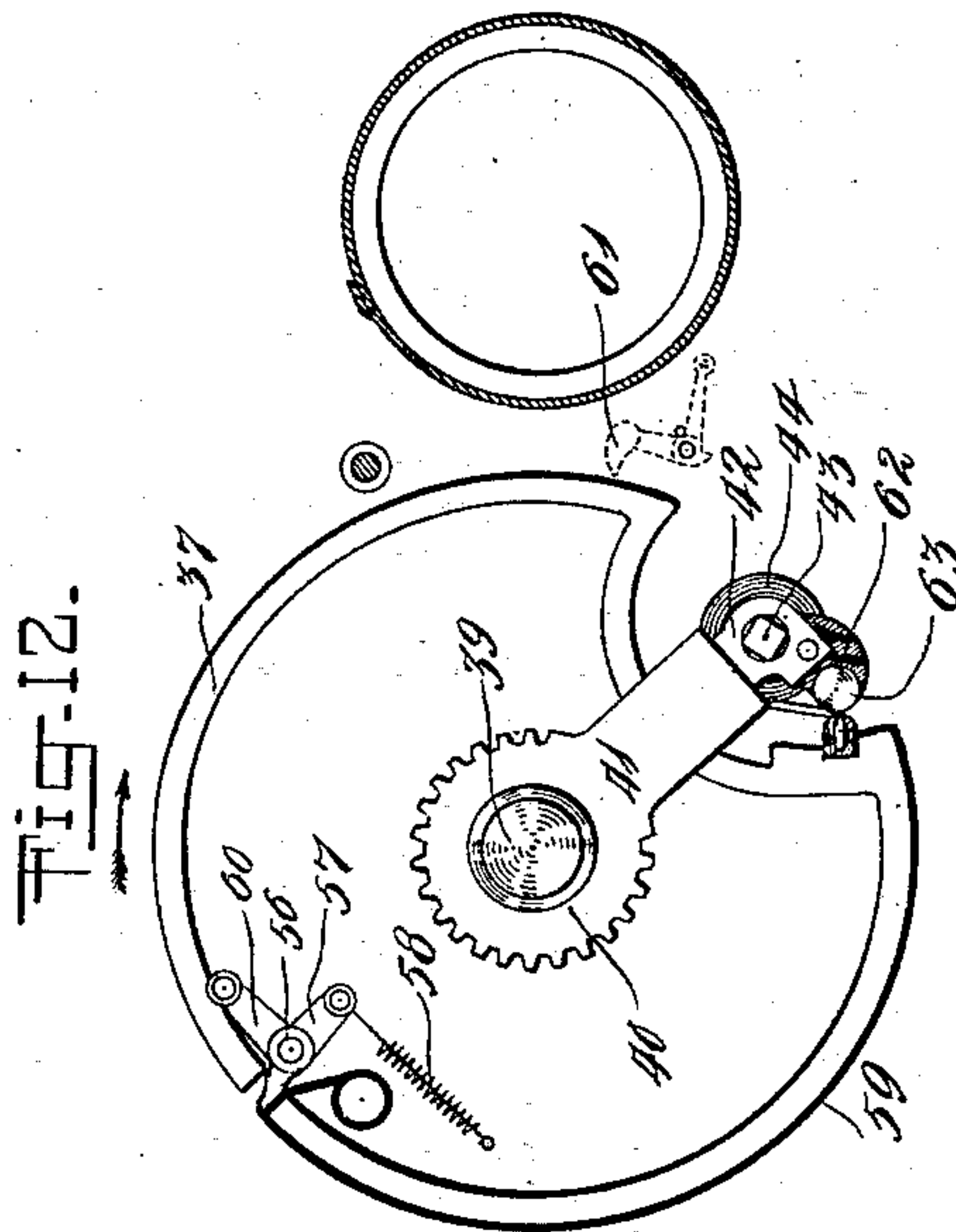
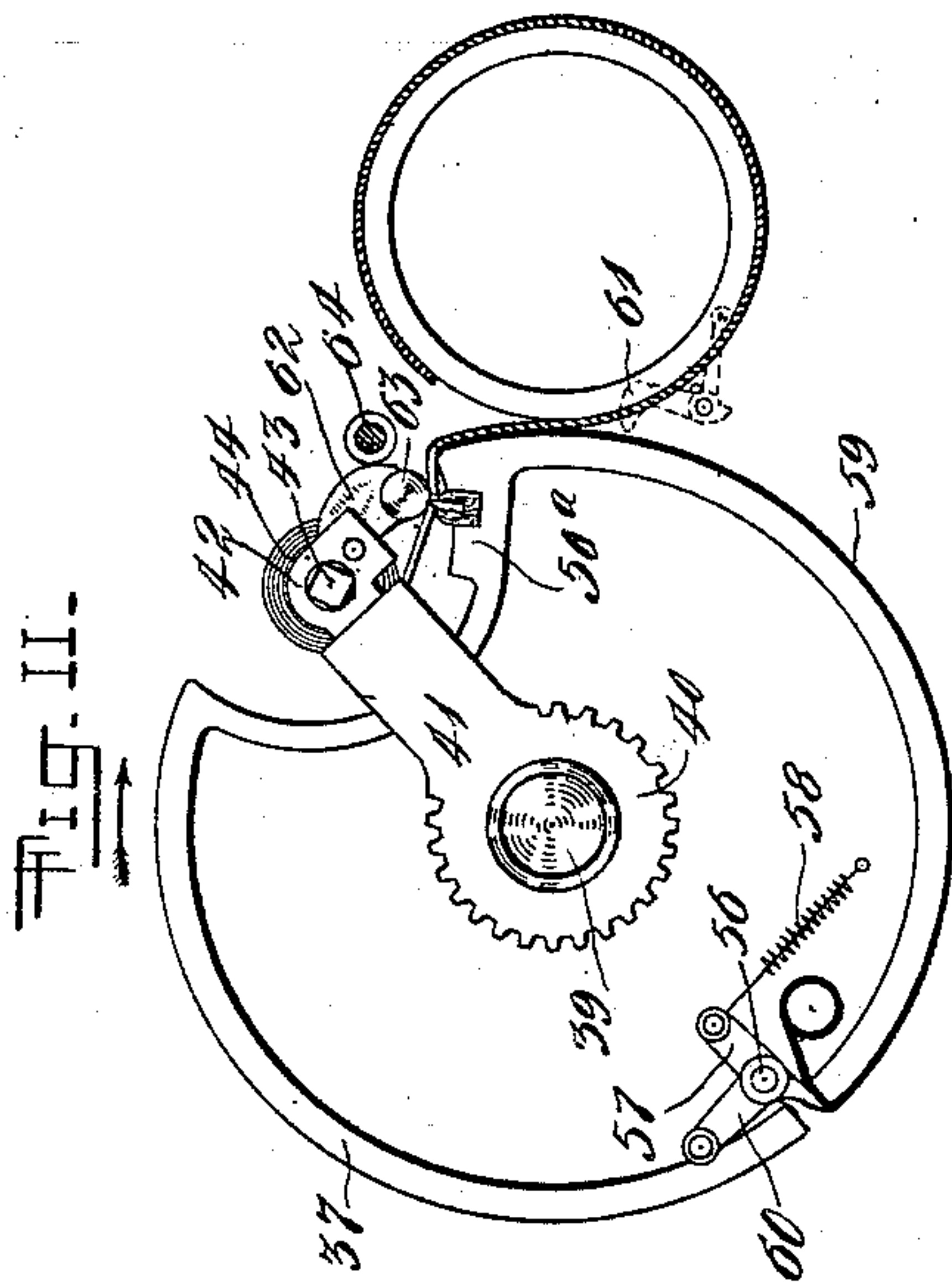
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(Application filed Jan. 3, 1899.)

