

(No Model.)

8 Sheets—Sheet 1.

L. C. CROWELL.

SHEET FEEDING AND REGISTERING APPARATUS.

No. 278,778.

Patented June 5, 1883.

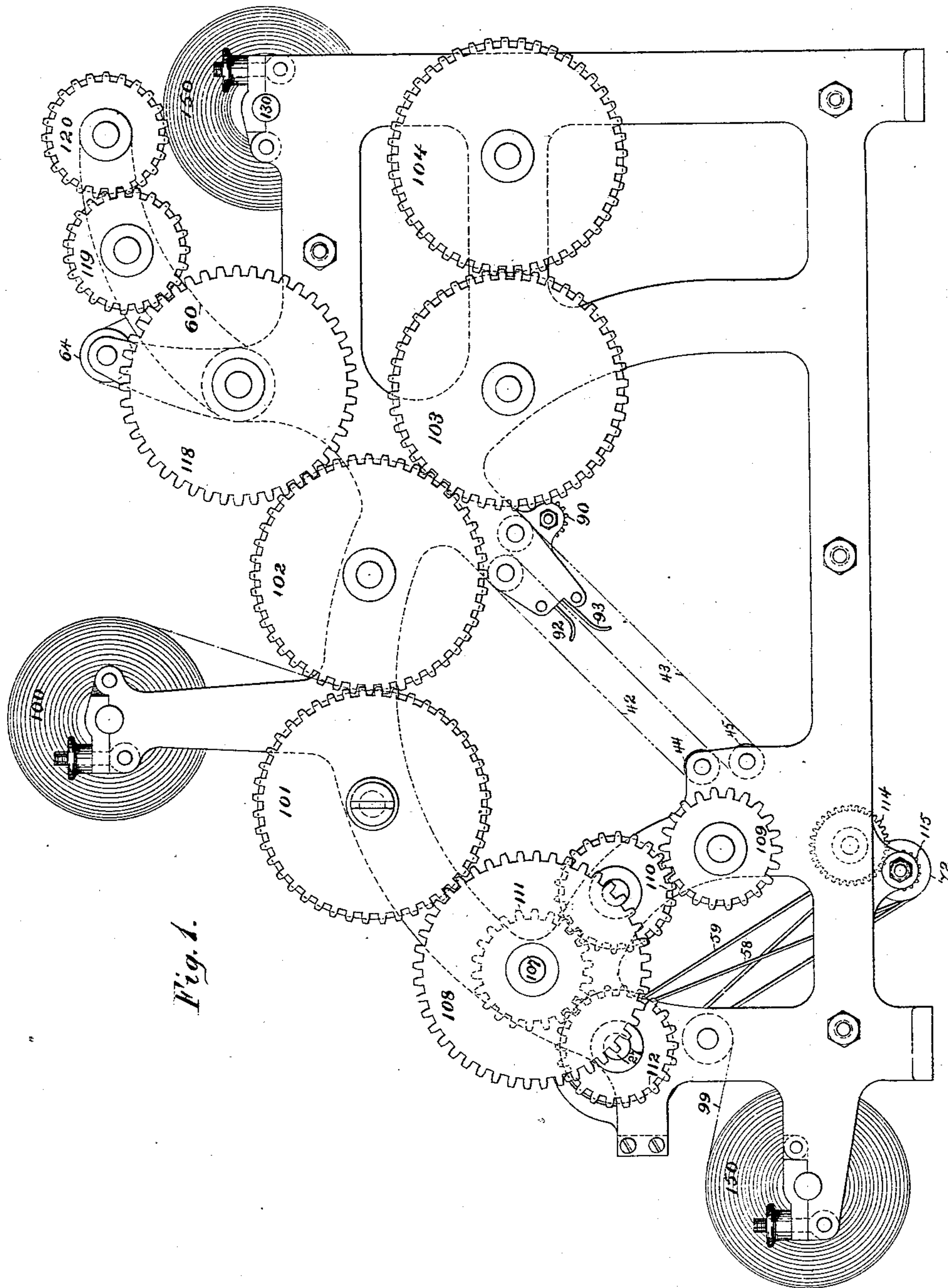


Fig. 1.

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(No Model.)

