

No. 791,834.

PATENTED JUNE 6, 1905.

C. SPAULDING.
PHOTOGRAPHIC PRINTING MACHINE.

APPLICATION FILED NOV. 14, 1904.

6 SHEETS—SHEET 1.

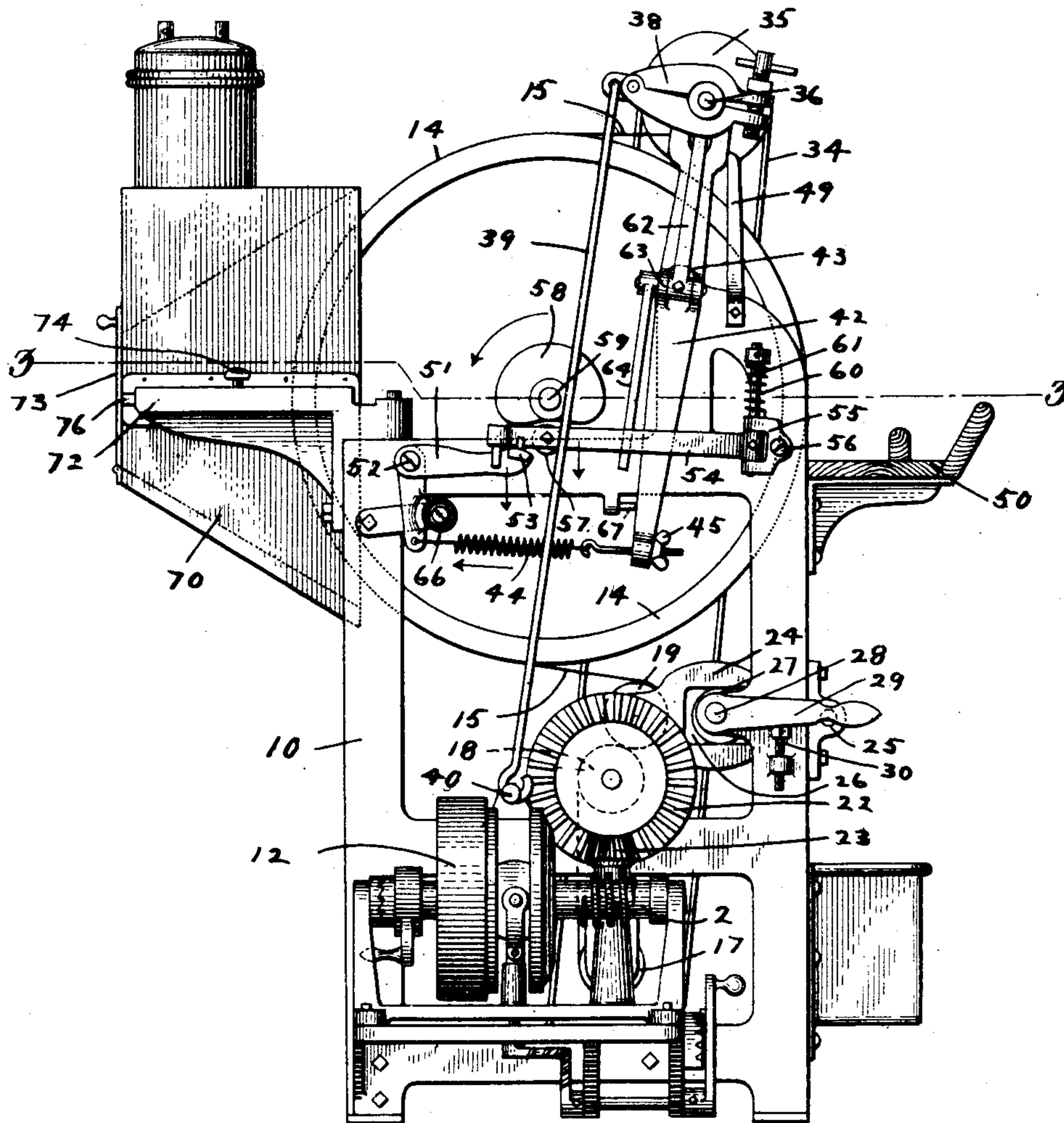


Fig. 1.