(No Model.)

8 Sheets—Sheet 8.



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# UNITED STATES PATENT OFFICE.

EDWARD HETT, OF NEW YORK, N. Y.

## MECHANISM FOR MAKING PRINTING-SURFACES.

SPECIFICATION forming part of Letters Patent No. 637,598, dated November 21, 1899.

Application filed January 3, 1899. Serial No. 700,922. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD HETT, a citizen of the United States, and a resident of New York, (New Dorp,) in the county of Richmond, State of New York, have invented Mechanism for Making Printing-Surfaces, of which the following is a specification.

This invention relates to a machine adapted for use in making printing-surfaces, whether planographic, relief, intaglio, or other printing surface.

The object of the invention is to provide a machine whereby printing-surfaces may be accurately and economically made in accordance with my new process as set forth in an application filed by me on November 2, 1898, Serial No. 695,281, and also in accordance with my new process set forth in an application filed by me October 4, 1899, Serial No. 732,439.

The machine embodying the present invention is organized to bring into coöperation a primary surface—i. e., a surface developed and capable of printing—a conveying-surface adapted to receive an imprint of the design of the primary surface, and a secondary surface—i. e., a surface adapted to be made into a printing-surface. These three surfaces are arranged and designed to coöperate in such a way that the primary surface prints its design upon the conveying-surface and the conveying-surface imparts the same design upon the secondary surface. The secondary surface is then developed and becomes a printing-surface, or the “secondary printing-surface,” as the secondary surface when developed will be herein called.

The invention consists of the features and combinations of features hereinafter set forth.

In the drawings forming part of this specification and in which like reference characters indicate corresponding parts throughout the various views, Figure 1 is a side elevation of a machine embodying this invention. Fig. 2 is a plan view. Fig. 3 is a vertical sectional elevation on the line 3 3 of Fig. 2. Fig. 4 is a vertical sectional elevation on the line 4 4 of Fig. 2. Fig. 5 is an end elevation looking in the direction of the arrow 5 of Fig. 2. Fig. 6 is a vertical sectional elevation on the line 6 6 of Fig. 2. Fig. 7 is an enlarged end view of the support for the conveying-surface. Fig. 8 is a side elevation of said support centrally

broken away. Figs. 9, 10, 11, and 12 illustrate diagrammatically the progressive steps in the coöperation of turning over the conveying-surface from its support upon the secondary surface. Fig. 13 is a sectional elevation of the primary surface seated on its support.

Referring now more particularly to the various features and combinations of features embodying the invention, as shown in the mechanism illustrated in the drawings, 1 and 2 are respectively the primary and secondary surfaces. They are cylindrical in form and are preferably continuous and removable from their respective supporting-cylinders 3 and 4. The primary surface 1 has an accurate preëstablished seat in the machine, so that it and successive primary surfaces may be mounted therein in accurate predetermined position both longitudinally and transversely. The seat of the primary surface is on the supporting-cylinder 3. The ribs 5, formed on the inner side of a primary surface, and the corresponding longitudinal grooves formed on the supporting-cylinder 3, in which the ribs fit—a marked rib in a marked groove—determine the transverse or circumferential location of the primary surface in its seat. The longitudinal position of the primary surface on its cylinder is determined by the collar or stop 3<sup>a</sup>, formed on one end of the support 3, (see Fig. 13,) against which the primary surface accurately fits when mounted in its seat on the support. The arrangement of the primary surface and its support, as shown in Fig. 13, is substantially the same as that of the printing-form shown and described in my pending application, Serial No. 537,582, filed February 7, 1895. Thus preëstablished guides for quickly and accurately seating the primary surface are provided. Of course various other forms of preëstablished guides for this purpose may be employed. The secondary surface 2 has an accurate preëstablished seat on the supporting-cylinder 4, in which it and successive secondary surfaces may be mounted in accurate predetermined position both longitudinally and transversely and with reference to preëstablished guides, these guides being the same as those shown and described for the primary surface. 6 designates the ribs of



the secondary surface, which fit in the corresponding grooves of the supporting-cylinder. The cylinders 3 and 4 are fixed on the shafts 7 and 8, supported in boxes 9 and 9<sup>a</sup>, adapted to slide in the oblique recesses 10 and 11 formed in the main frame. The primary surface is provided with an inking-frame 12, carrying inking-rollers supplied from the ink-distributing cylinder 13, loosely mounted on the shaft 14, on which the frame 12 is fixed.