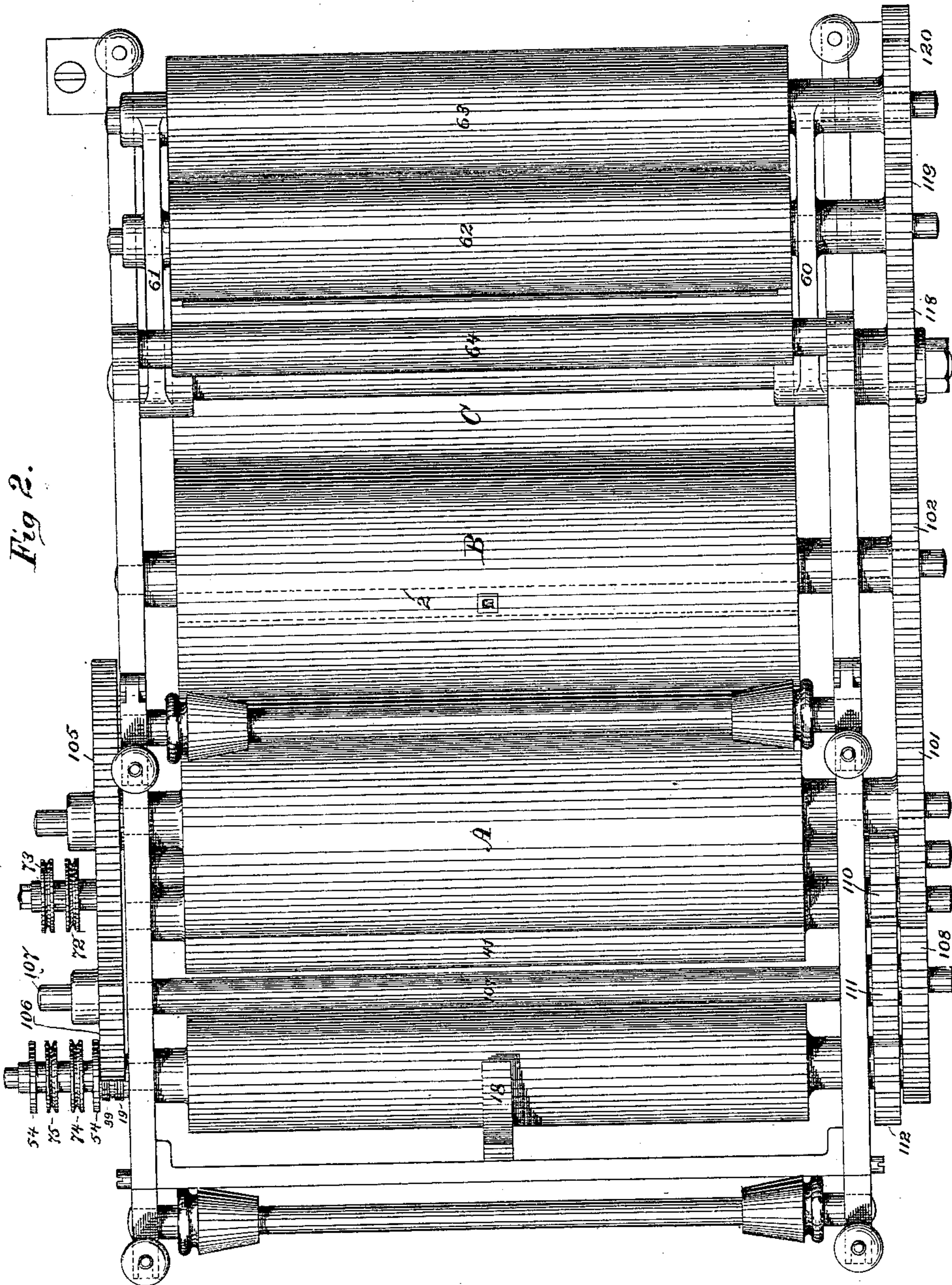
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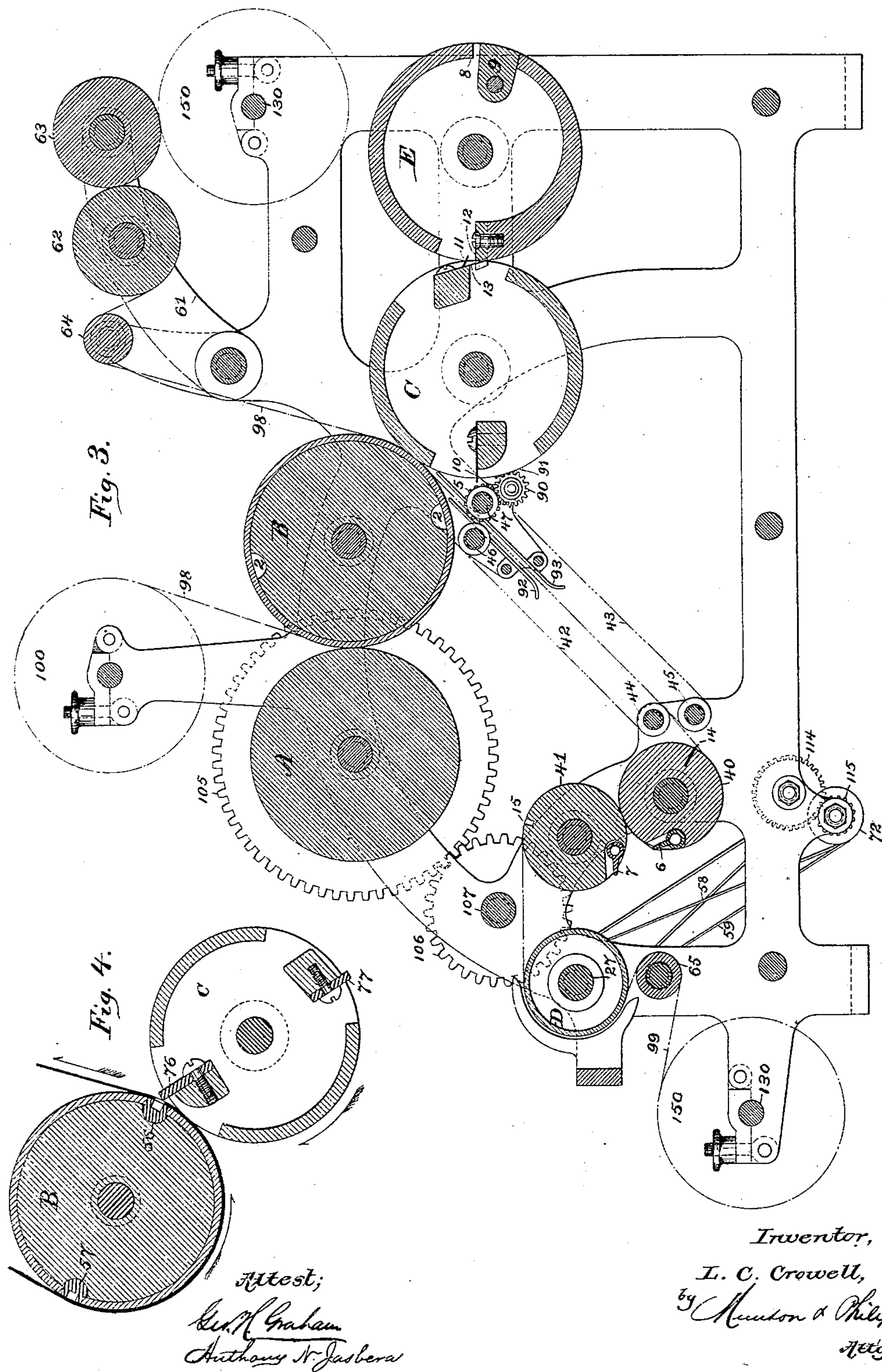
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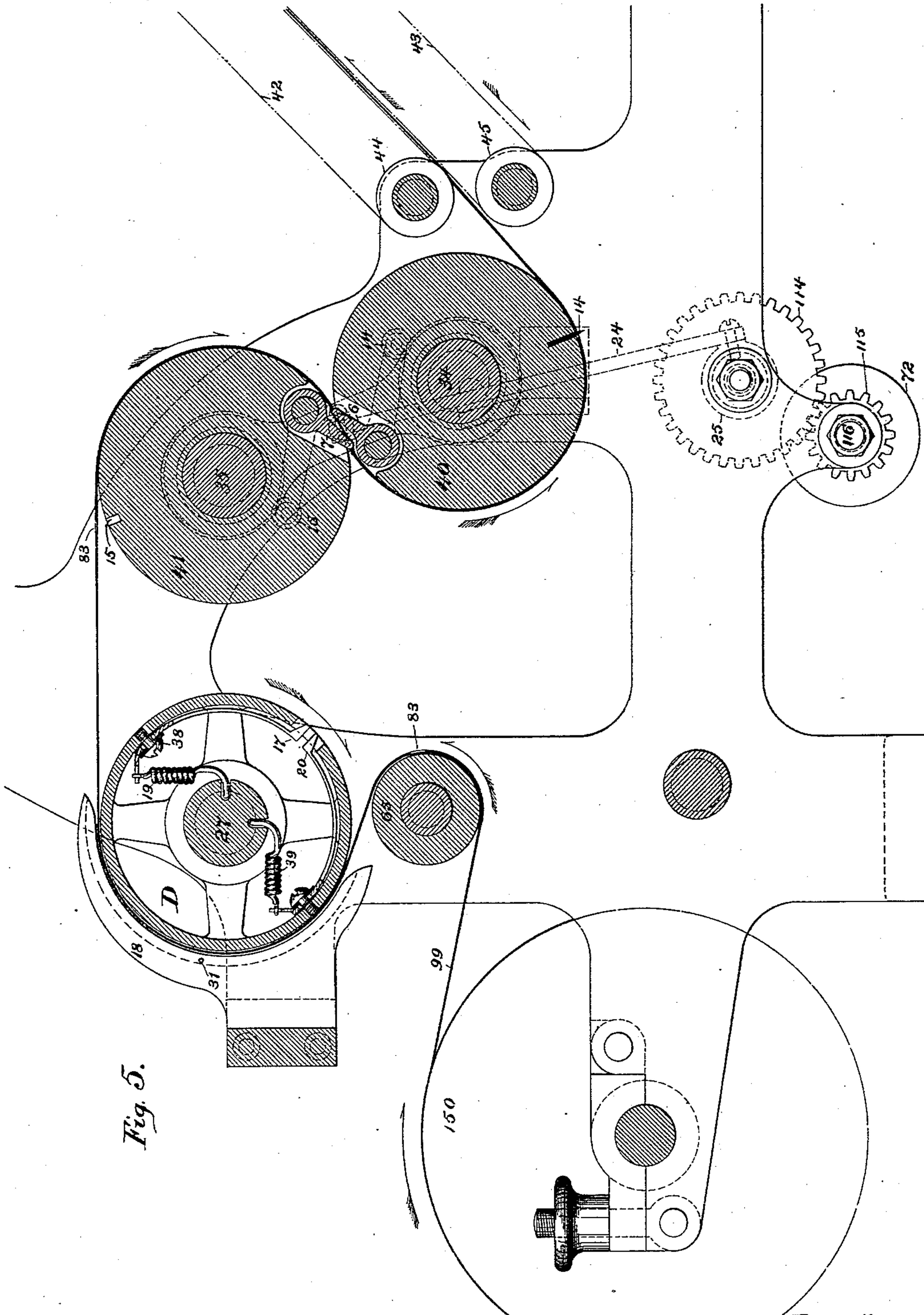


Fig. 5.