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Inventor:

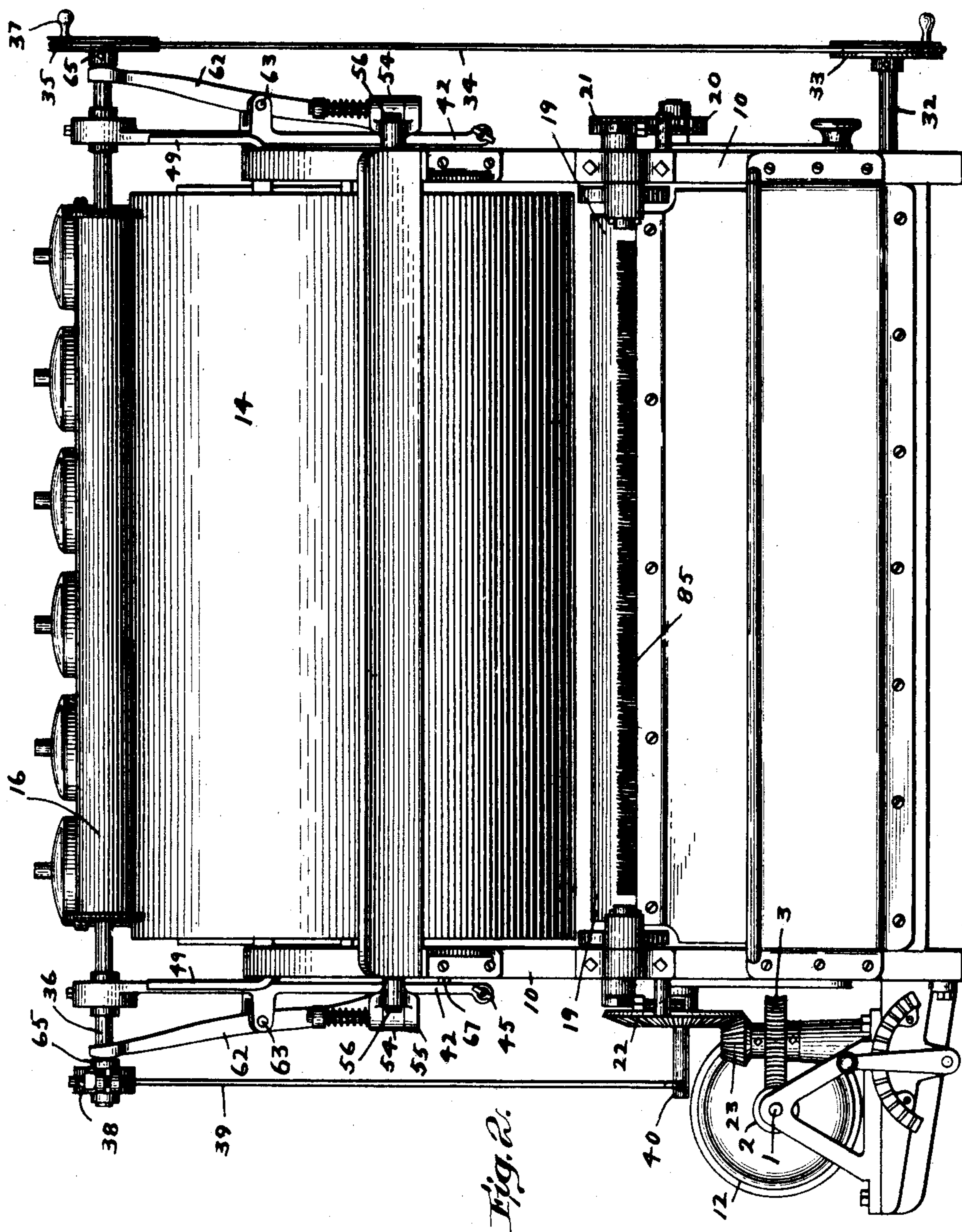
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6 SHEETS—SHEET 2.