15 is a damping-frame carrying damping-rollers designed to supply the primary surface with water when required. This damping-frame 15 is pivotally mounted on the shaft 14. The inking-frame has a segmental gear 17 in mesh with the worm 18, turned by the hand-wheel 19. Thus the inking-frame, with its inking-rollers, may be moved to and from the primary surface 1. The damping-frame 20 15 has a segmental gear 20 meshing with a worm 21, turned by the gear 22, which is actuated by the gear 23, fixed on the hand-shaft 24. Thus the damping-frame, with its damping-rollers, may be moved to and from the printing-surface.

The secondary surface 2 is provided with an inking-frame 25 and damping-frame 26, carrying inking and damping rollers and mounted on the shaft 27 of the main ink-distributing cylinder 28, the construction and arrangement of these parts being similar to that of the inking and damping frames 12 and 15. The inking-frame 25 has the segmental gear 29 in mesh with the worm 30, turned by the hand-wheel 31. The damping-frame 26 has the segmental gear 32 in mesh with the worm 33, turned by the gear 34, which is actuated by the gear 35, fixed on the hand-shaft 36. These devices for moving the inking and dampening frames 25 and 26 are similar to the corresponding devices already described for the inking and dampening frames 12 and 15.

The support 37 for the conveying-surface 38 is preferably cylindrical in form and is mounted loosely on a rotating shaft 39, supported in the frame of the machine. The support 37 is so arranged that the primary surface and secondary surface may be easily moved to and from it, so as to effect the desired contact of these surfaces with the conveying-surface on the support 37. The support 37 may vary considerably in shape and arrangement; but it is preferably constructed, arranged, and equipped as shown in the drawings and as will now be described.

Loosely mounted on the shaft 39 are two bosses 40, having arms 41, in which slide the extensible arms 42, carrying a shaft 43, on which is a roll of transfer-paper 44. The bosses 40 have gear-teeth 45 meshing with the gears 46 and 47, fixed on the shaft 48, carried by the support 37 and turned by the hand-wheel 49. The arms 42 have racks 50 meshing with gears 51 and 52, fixed on a shaft 53, whereby the arms 42 move together equally when moved out, so as to bring the roll 44 out

of its recess 50<sup>a</sup> in the cylinder 37. When the catch 54 is released and the roll 44 is moved out and the hand-wheel 49 is turned, the arms 42 are turned around the shaft 39 and the roll 44 travels over the surface of the cylinder 37 to the grippers 55, which are fixed on a shaft 56. The shaft 56 is provided with a rigid arm 57, having a spring 58 acting upon the arm so as to hold the grippers yieldingly in gripping position. The end of the paper 38 is then brought into engagement with the grippers, and the roll 44 is carried back and brought to place in its recess 50<sup>a</sup>. 59 is a rubber blanket stretched permanently over the cylinder 37 and lying beneath the paper 38. When the conveying-surface 38 is thus disposed upon the cylinder, the cylinder is brought into positive contact with the primary surface and receives an imprint of the design of the primary surface, the primary surface and the conveying-surface rotating together, the conveying-surface beginning its contact at its end toward the grippers. After the conveying-surface has received its impression the primary surface and the conveying-surface are separated and the secondary surface and conveying-surface are brought into contact, beginning at the gripper end of the conveying-surface. Just as the cylinder 37 and the secondary surface begin to rotate in contact the arm 60, fixed on the gripper-shaft 56, strikes the end of a lever 61 and opens the grippers to release the paper 38, so that it may be turned over upon the secondary surface. The lever 61 is pivoted on the main frame. It is turned by hand into the position shown in Figs. 10, 11, and 12, so as to be out of the way of the arm 60 when the cylinder 37 rotates in conjunction with the printing-surface. As the rotation continues the cams 62, pivoted on the arms 42 and connected by the wooden tie-rod 63, strike the studs 64 projecting from the inner sides of the frame of the machine and drive the rod against the knife 64<sup>a</sup>, fixed on the cylinder 37. This severs the paper near the roll 44, so that the conveying-surface is free to be turned over fully upon the secondary surface, which may then be separated from the supporting-cylinder 37. The progressive steps of this operation are illustrated in Figs. 9, 10, 11, and 12. In Fig. 9 the secondary surface is ready to be brought into contact with the conveying-surface on its cylinder 37. In Fig. 10 the conveying-surface has been released from the grippers and has just begun to be turned over upon the secondary surface. In Fig. 11 the cams 62 have just met the studs 64 and the conveying-surface is about to be severed. In Fig. 12 the conveying-surface has been entirely turned over upon the secondary surface and the latter separated from the cylinder 37.