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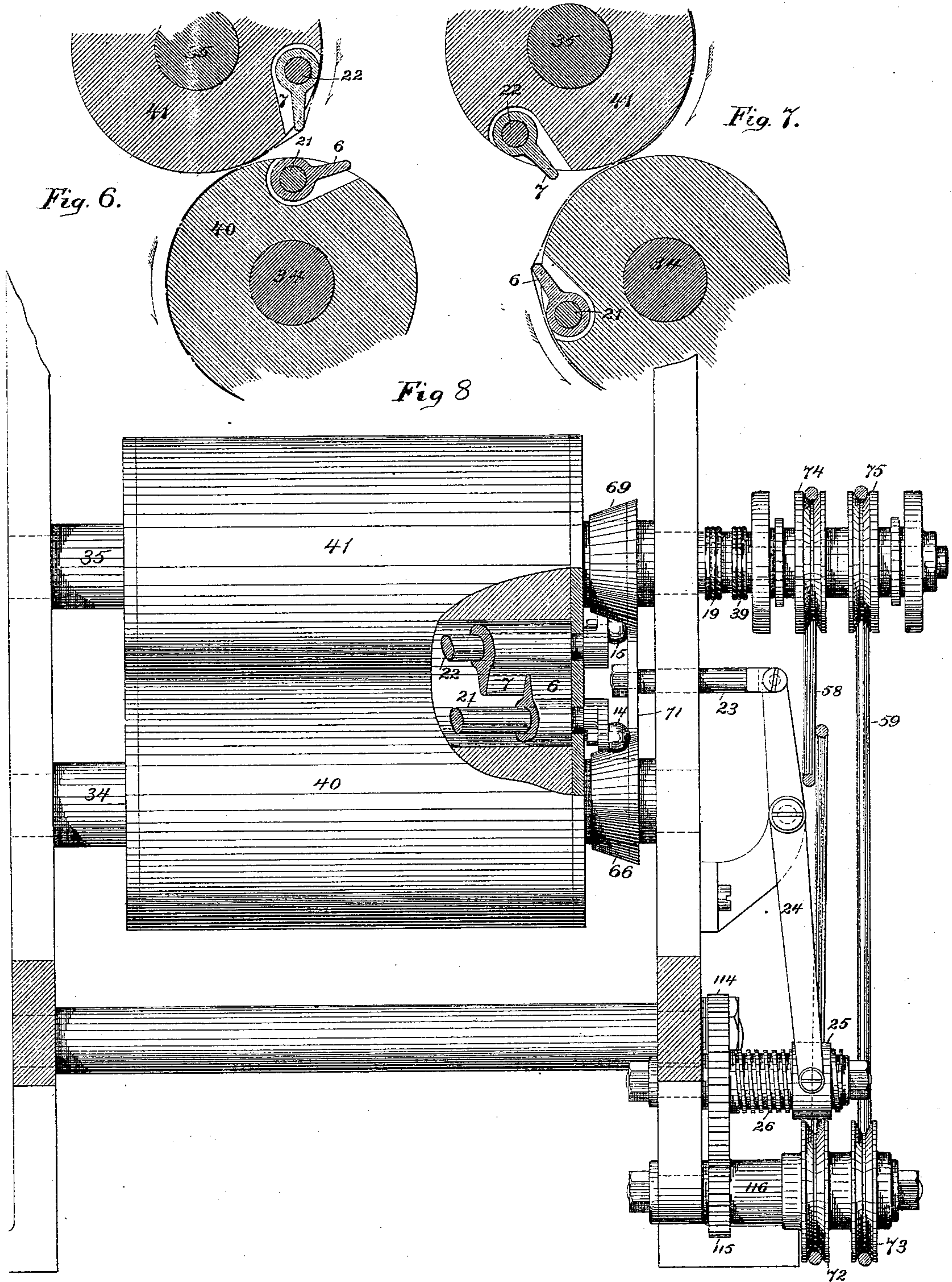
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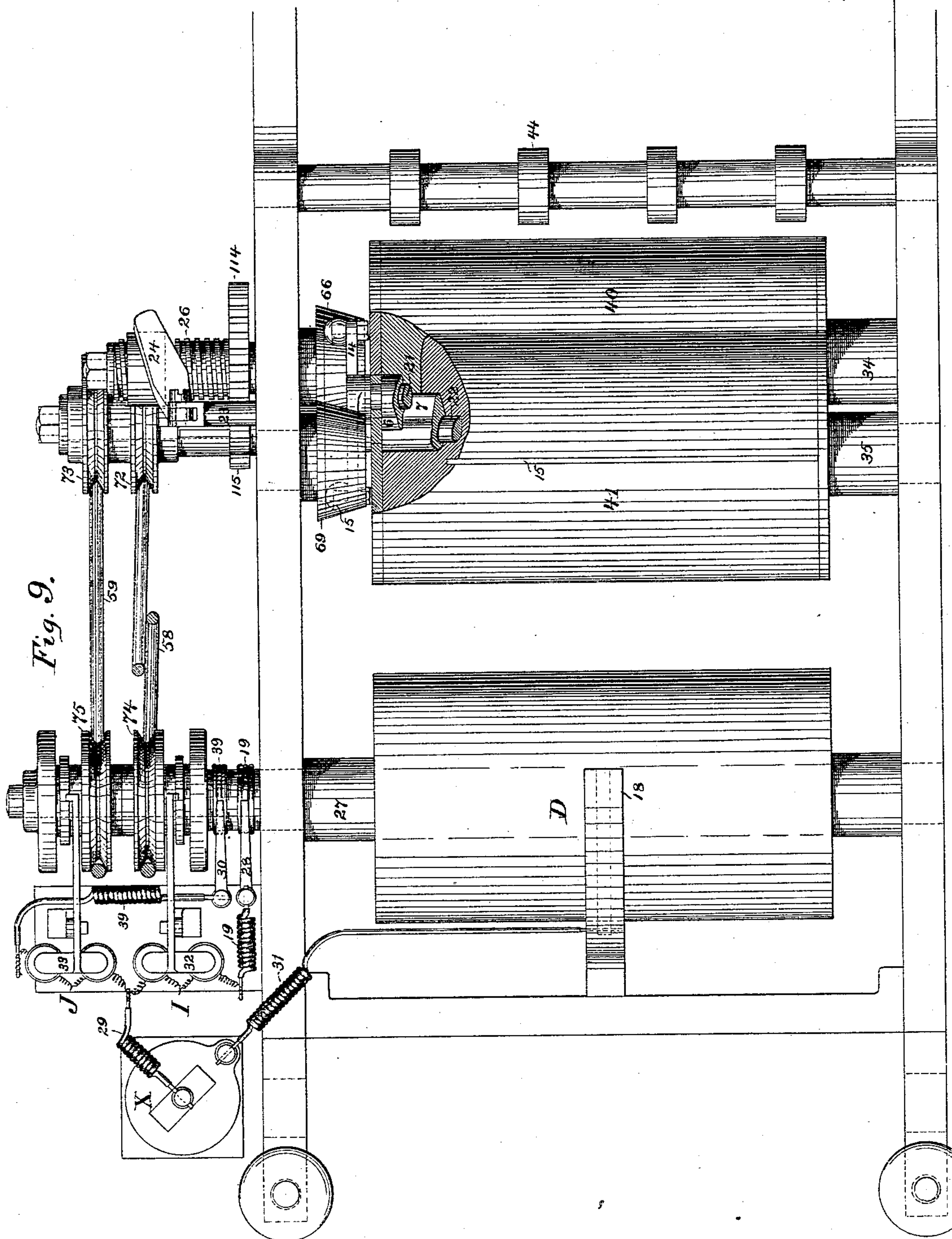
8 Sheets—Sheet 6.

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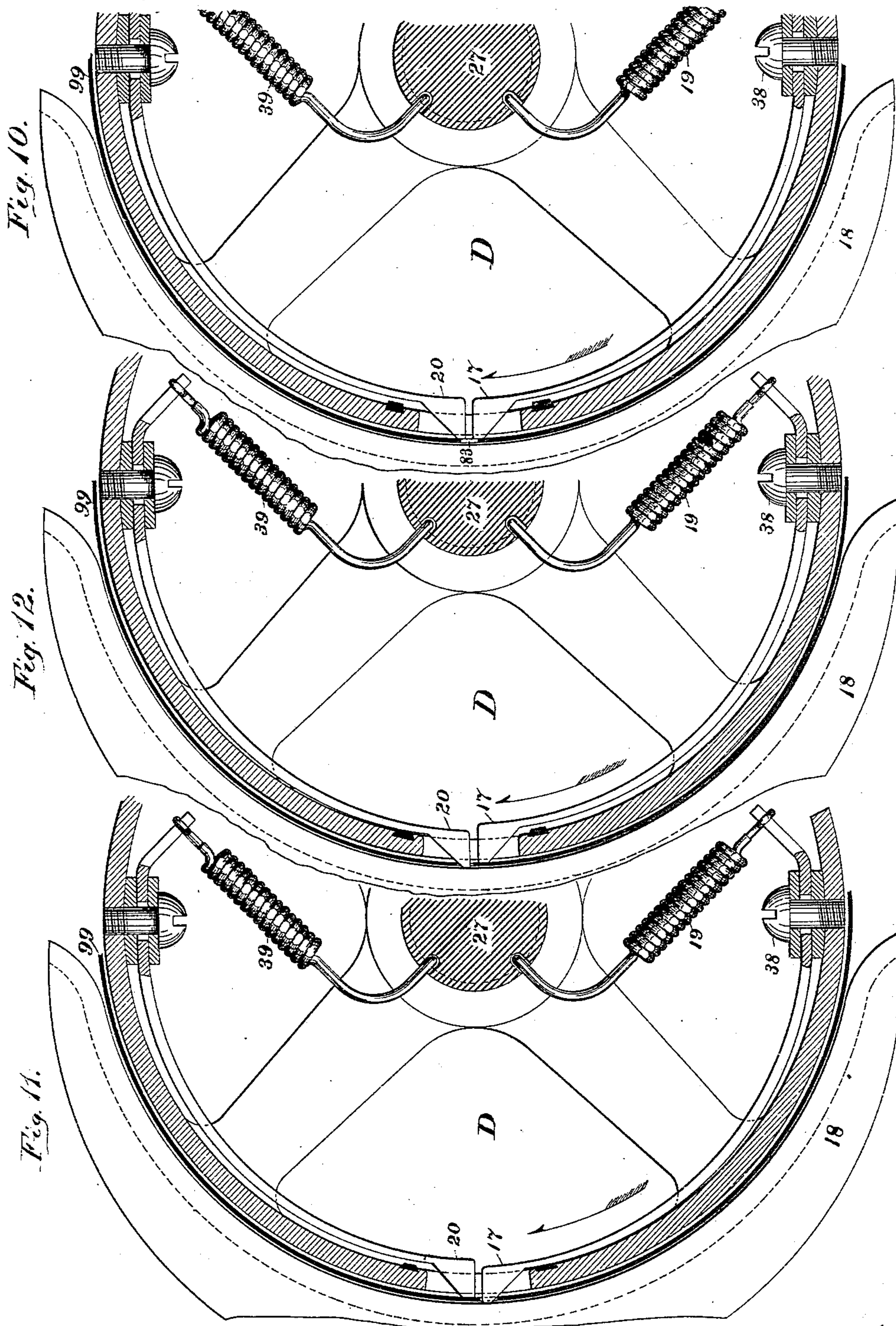
8 Sheets—Sheet 7.