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6 SHEETS—SHEET 3.

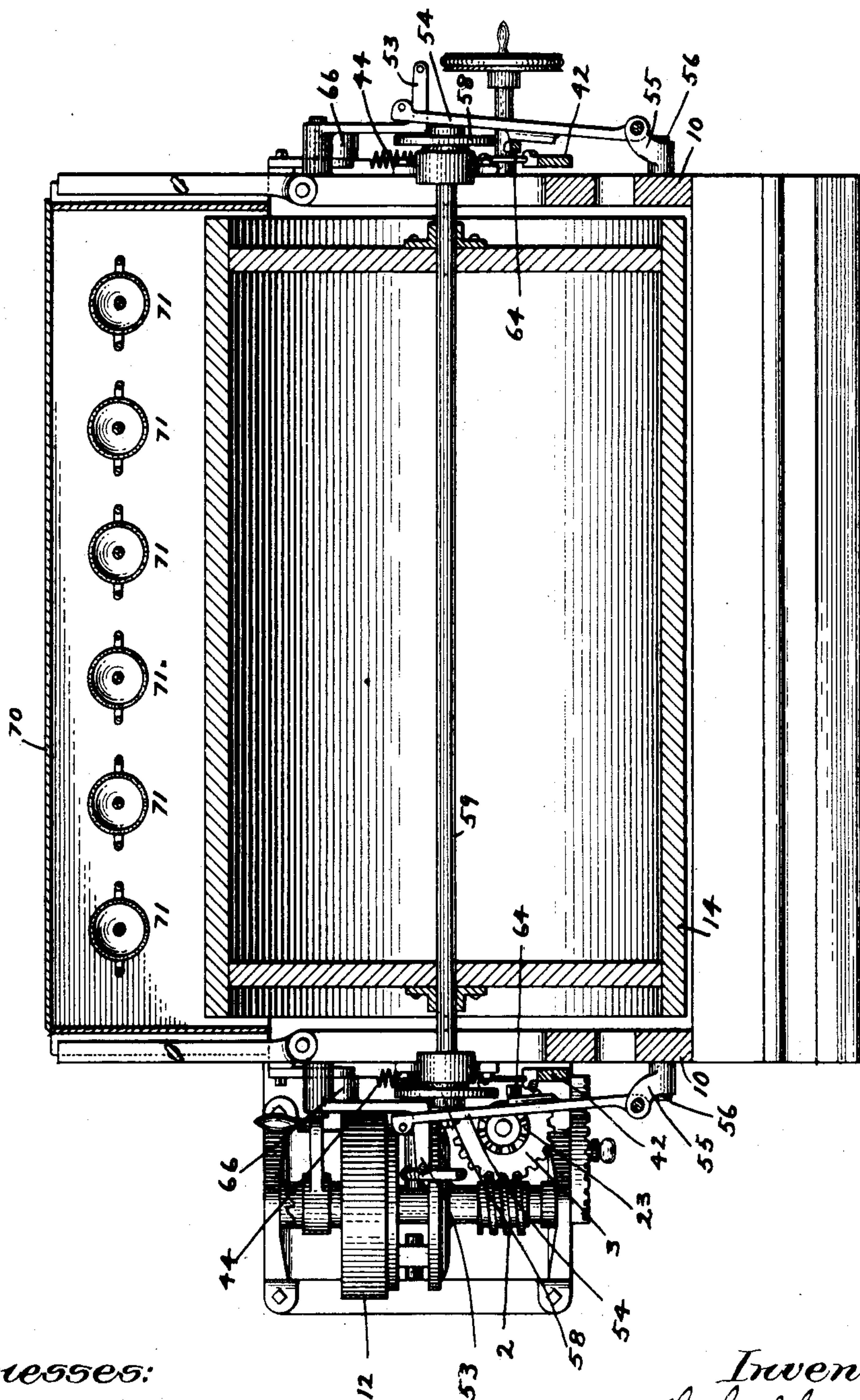


Fig. 3.