The cylinder 3, carrying the primary surface, is moved to and from the cylinder 37 by any suitable means. In the present embodiment of the invention there is shown a hand-



lever 65, fixed on a shaft 66, to which are secured arms 67, having links 68 pivotally connected therewith and with toggles 69, which are connected each at one end to the frame and at the other end to the sliding box 9. By operating the lever 65 the cylinder 3 may be moved to and from the cylinder 37 and the requisite pressure exerted between the primary surface and the conveying-surface 38. The secondary surface is similarly provided for the same purpose with a hand-lever 70 on the shaft 71, carrying arms 72, connected by links 73 to the toggles 74, which move the boxes 9<sup>a</sup>.

For the purpose of enabling the primary and secondary surfaces to be removed from the supporting-cylinders hoisting-arms are provided. The hoisting-arms 75 for the primary surface are each provided with a fork 76 at its upper end, in which rests the shaft 7. These arms have also racks 77, which are in mesh with the gears 78 and 79 on the shaft 80. On the shaft 80 is a gear 81 in mesh with a worm 82 on the hand-shaft 83. By turning the hand-shaft 83 the shaft 80 is rotated and the hoisting-arms 75 are moved upward to lift the shaft 7, so that the cylinder 2 clears the frame of the machine, when the primary surface 1 may be slipped off and another primary surface substituted for it. In this operation one end of the shaft 7 is generally supported by an apparatus such as is shown in an application filed by me July 12, 1898, Serial No. 685,764, which permits the fork 76 of one of the hoisting-arms 75 to be turned down out of the way. If desired, the entire shaft and cylinder 3, with the primary surface carried thereby, may be removed from the machine and another cylinder of like proportions with a new primary surface substituted therefor. The hoisting-arms are of course employed to lower the shaft again in place. For the secondary surface 2 there is a pair of hoisting-arms 84, operated and constructed similarly to the arms 75. These hoisting-arms 84 are operated by the hand-shaft 85 through worm 86, gear 87, and shaft 88, gears 89 and 90 meshing with the racks 91 on the arms 84. The supporting-cylinders 3 and 4 are located above the supporting-cylinder 37 and move to and from the same on lines coincident with their radii and with the radii of the cylinder 37.

The shaft 39 is the main driving-shaft whereby the cylinder 37 is driven conjointly with the primary surface or conjointly with the secondary surface and whereby the primary and secondary surfaces are driven separately and each in conjunction with its inking and damping rollers. For this purpose the gear-wheel 92 is fixed on the shaft 39 and meshes with a gear 93, fixed on a short shaft 94, which carries the gear 95, meshing with the gear 96, fixed on the shaft 7. The shaft 7 has fixed on it a gear 97, adapted to mesh with a gear 98 on the hub of the cylinder 37 when the primary surface is in contact with

the conveying-surface. The short shaft 94 is carried by the toggle-arms 99 and 100, sleeved thereon at their inner ends and at their outer ends sleeved on the shaft 39 and the shaft 7. When the shaft 7 is moved from the cylinder 37, so as to bring the cylinder 3 into position for its primary surface to be inked or is moved toward the cylinder 37 to bring the gears 97 and 98 into mesh, the toggle-arms 99 and 100 carry around the shaft 94 with its gears 93 and 95, so as to keep them in mesh with the gears 92 and 96, respectively. The toggle-arms 99 and 100 are of such length as to permit the shaft 7 to be lifted by the hoisting-arms 75 high enough to enable the primary surface to be slipped from its cylinder 3. Idle gears 101 and 102, supported on studs projecting from the inner side of the main frame, mesh with each other, and the former meshes with the gear 92 and the latter with the gear 103, fixed on the long hub of the cylinder 13. Thus the shaft 39 operates to drive the main ink-distributing cylinder 13, which drives the other inking-rollers. By means of the gearing described it will be seen that when the shaft 7 is moved from the cylinder 37 the shaft 39 may drive the cylinder 3, carrying its primary surface and also the inking-rollers. When the shaft 7, with the primary surface, is moved toward the cylinder 37, the primary surface moves out of contact with the inking-rollers and the damping-frame is moved back out of the way, so that the gears 97 and 98 mesh. Thus the gear 97 through the gear 98 drives the cylinder 37, the primary surface and conveying-surface rotating together in positive contact under suitable pressure for the purpose of printing or imparting the design of the primary surface upon or to the conveying-surface.