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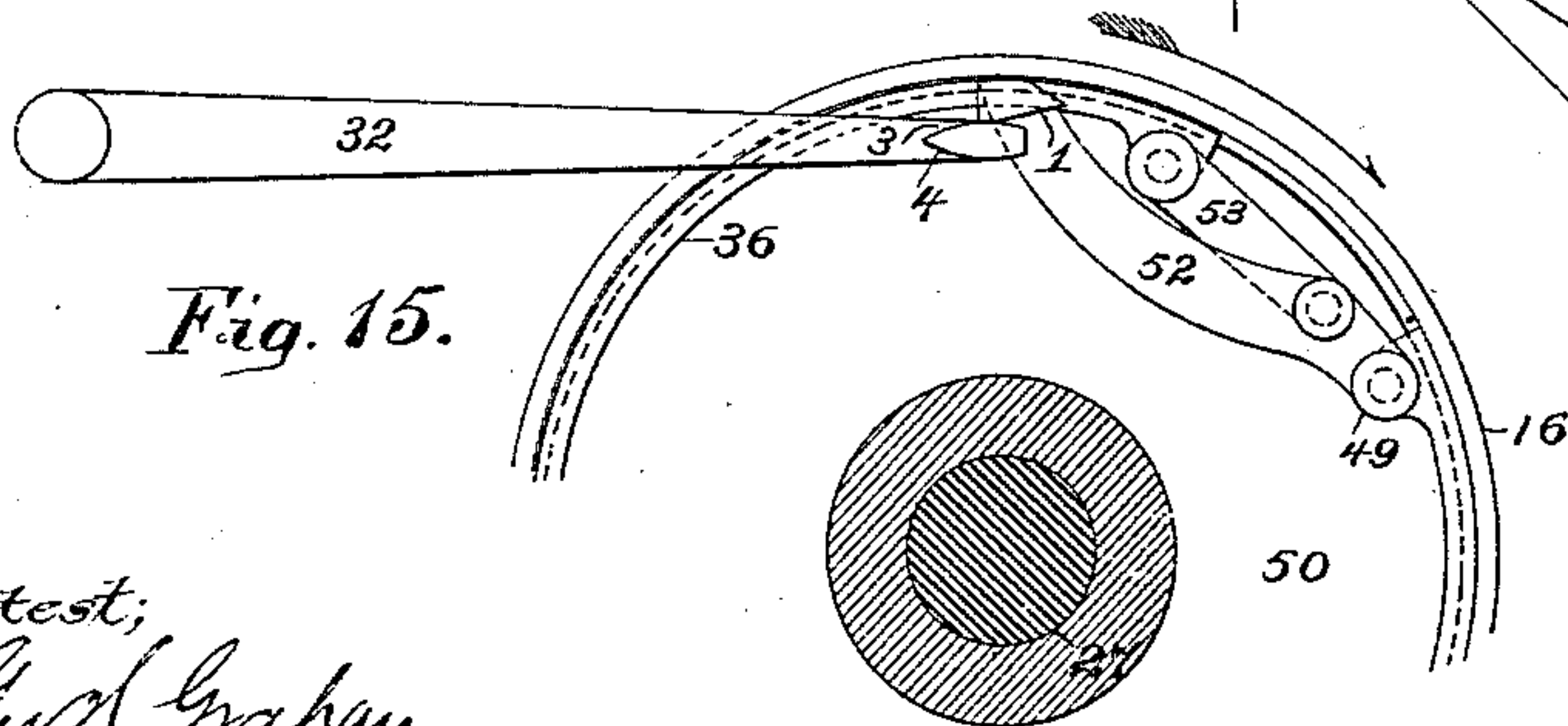
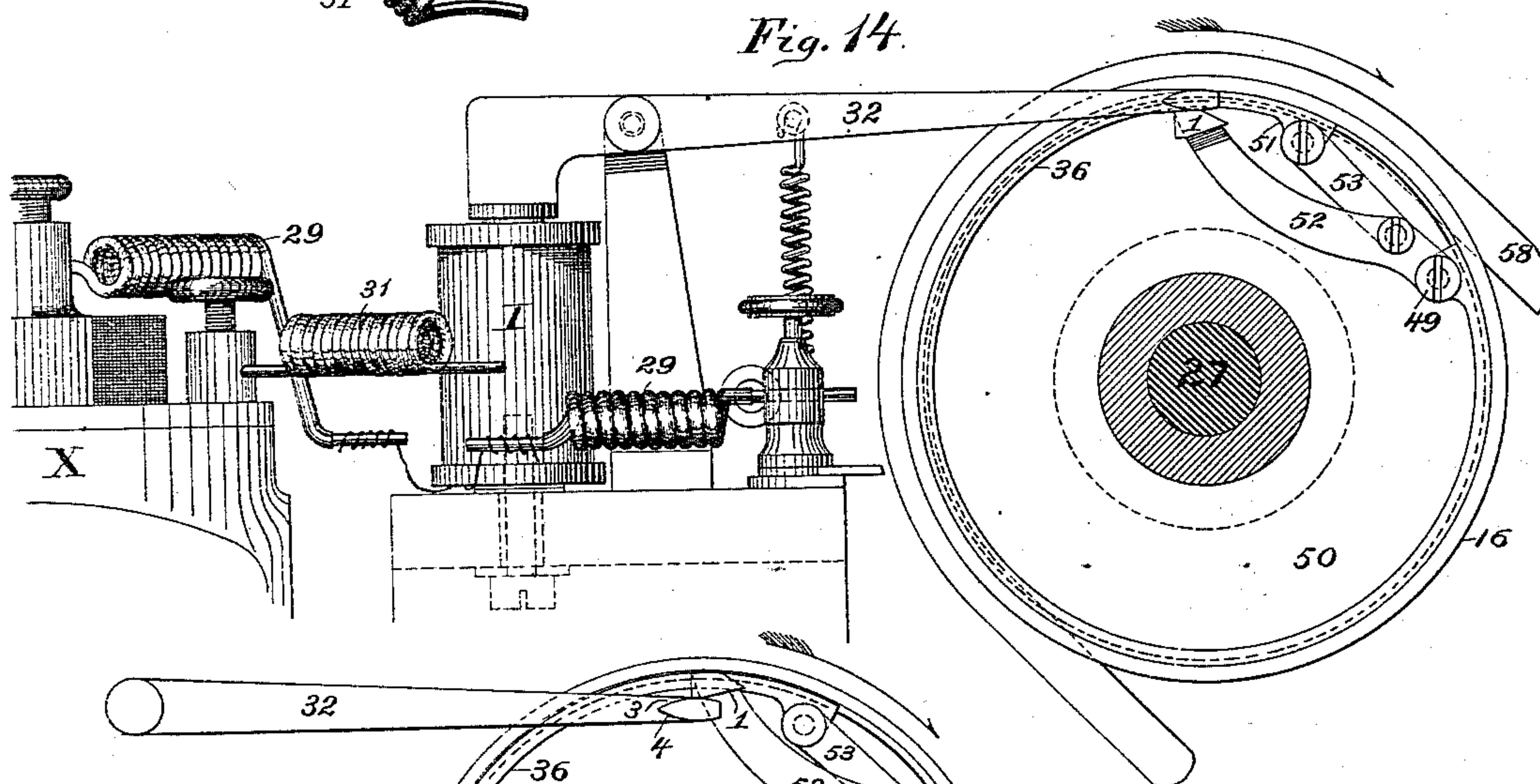
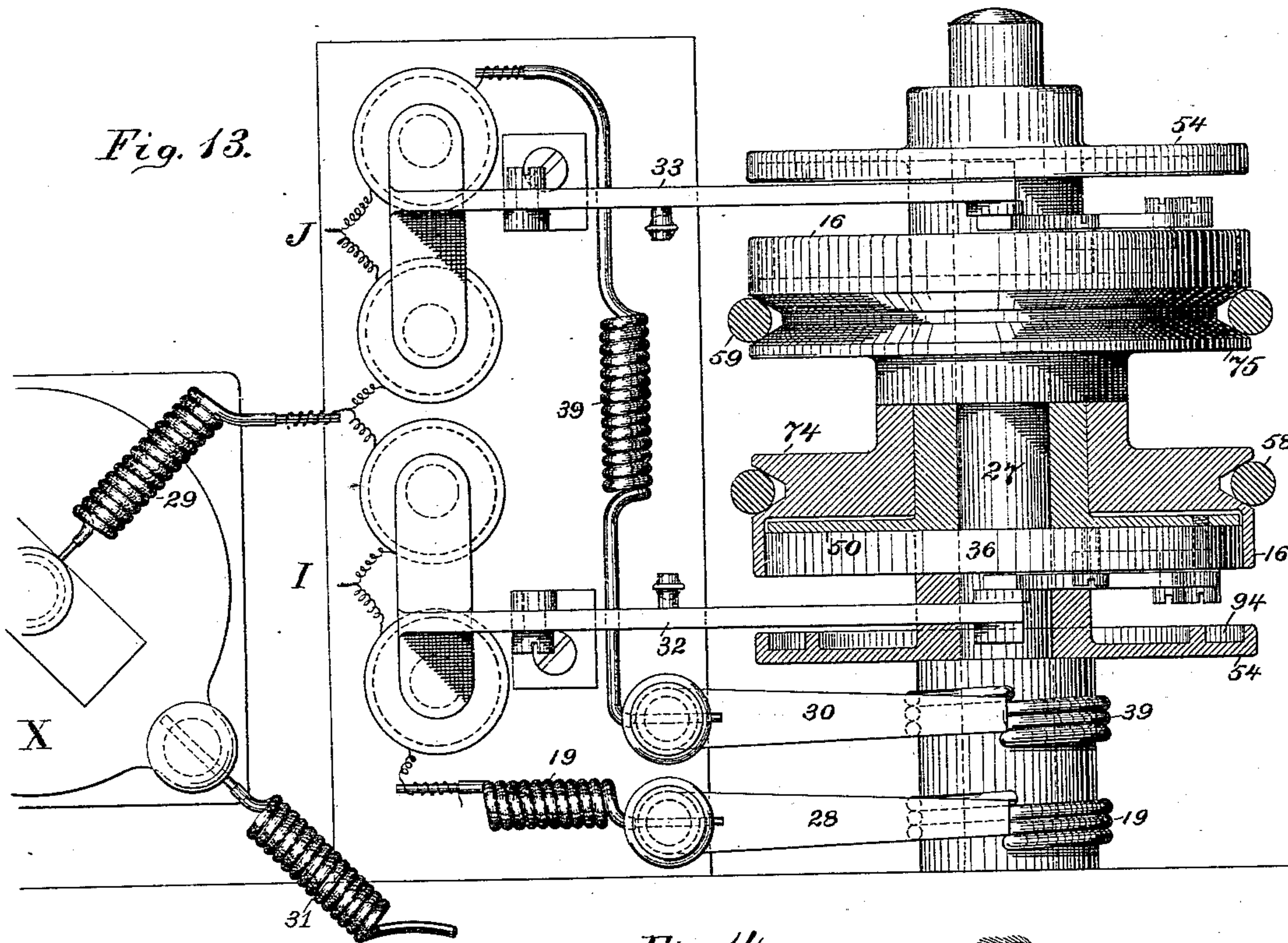
8 Sheets—Sheet 8.