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6 SHEETS—SHEET 4.

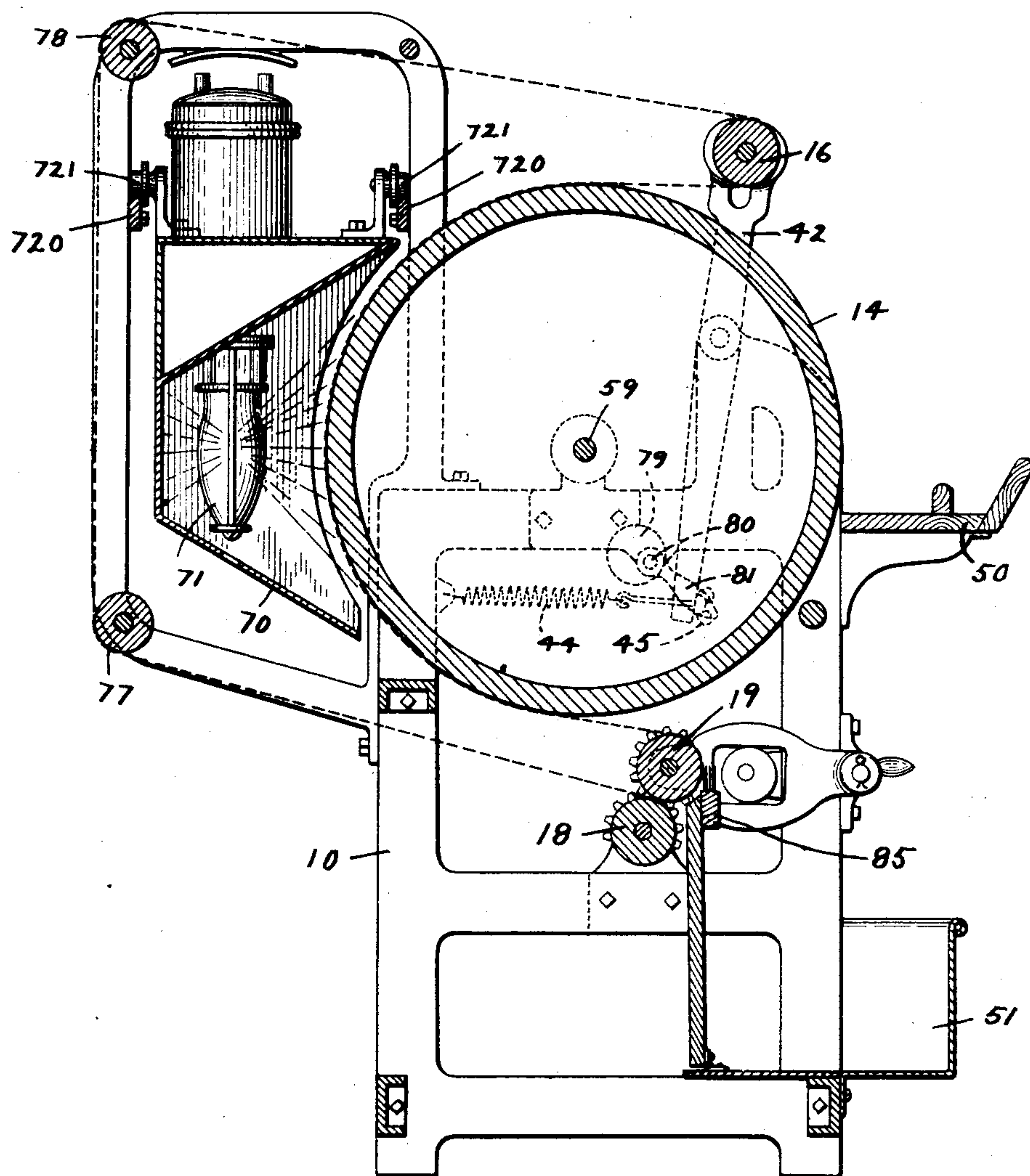


Fig. 4.