The gearing for the secondary surface and its supporting-cylinder 4 and for the inking-rollers is constructed and arranged in the same way as that just described and need be only briefly referred to. The gear 92 meshes with the gear 104 on the short shaft 105, which carries the gear 106, meshing with the gear 107 on the shaft 8. The shaft 8 carries the cylinder 4 for the secondary surface and also a gear 109, adapted to mesh with the gear 98. The toggle-arms 110 and 111 are sleeved at their inner ends on the shaft 105 and at their outer ends on the shafts 39 and 8. The gear 92 meshes with the idle gear 112, which meshes with the idle gear 113, which meshes with the gear 114, fixed on the long hub of the cylinder 28. These idle gears are supported on studs projecting from the inner side of the main frame. The gear-wheels 97, 98, and 109 are so marked that the gear 98 may mesh with the other two always in identically the same way in order that the primary surface and the conveying-surface and the conveying-surface and secondary surface may be brought into accurate predetermined coöperating relation for the purpose of imparting the design from the primary surface



upon the conveying-surface and from the conveying-surface upon the secondary surface in accurate predetermined position.

In the operation of the machine the primary surface 1, having been suitably inked, is brought into contact with the conveying-surface 38 by operating the lever 65. The shaft 39 is then rotated and the primary and conveying surfaces rotate together in positive rolling contact and the design of the primary surface is printed upon the conveying-surface. The primary surface is then separated from the conveying-surface and the secondary surface is brought into positive rolling contact with the conveying-surface and the design carried thereby is imparted to the secondary surface, the conveying-surface for this purpose being turned over upon the secondary surface. The secondary surface is then separated from the supporting-cylinder 37 and is suitably developed into the desired secondary printing-surface, the inking and damping rollers in the frames 25 and 26 being preferably used in this developing operation. The secondary printing-surface is then removed from the machine and is mounted in a press and employed in printing. Of course, if desired, the secondary surface may be removed from the machine and subsequently developed, the inking and damping frames, with their rollers, being dispensed with. The same primary surface may be used in making a plurality of identical secondary surfaces successively supported in place in the machine in the same definite and predetermined position, whereby the designs on such plurality of secondary printing-surfaces will be identical and identically placed thereon, and these secondary printing-surfaces may be and preferably are interchangeable with one another and with their coacting primary surfaces and constructed and designed to fit in a preestablished seat or seats in a printing-press. A series of primary surfaces designed and constructed for register may be successively supported in definite and predetermined position in the machine and each employed in making a plurality of identical secondary printing-surfaces, so that from the series of registering primary surfaces a plurality of series of registering secondary printing-surfaces may be made. The supporting-cylinders 3 and 4 are preferably identical, as shown, and it is evident that instead of supporting the primary and secondary surfaces on separate cylinders the primary surface, after printing on the conveying-surface, may be removed and a secondary surface substituted therefor on the same cylinder and be brought into coaction with the conveying-surface, having the design of the primary surface printed thereon. In this way the secondary printing-surface may be made identical with the primary surface with the same accuracy as where the primary and secondary surfaces are supported on their different cylinders. It will be seen that when the primary and secondary sur-

faces are supported on the same cylinder they are arranged in the same definite and predetermined coöperating relation with respect to each other and also with respect to the conveying-surface. Where they are supported on the separate cylinders, they are supported in equivalent definite and predetermined coöperating relation with respect to each other and with respect to the conveying-surface. The successive primary surfaces are arranged in the same position and in the same relation with respect to the support for the conveying-surface or with respect to the successive conveying-surfaces carried thereby. The same is true in regard to the successive secondary surfaces. The successive coacting primary and secondary surfaces are, moreover, arranged in the same relation with respect to each other.