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UNITED STATES PATENT OFFICE.

LUTHER C. CROWELL, OF BROOKLYN, ASSIGNOR TO R. HOE & CO., OF NEW YORK, N. Y.

SHEET FEEDING AND REGISTERING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 278,778, dated June 5, 1883.

Application filed June 3, 1881. (No model.)

To all whom it may concern:

Be it known that I, LUTHER C. CROWELL, a citizen of the United States, residing in the city of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Sheet Feeding and Registering Apparatus, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The invention embodied herein constitutes improvements upon sheet registering and delivering apparatus of the general character of that forming the subject-matter of my companion application filed May 20, 1881.

The object of the present improvements is to provide a web-feeding mechanism that is variable in its feeding operation—that is to say, supplied with means for adjusting its feeding action so that it may feed more slowly or more rapidly, as is required—and a register-governing mechanism that is supplied with devices controlling the operation of the means for adjusting the speed of the feeding mechanism, whereby a supplement-web punched, perforated, or notched at points suitable distances apart will, in passing the register-governing mechanism, control the action of its devices, so that when, from faulty action of the feeding mechanism, the true position of the line of severance of the web, whereby it is divided into sheets, is lost, (from which would result a defective or imperfectly-registered supplement-sheet,) such web will itself cause the register-governing mechanism to so operate as to readjust the action of the feeding mechanism and enable its operation to become such as will correct the feeding movement of the supplement-web, thereby bringing its severing-line into true position for the action of the cutting devices, whence an accurate division of the web into sheets will be effected and the latter be properly associated with main sheets. As is set forth in said application, register-governing mechanisms of this character may be combined with any form of delivery apparatus, as a gathering-cylinder, a folding mechanism, a compound gathering and folding mechanism, a piling-fly, or other means for delivering sheets flat, and with mechanisms adapted to feed sheets, or to form such sheets by dividing a

web by means of any suitable severing mechanisms, all of which is so particularly set forth in said application and the patents therein enumerated as to require no elaboration herein.

The present invention may be briefly stated to consist in an improved construction of supplement-sheet-feeding mechanism, an improved electrical sheet-governing mechanism, and in various combinations of the same with mechanisms for printing webs of material, severing the same into sheets, and delivering associated sheets, all of which will be described with particularity in connection with the accompanying drawings, in which—

Figure 1 illustrates a side elevation, Fig. 2 a plan or top view, and Fig. 3 a longitudinal sectional elevation, of a printing-machine embodying my improvements. Fig. 4 shows detached views illustrating one means of punching the supplement-web with its register-holes. Fig. 5 is an enlarged longitudinal sectional elevation of a portion of said machine, more particularly illustrating the sheet-register-governing apparatus and the feeding mechanisms. Figs. 6 and 7 are transverse sectional elevations of the feeding-rollers. Fig. 8 is an end elevation of a portion of the machine, showing particularly said feeding-rollers and the mechanism for expanding and contracting the same. Fig. 9 is a plan view, showing more particularly the relation of the feeding-rollers and the sheet-register-governing mechanism and their coacting mechanisms. Figs. 10, 11, and 12 are sectional elevations of the register-governing mechanism, showing its devices in positions of operation differing from that shown in Fig. 5, said parts being seen in a direction opposite to that in Fig. 5. Fig. 13 is a plan view, partly in section, of a clutching mechanism, of which Fig. 14 is a side elevation, and Fig. 15 a detail.

In order to a ready understanding of the present improvements, the structure and operation of the machine to which they are applied, as shown in Figs. 1 to 4, will first be explained.

The machine shown comprises so much of a web-printing machine and its delivery apparatus as is necessary to explain the relation thereto and mode of operation therewith of the improvements effected by me. Thus the type-

cylinder A and impression-cylinder B will be understood as illustrating the last printing-cylinders of such a machine, and though the web 98 is shown as passing between them from a roll, as 100, it will also be understood that in practice this web will pass between the first printing-cylinders of such a machine, and thence between the cylinders A B, such necessary inking apparatus, tension devices, and other appurtenances for such machines being supplied as are common. In passing between two sets of printing mechanisms the web will be printed upon both sides. This result, however, may be accomplished by one set of cylinders, as A B, with the peculiar turning devices shown in the Patent No. 212,444, granted February 18, 1879. The printed web 98, emerging from between the cylinders A B, may pass partially around the latter, and thence be entered between folding delivering-carriers, as C E, and be operated upon by the mechanisms supported by said carriers, so as to be divided into sheets and each sheet folded transversely, as explained in Patent No. 225,746, granted March 23, 1880. The cylinder B will be blanketed, as is usual, and in the precise arrangement here shown will have recesses 2, to compensate for the protrusions of the folding or creasing blade 10, supported by the carrier C, which, being rigid, must extend behind the peripheral line of the cylinder B in passing the same. This blade 10 co-operates with a fixed jaw, 8, and with a vibrating jaw, 9, supported by the carrier D. The carrier C is provided with pins 11, which impale the web just behind the cutting-point, the forward end of the web being thus secured as each cut is made. This cutting operation is effected by a knife, 12, in the carrier D and a cutting-slot or co-operating blade, 13, in the carrier C. The cylinders A B will be geared together by toothed wheels, as 101 102, and the carriers C D will in like manner be provided with toothed wheels 103 104, said wheels forming a train whereby the cylinders A B and carriers C E are caused to make turn for turn in the proper direction.

The construction and operation of the cutting and folding mechanisms with which the carriers C E are supplied are like that described in Patent No. 143,074, granted October 14, 1873, Reissue No. 8,900, granted September 16, 1879, from the description contained in which it will be understood that a web directed between the carriers C D will be impaled by the pins 11, severed by the blades 12 13, and that the leading edge of said web, held by the pins 11, will be carried around upon the surface of the carrier C until the creasing-blade 10 comes into co-operation with the jaws 8 9, (the latter then standing open,) whereby the body or web is doubled or creased between said jaws, and there retained by the jaw 9 being vibrated so as to seize and hold the same, and that the web thus creased or folded and held will be carried by its doubled edge around with the surface of the carrier E, its

free end held by the pins 11 being torn from said pins, (unless the same are withdrawn, as they may be,) and that when the cutting devices arrive a second time into the position shown in Fig. 3 they will again sever the web, thus completing the sheet held by the jaws 8 9, from which it will be released and delivered by the opening of the jaw 9. With these devices there is also arranged a supplement-introducing mechanism, consisting of the feeding cylinders or rollers 40 41, which are provided with a cutting-blade, 14, and cutting-slot 15, whereby the supplement-web 99 is divided into sheets, and with a conductor consisting in part of endless tapes 42 43, that run from rollers or pulleys 44 45, placed just in advance of the cylinder 40, and rollers or pulleys 46 47, placed near the contact-point of the cylinder B with the carrier C, said tapes being given the proper speed of travel and direction of motion through pinions 5 90 and a toothed wheel, 91, fast on the shaft of the carrier C. Guide-rods 92 93 extend this supplement-sheet conductor to a point close to the point of contact between the peripheries of the cylinder B and the carrier C. This conductor, as well as the delivery mechanism, may in practice be arranged to run slightly faster than the feeding-cylinders 40 41 by a suitable arrangement of the gearing, the purpose being to advance the supplement-sheet rapidly enough to detach the forward sheet from the web, if only partially severed, and in all cases to separate sheet from sheet a suitable distance apart to provide for its subsequent manipulation; but this increased speed of travel might be accomplished by the action of cylinder B and carrier C.

The gearing by which the feeding-cylinders are driven consists of a toothed wheel, 105, on one end of the shaft of the cylinder A, that gears with a wheel, 106, on the shaft 107 at one side of the machine, and of a toothed wheel, 101, that drives a toothed wheel, 108, on the shaft 107 at the other side of the machine, the said wheels 106 and 108 being splined upon the shaft 107, so that either may be thrown out of gear at will. The motion of this shaft 107 is imparted to the cylinders 40 41 by toothed wheels 109 110 and an intermediate, 111. This gearing, it will be observed, is such that the feeding-cylinders 40 41 may be driven at an equal surface-speed, or in unison with the cylinders A B and carriers C E, when the intermediate 106 is properly in gear, or at one-half of that speed when the intermediate 108 is properly in gear, the machine being thus capacitated to introduce a supplement-sheet of a length equal to that of the main sheet, or of one-half that length.

The general structure and operation of the supplement-introducing mechanism is fully set forth in the aforesaid Patent No. 225,746, to which reference is made, and the description whereof applies here. In this apparatus is also shown a means for printing and winding up a supplement-web. This consists of swinging arm 60 61, hung to the side frames and car-

rying a guiding-cylinder, 62, and a pressing-cylinder, 63, which latter rests upon the lap-pings of the rolled supplement-web 150, that are wound upon a shaft, mandrel, or core, 130, that is mounted removably in bearings in the frame-work. The cylinders 62 and 63 are driven in unison by toothed wheels 119 120, through an intermediate, 118, that gears with the wheel 102. A web printed in passing between the cylinders A B, at which time the supplement-introducing apparatus will be entirely thrown out of action, is led over a guide-roller, 64, mounted in fixed bearings in the frame-work, under the guiding-cylinder 62, over the pressing-cylinder 63, and onto said core or mandrel 130. The particular structure and operation of this supplement-winding apparatus is fully explained in my said application, and forms no part of the invention here claimed. When the supplement-roll 150 is completed to the desired size, it is removed bodily from its bearings at the upper part of the frame-work, and is placed in similar bearings at the lower end of the frame-work, as is shown at the left-hand side of Fig. 3. This supplement-web, as is described in said application and in said Patent No. 225,746, may be perforated throughout its width at the lines of ultimate division into sheets, or be simply punched at such points, to afford an index whereby its position of relation when associated with the main sheet can be readily determined.

When the machine is in operation and the main sheet is being delivered by the mechanisms supported by the carriers C E, the supplement-sheet would be associated therewith by being conveyed thereto through the conductor formed by the tapes 42 43, in the manner explained in said Patent No. 225,746; but it has been found in practice that no matter how perfectly the feeding-cylinders 40 41 may be constructed and operated, either with or without tension devices applied to the supplement-roll 150, it is impossible in a long run to feed sheets by simple cylinders with that precision requisite to the accurate division of such web into sheets and the proper association of each supplement-sheet with a main sheet. Thus while the supplement-web may be fed onward and divided, so that one or a number of supplement-sheets may run accurately and be associated properly, such supplement-web will sooner or later either advance too fast or too slow to be properly divided to produce perfect work, and this inaccuracy, once begun, rapidly multiplies until spoiled products are the result. The purpose, therefore, of the sheet-governing mechanism, forming an essentially novel feature of this apparatus, is to prevent, or rather to correct, this faulty feeding operation of the cylinders 40 41. The supplement-web, therefore, is caused to pass through this register-governing mechanism, which consists of devices connected with the carrier D and coacting with the feeding-cylinders 40 41, the supplement-web, as is shown in Fig.

3, passing, for convenience, over a guiding-roller, 65, thence partially around the carrier D, over the cylinder 41, between it and the cylinder 40, under the latter, and into the conductor formed by the tapes 42 43. This carrier D is driven in unison with the feeding-cylinders 40 41 by means of a toothed wheel, 112, that is constantly geared with the wheel 111, and therefore partakes of the same surface movement as the feeding-cylinders, whether the latter are driven by the intermediate 106 or the intermediate 108.

The peculiar structure of sheet-governing mechanism embodied herein will now be explained, and as the feeding-cylinders 40 41 require to feed faster or slower, according as the sheets fed by them advance too fast or too slow, the special means for accomplishing that function will first be explained, which is best illustrated in Figs. 5 to 10. The cylinder 40 is provided, in a suitable recess of its periphery, with an expanding-bar, 6, that is mounted fast upon a shaft, 21, provided at one end with a rock-arm, 14, the movements of which are accomplished by a sliding cam, 66, the bearing-surface of which is made conical, so that its position of lateral adjustment with respect to the rock-arm 14 will determine the degree of throw which said arm shall have, and consequently the extent to which the bar 6 shall be protruded. This cam 66 is arranged to slide upon the shaft 34 of the cylinder 40. The cylinder 41 is provided in like manner with an expanding-bar, 7, fast upon a shaft, 22, the rock-arm 15 of which is moved by a conical-faced cam, 69, that slides upon the shaft 35 of said cylinder. A spring (not shown) is attached to each shaft 21 22, so as to cause the rock-arms they carry to constantly press against the cam 66. If desired, each cylinder 40 may be provided with a number of expanding-bars. The longitudinal movements of these cams 66 69 are accomplished by means of a reciprocating rod, 23, (see Fig. 8,) that slides in the frame-work, and carries at its forward end a branching plate, 71, the extremities of which are attached to said cams 66 69.