It will be noted that this invention makes it possible to dispense with the employment of a separate basic surface heretofore required in making each printing-surface and that great economy is effected in time and labor and painstaking care heretofore required in making printing-surfaces, especially printing-surfaces designed to register, as in multicolor-printing.

Instead of using a separate and fresh conveying-surface for each operation I may of course use a permanent conveying-surface, such as a sheet of rubber.

The primary and secondary surfaces may be made of any suitable material, but are preferably made of metal, which may be electrolytically deposited upon a suitable base. I prefer to electrolytically deposit zinc upon copper. In developing the primary and secondary surfaces any suitable method may be used—such as light or deep etching, routing out, &c.—and they may be developed so as to be planographic, relief, intaglio, or otherwise. The primary and secondary surfaces may be differently or similarly developed.

While it is of course important that the rolling contact of the conveying-surface with the primary and secondary surfaces be positive—that is, without slipping—it is not essential that intermeshing gears be employed for this purpose. Other means may be employed to accomplish the result and to drive the bodies in unison and the intermeshing gears may be dispensed with. Again, while I make use of a marked tooth and a marked recess in the intermeshing gears as preestablished guides to bring the primary surface and conveying-surface and the secondary surface and conveying-surface into accurate predetermined coöperating relation it will be obvious that various other devices may be used for this purpose.

Various changes may be made in the mechanism herein shown and described for operating the primary, secondary, and conveying surfaces, and various changes may be made in the shape and arrangement of the primary, secondary, and conveying surfaces, and



various features may be employed apart from the others and in different relations.

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

5 1. In a machine adapted for use in making printing-surfaces, the combination of a drum adapted to carry a conveying-surface mounted loosely on the driving-shaft so as to rotate thereon, a cylinder adapted to carry a print-  
10 ing-surface movable to and from said drum, whereby the printing-surface and conveying-surface may be brought together in operative contact and separated, intermeshing gearing connecting said cylinder and drum, and in-  
15 termeshing gearing connecting the driving-shaft and said cylinder arranged to maintain its connection when said cylinder is moved to and when it is moved from said drum, whereby said cylinder and said drum may be  
20 driven together from the driving-shaft and whereby said cylinder may be driven from the driving-shaft when separated from said drum.

2. In a machine adapted for use in making  
25 printing-surfaces, the combination of a drum adapted to carry a conveying-surface mounted loosely on the driving-shaft so as to rotate thereon, a cylinder adapted to carry a print-  
30 ing-surface movable to and from said drum, whereby the printing-surface and conveying-surface may be brought together in operative contact and separated, intermeshing gearing connecting said cylinder and drum, intermeshing gearing connecting the driving-shaft and  
35 said cylinder arranged to maintain its connection when said cylinder is moved to and when it is moved from said drum, whereby said cylinder and said drum may be driven together from the driving-shaft and whereby said cylinder may be driven from the driving-shaft  
40 when separated from said drum, and a movable frame carrying inking-rollers adapted to cooperate with the printing-surface on said cylinder.

45 3. In a machine adapted for use in making printing-surfaces, the combination of a main driving-shaft and drum adapted to carry a conveying-surface and loosely mounted thereon, two cylinders adapted to carry primary  
50 and secondary surfaces and mounted in sliding boxes, whereby the said cylinders may be moved to and from said drum, gearing connecting each of said cylinders with said drum, whereby when either cylinder and the drum  
55 are brought together they may rotate positively together, gearing connecting the driving-shaft with each of said cylinders arranged to maintain its connection when said cylinders are moved to or from said drum, and  
60 means for moving each of said cylinders to and from said drum and thereby meshing and unmeshing the gearing connecting said cylinders with said drum, whereby either of said cylinders may be driven separately or in con-  
65 junction with said drum.

4. In a machine adapted for use in making printing-surfaces, the combination of a main

driving-shaft and drum adapted to carry a conveying-surface and loosely mounted thereon, two cylinders adapted to carry primary 70 and secondary surfaces and mounted in sliding boxes, whereby the said cylinders may be moved to and from said drum, gearing connecting each of said cylinders with said drum, whereby when either cylinder and the drum 75 are brought together they may rotate positively together, gearing connecting the driving-shaft with each of said cylinders arranged to maintain its connection when said cylinders are moved to or from said drum, means 80 for moving each of said cylinders to and from said drum and thereby meshing and unmeshing the gearing connecting said cylinders with said drum, whereby either of said cylinders may be driven separately or in conjunction 85 with said drum, and swinging frames carrying inking-rollers for said primary and secondary surfaces.

5. In a machine adapted for use in making printing-surfaces, the combination of a drum 90 adapted to carry a conveying-surface mounted loosely on the driving-shaft so as to rotate thereon, a cylinder adapted to carry a printing-surface movable to and from said drum arranged to slide obliquely in the main frame, 95 whereby the printing-surface and conveying-surface may be brought together in operative contact and separated, intermeshing gearing connecting said cylinder and drum, intermeshing gearing connecting the driving-shaft 100 and said cylinder arranged to maintain its connection when said cylinder is moved to and when it is moved from said drum, whereby said cylinder and said drum may be driven together from the driving-shaft and whereby 105 said cylinder may be driven from the driving-shaft when separated from said drum, and hoisting-arms for lifting said cylinder from its working place in the machine.

6. In a machine adapted for use in making 110 printing-surfaces, the combination of a main driving-shaft and drum adapted to carry a conveying-surface and loosely mounted thereon, two cylinders adapted to carry primary 115 and secondary surfaces and mounted in sliding boxes arranged to slide obliquely in the main frame to and from said drum, whereby the said cylinders may be moved to and from said drum, gearing connecting each of said cylinders with said drum, whereby when 120 either cylinder and the drum are brought together they may rotate positively together, gearing connecting the driving-shaft with each of said cylinders arranged to maintain its connection when said cylinders are moved 125 to or from said drum, means for moving each of said cylinders to and from said drum and thereby meshing and unmeshing the gearing connecting said cylinders with said drum, whereby either of said cylinders may be 130 driven separately or in conjunction with said drum, and hoisting-arms whereby said cylinders may be lifted from their working places in the machine.



7. In a machine adapted for use in making printing-surfaces, the combination of a drum adapted to carry a conveying-surface mounted loosely on the driving-shaft so as to rotate thereon, a cylinder adapted to carry a printing-surface removable therefrom, movable to and from said drum, and arranged to slide obliquely in the main frame, whereby the printing-surface and conveying-surface may be brought together in operative contact and separated, intermeshing gearing connecting said cylinder and drum, intermeshing gearing connecting the driving-shaft and said cylinder arranged to maintain its connection when said cylinder is moved to and when it is moved from said drum, whereby said cylinder may be driven together with said drum from the driving-shaft and when separated from said drum, hoisting-arms for lifting said cylinder from its working place in the machine, and a swinging frame carrying inking-rollers for said printing-surface.

8. In a machine adapted for use in making printing-surfaces, the combination of a main driving-shaft and drum adapted to carry a conveying-surface and loosely mounted thereon, two cylinders adapted to carry primary

and secondary surfaces removable therefrom and mounted in sliding boxes arranged to slide obliquely in the main frame to and from said drum, whereby the said cylinders may be moved to and from said drum, gearing connecting each of said cylinders with said drum, whereby when either cylinder and the drum are brought together they may rotate positively together, gearing connecting the driving-shaft with each of said cylinders arranged to maintain its connection when said cylinders are moved to or from said drum, means for moving each of said cylinders to and from said drum and thereby meshing and unmeshing the gearing connecting said cylinders with said drum, whereby either of said cylinders may be driven separately or in conjunction with said drum, and hoisting-arms whereby said cylinders may be lifted from their working places in the machine.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD HETT.

Witnesses:

G. W. DONALDSON,  
EDWIN SEGER.