The reciprocatory movements of the rod 23 are produced by a lever, 24, the movement of which is effected as follows: Its lower end is attached to a nut, 25, that is engaged by a screw, 26, the shank of which turns freely upon a stud secured to the frame-work, the shank of said screw carrying fast to it a toothed wheel, 114, through which it is turned in either direction, as the case may be, by means of a pinion, 115, that is fast to a sleeve, 116, and arranged to turn on a stud secured to the frame-work, said sleeve being provided with belt-pulleys 72 73, by which it may be turned in opposite directions. It will be apparent, now, that when the sleeve 116 is turned in either direction the screw 26 will be rotated and the nut 25 caused to travel outwardly or inwardly, thus imparting to the cams 66 69 inward or outward movements, as the case may be; and that when these cams 66 69 are moved inward they will,

in consequence of their conical shape, afford a bearing-surface of such diameter as to cause the rock-arms 14 15 to be moved outward concertedly and to travel in a circular path of increased dimensions, and therefore that they will protrude the bars 6 7 correspondingly, and hence expand the peripheral extent of the cylinders 40 41, which increased size of said cylinders consequently causes the supplement-sheet to be moved onwardly more rapidly, or advanced to a greater extent. These bars 6 7 may therefore be retained within the peripheral line of their respective cylinders, or be protruded therefrom more or less, as is required, and this protrusion of them will be regulated positively by lateral reciprocation of the cams 66 69, caused by a suitable rotation of the screw 26. While said screw may be rotated by hand, if desired, which operation, however, would be tedious and require frequent manipulation by the attendant, the same is herein accomplished automatically by the register-governing mechanism, its movements being determined by the sheets that are to be associated with the main sheets.

The register-governing mechanism proper, through which the supplement-sheet (as here shown) travels before it is passed over the feed-rollers, consists of appliances set into operation by electrical circuits, the breaking or making of which circuits is performed by the sheet passing over the carrier D, as will presently appear. This carrier (see Figs. 5 and 8 to 12) is a rotating cylinder provided with a tongue, 17, the forward end of which protrudes through an opening in the shell of the carrier, its spring-arm being secured to the inner surface of the carrier-shell by an insulated screw, 38, this spring-tongue thus acting normally to protrude its forward end beyond the periphery of the carrier, and so as to have contact with a guard, 18, partially surrounding said carrier. From this spring-tongue 17 an insulated conducting-wire, 19, extends to the positive pole of a suitable battery, x , passing, for convenience, through the shaft 27 of the carrier, and being brought to the exterior thereof, outside of the frame-work, around which shaft it is wrapped in a coil, as is seen in Figs. 9 and 13. Upon this coil, the exterior surface of which is laid bare for the purpose of establishing electrical action, bears a spring-tongue, 28, that extends from an insulated post, which tongue 28 is connected to the positive pole of the battery x by a continuation of the wire 19 through electrical coils constituting a magnet, I, and a battery-wire, 29.

The carrier D is provided with a second spring-tongue, 20, constructed and operating in the same manner as the tongue 17, and, like it, connected by an insulated wire, as 39, that enters into the shaft 27, and emerges therefrom outside of the frame-work, and terminates in a wrapped coil, as is indicated in Figs. 9 and 13. Upon this coil bears a spring-tongue, 30, that is supported in a suitable post, and connected by a continuation of the wire 39 through the

coils of a magnet, J, with the battery-wire 29, which leads to the positive pole.

The guard 18 has a suitable surface or insulated lining that is connected by a conducting-wire, 31, with the negative pole of the battery x .

The magnets I J are each provided with armatures 32 33, the rear ends of which armatures will be drawn down whenever an electrical circuit is established through the magnets. The long arms of these armatures 32 33 co-operate with clutching mechanisms for setting into motion belt-pulleys 74 75, that are mounted on the shaft 27 of the carrier D. As here shown, this clutching mechanism is constructed as follows: Each pulley is provided with an extended flange or rim, 16, (see Fig. 13,) within which a divided friction-ring, 36, is carried. This ring has one end secured by a pivot, 49, to a disk, 50, upon the hub of which the pulley is free to revolve. The disk 50 is fast to the shaft 27, and consequently revolves with it, and while the ring 36 also revolves with the said disk, its two ends are so connected that it may be contracted to freely turn within the flange or rim 16 without imparting motion to the pulley, or be expanded to drive the same by its frictional contact therewith. These effects are produced by connecting the free end 51 of the ring 36 with the pivot 49 by means of a toggle, one lever, 52, of which is hung to the pivot 49, while the other, 53, is pivoted to the lever 52 and to the free end of the ring 36. This toggle is actuated by moving the lever 52 to and from the shaft 27, operating when moved toward said shaft, as in Fig. 14, to shorten the toggle and contract said ring; so as to relieve its frictional bearing upon the rim 16, when the pulley will stand idle, and when moved outward, as in Fig. 15, to elongate or straighten the toggle, and thus force the ring into frictional or clamping contact with the rim 16, and thus cause the pulley to be revolved with the disk 50. This toggle is constructed so that it will maintain either position of its adjustment until forcibly moved. The action of this toggle in either direction, and hence the desired movement of the pulleys 74 or 75, is accomplished by means of the armatures 32 33, a description of the action of one of which will now be given.

The long arm of the armatures carries a T-shaped end, one branch of which enters into the groove 94 of a guiding-disk, 54, that is fast on and turns with the shaft 27, which groove acts to limit the vibratory movement of the end of said armature. The rear portion of the other branch of the T end of the armature is shaped to provide an inclined upper face, 2, and an inclined lower face, 3, (see Fig. 15,) one or the other of which inclined faces is brought into the path of travel of the end of the long arm of the toggle-lever 52, which latter is provided with a lateral projection, 1, that has similarly-inclined upper and under faces. When the long arm of the armature is elevated, as in Fig. 14, its inclined lower face will be en-

gaged by the inclined upper face of the projection 1 of lever 52, and said lever thus forced inwardly operates to straighten the toggle and expand the ring 36, so that the latter frictionally clamps the rim 16 of the belt-pulley to it and the disk 50, whereby the pulley is caused to revolve with said disk. When, however, the long arm of the armature is depressed, as in Fig. 15, its inclined upper face will be engaged by the inclined lower face of the projection 1 of the lever 52, and said lever thus be forced outwardly, thereby shortening the toggle and contracting the ring 36, so that the latter no longer frictionally clamps the rim 16, whereby the band-pulley is unclutched from the disk 50 and remains stationary, while said disk continues to revolve. When the pulley 74 is thus clutched to its driving-disk 50 by the action of its armature 32, it will be revolved, and through the driving-belt 58 it carries impart its motion to the belt-pulley 72, as will the pulley 75, through its belt 59, to the belt-pulley 73, said pulleys 72 73 turning in opposite directions in consequence of the belt 58 being crossed, and appropriately turning the screw 26 to adjust the feeding-rollers 40 41, as heretofore described, and as will be more fully explained in connection with the action of the mechanisms as controlled by the sheet passing over the carrier D. Any other clutching mechanism set into action by the armatures 32 or 33 may be used, as is indicated by the structure shown in Figs. 8 and 9, which corresponds with that illustrated in my companion application.

In order to facilitate an understanding of the operation of the registering apparatus—that is, the mode of its acting to adjust the feeding-rollers 40 41 so that they shall properly detach supplement-sheets from a web, (if they carry the cutting devices,) or properly feed each sheet onward in true position for association and delivery with a main sheet—the supplement perforation, punching, or notching mechanism must first be explained.

It may be remarked that, as here embodied, the register is determined while sheets are in the web form—that is to say, the register-governing mechanism coacts with the web, instead of with sheets separated therefrom, said governing mechanism being placed between the feeding-rollers and the source from which the web is supplied. To do this the web must be notched at its edge, or be punched in its body at points the distance of a sheet's length apart, through which notches, punched holes, or perforations the arms 17 20 may protrude as the said web varies from its proper position. As before stated, however, a sheet-register-governing mechanism constructed as is here shown may be used in connection with detached sheets; but in its combination with feeding-rollers, when arranged to act upon sheets which have passed said rollers, it will be claimed in an application yet to be filed.

To perforate a web or provide it with notches a sheet's length apart, the means shown in

Figs. 5 to 9 in my application filed May 20, 1881, may be used, from which would result a web punched or notched and wound up in a roll; or such web, when whole, may be punched with properly-shaped holes a sheet's length apart after it has been printed and is passing between the carriers B and C, as in Fig. 4, by providing the carrier B with a die or dies, (according as it is to be a full or half sheet,) placed at margin-points, and providing the carrier C with a punch or punches, to cooperate therewith, said punches protruding through the cutter 13 and blade 10, as the case may be, and said dies being inserted into the cylinder B at its recess or margin-points 2.

It may be further stated that, as is explained in the Patent No. 225,746, the supplement-web need only be partially severed along the dividing-lines which are to separate the web into sheets, (in which case the cutters 12 13, one or two sets, will be constructed to perforate, but not sever, the web,) and that when a partially-severed web is operated upon the faster-running carriers B C will be depended upon to complete the separation when the supplements are led thereto from the rollers 40 41, said partially severed or perforated web being punched or notched, as before explained, prior to its being wound up; and, further, it may be stated that the cutting-blade 14 and slot 15, with which the rollers 40 41 are provided, may be supplanted by like or other cutting or partially-cutting mechanisms operating upon the supplement-web as it passes between the feeding-rollers 40 41; further, that the severing or partially-severing mechanism may be independent of the feeding-rollers 40 41, and be situated so as to operate upon the web before it reaches said rollers, or even before it passes to the carrier D; also, that when the supplement-web has been partially severed on its dividing-lines, before winding up in a roll, no cutting mechanism will be used upon it when it is being introduced to the main sheet; but as the cutting and feeding mechanisms are here embodied in the rollers 40 41, the apparatus will be described as thus organized.

It being understood that the web has notches or punched holes of suitable size, as in Figs. 5, 10, 11, 12, which are a sheet's length apart, the explanation of the register-governing mechanism will be readily understood. This register-governing mechanism is of peculiar construction; but it should be remarked, as is indicated in the specification of my said application filed May 20, 1881, that the particular structure of the sheet-register-governing mechanism then described may be used here, in which case the supplement-web will be punched with holes, providing a space as large as the end of the breaker and closer 9 shown in that application. When the web 99 is running onward accurately—that is, when it is properly advancing so that the line dividing sheet from sheet or the adjacent margins of printed matter pass correctly through the rollers 40 41, and thus cause the

supplement-sheet to register with the main sheet to which it is conducted—the punched holes or notches 83 in the web 99 will overlie the arms 17 20, as in Fig. 10, thus covering each and insulating them from electrical contact with the guard 18. At this time the bars 6 7 of the rollers 40 41 will be in their normal positions, or but slightly protruded from said rollers. In such relation of the mechanisms the web will run onward, carried by the feeding-rollers 40 41, pass thence into the conductor formed by the tapes 42 43, enter between the carriers B C, the forward sheet be detached from the web and combined or associated with the main sheet, as is explained in said Patent No. 225,746, and be folded and delivered therewith; but if, from any cause, said feeding-rollers operate to advance the web too slowly, as in Fig. 11, and thus throw the supplement-sheet out of register, such defective action will cause the perforations or punched holes 83 in the web to be carried so far rearwardly as to expose the arm 17, which thus uncovered will be free to spring outward and protrude against the guard 18, its contact with which will establish an electrical circuit through the coils of the magnet I, whereupon the latter will act to draw down the heel of the armature 32, thereby raising its long arm, as in Fig. 14, which arm, throwing the lever 52 inwardly, operates the clutch mechanism, as heretofore described. The revolving disk 50 is thus clutched to the belt-pulley 74, the rotation of which is imparted to the belt-pulley 72, which acts to rotate the screw 26, and, through the lever 24, to move the sliding cams 66 69 inwardly, whereby paths of travel of increased size are presented for the rock-arms 14 15, which causes the bars 6 7 to swing, thus expanding the circumferential extent of the rollers 40 41, and hence increasing the speed of their feeding action. This action will consequently result in moving the web onward faster, until its punched hole becomes so related to the arms 17 20 as to break the circuit established by the one 17 by insulating both of them, whereupon the outward protrusion or adjustment secured for the bars 6 7 will be maintained.

If, now, from any cause, the web should feed onward too rapidly, as in Fig. 12, which would also disturb the proper registration of the supplement-sheets with the main sheet, the punched hole in the web will be brought into such relation with the spring-arms 17 20 as to leave the latter free to press outward and have contact with the guard 18 in passing the same. From this will result an electrical circuit established through the coils of the magnet J, which magnet will at once draw down the heel of its armature 33 and elevate its long arm, the latter setting into action the clutching mechanism connected with the pulley 75, the rotating motion of which will be communicated to the pulley 73, which latter will so turn the screw 26 as to vibrate the lever 24 and move the sliding cams 66 69 outwardly, whereby

paths of travel of decreased size will be presented for the rock-arms 14 15, that will cause the bars 6 7 to be drawn inward, thus contracting the circumferential extent of the rollers 40 41, and hence decrease the speed of their feeding action. This movement will result in moving the web more slowly in its onward movement until the punched hole becomes so related to the arms 17 20 as to break the circuit established by the one 20 by insulating both arms. The bars 6 7, thus adjusted, will maintain their positions until another defective feeding of the web ensues, whereupon one or the other of the arms 17 20 will pass through a punched hole in the web, and, establishing a circuit, cause one or the other of the magnets to operate its armature to perform a proper adjustment of the feeding-rollers.

If, from any cause, the web should break or the machine be set into operation before the supplement-web has been properly entered, at which time there would, of course, be no web passing over the carrier D, in the absence of which both arms 17 20 would have contact with the guard 18, both armatures 32 33 would be drawn down, and hence set both clutches into action, which would either injure the apparatus or materially disturb the adjustment of the feeding-rollers. It is therefore desirable to prevent this faulty action, and it may be done by the means described in my said application filed May 20, 1881, and more particularly illustrated in Figs. 21 to 25 thereof, and in which case its combination with equivalent mechanisms is claimed.

If, from any cause, it is desirable that the arms 17 20 should be moved a greater or lesser extent apart than is shown here, it may be accomplished by making them adjustable; but such structure is not claimed herein.

If the supplement-web is left intact, except at the points where it is punched for the action of the arms 17 20, it may, in the case where the supplement is to be a whole sheet, be severed by the devices of carriers C E simultaneously with that operation on the main web.

It is manifest that only one of the feeding-cylinders need have means for increasing and diminishing its circumferential area. Thus, if the cylinder or roller 41 were alone supplied with the bar 7, it would operate, since whatever extent of web is advanced up by it will be taken up by the roller 40 and the tapes 42 43.

What is claimed is—

1. The combination of a register-governing apparatus provided with means for establishing electric circuits that are controlled by the web, and which operate the mechanism adjusting the feeding action of the feeding mechanism, with said feeding mechanism, for drawing the paper onward through the register apparatus, and devices for dividing said web into sheets, all substantially as described.

2. The combination of a register-governing apparatus provided with means for establishing electric circuits that are controlled by the paper, and which operate armatures that set

into motion devices that adjust the action of a feeding apparatus, with said feeding apparatus, when interposed between said register apparatus and the delivery apparatus, all substantially as described.

3. A register-governing apparatus consisting of a carrier supporting arms 17 20, each connected with one pole of a battery, and of a co-operating guard, 18, connected with the opposite pole of a battery, the electrical contact of which arms and guard is controlled by the presence and absence of a paper, substantially as described.

4. The combination, with the moving carrier D and its arms 17 20, of the stationary guard 18, substantially as described.

5. The combination, with the moving carrier D, its arms 17 20, their battery-wires, the guard 18, and its battery-wire, of the magnet-coils I J, armatures 32 33, a clutching mechanism operated by said armatures, gearing set in motion thereby to adjust the feeding action of the feeding mechanism, substantially as described.

6. The combination, with a sheet or web register determining mechanism, of a feeding apparatus consisting of a pair of rollers or cylinders provided with means for enlarging and contracting the circumferential extent of one or both of them, all substantially as described.

7. A web or sheet feeding apparatus consisting of rollers or cylinders, each provided with a bar and with means for adjusting the extent to which said bar protrudes from the surface of the roller or cylinder, all substantially as described.

8. The combination, with the cylinders or rollers 40 41 and their bars 6 7, of sliding cams 66 69, having conical peripheries or bearing-surfaces, substantially as described.

9. Feeding-cylinders having means for expanding and contracting the circumferential extent of one or both of them to regulate their feeding action upon the paper passed between them, and provided with cutting devices, substantially as described.

10. The combination, with the long arm of an armature provided with a projection having inclined faces, as 3 4, of a flanged disk, as 50, carrying a friction-ring, as 36, whose ends are connected by a toggle, one lever of which is operated by said armature, said ring running within the rim or flange of a pulley or wheel, as 74, that transmits motion to a feed-adjusting mechanism, substantially as described.

11. The combination of the electric circuit making and breaking devices, armatures actuated by said circuits, mechanisms operated by said armatures to clutch driving disks or wheels to gearing transmitting motion to and laterally adjusting conical cams, as 66 69, whereby rock-arms, as 14 15, are rocked to protrude or withdraw the bars 6 7, substantially as described.

12. The combination of the feeding-rollers 40 41, their bars 6 7, the conical cams 66 69, their moving-lever 24, its actuating-nut 25 and screw 26, and means for rotating the latter, which are driven from the shaft 27 of the register-governing apparatus, all substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

LUTHER C. CROWELL.

Witnesses:

GEO. H. GRAHAM,
T. H. PALMER.