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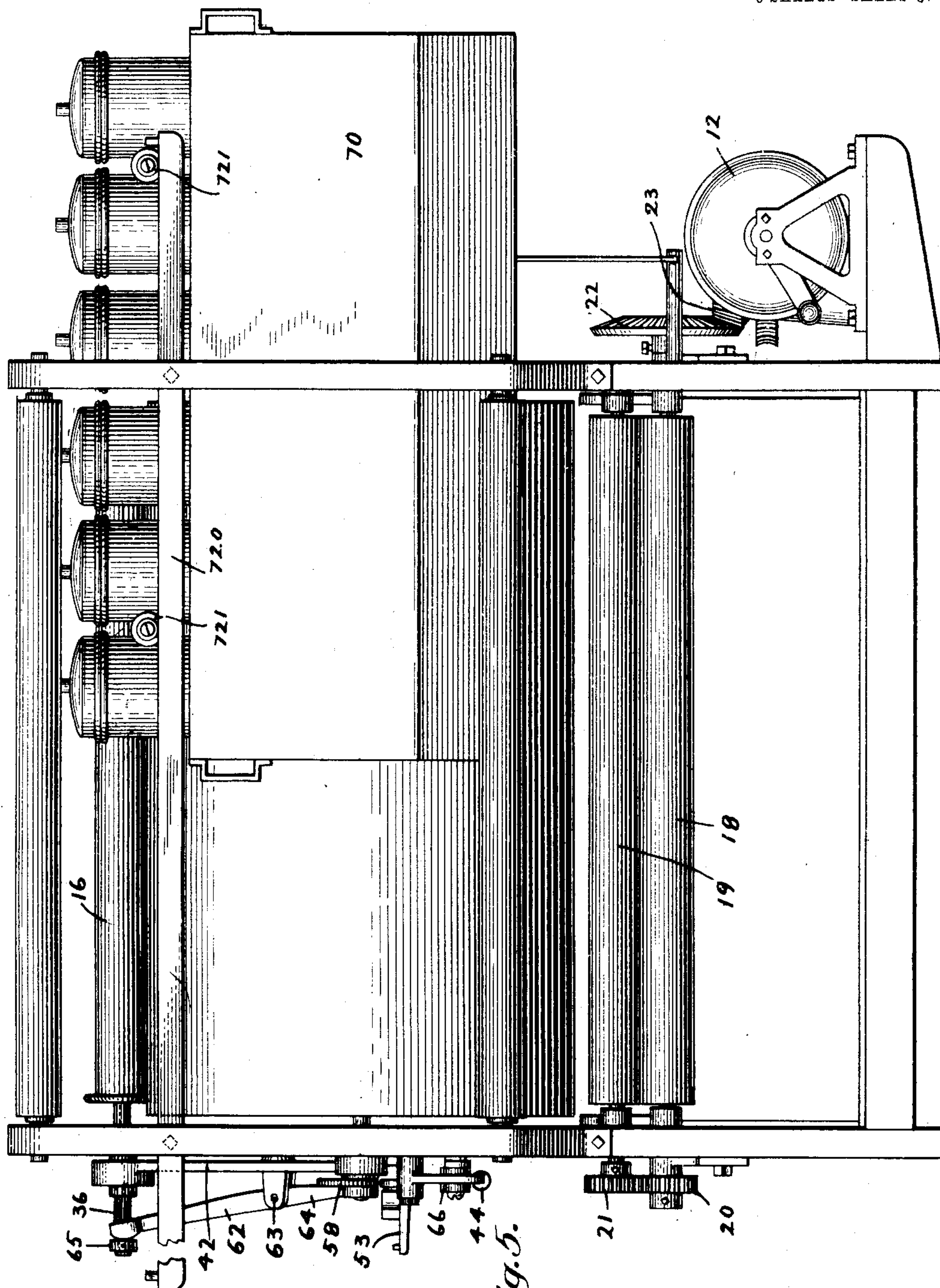
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6 SHEETS—SHEET 5.



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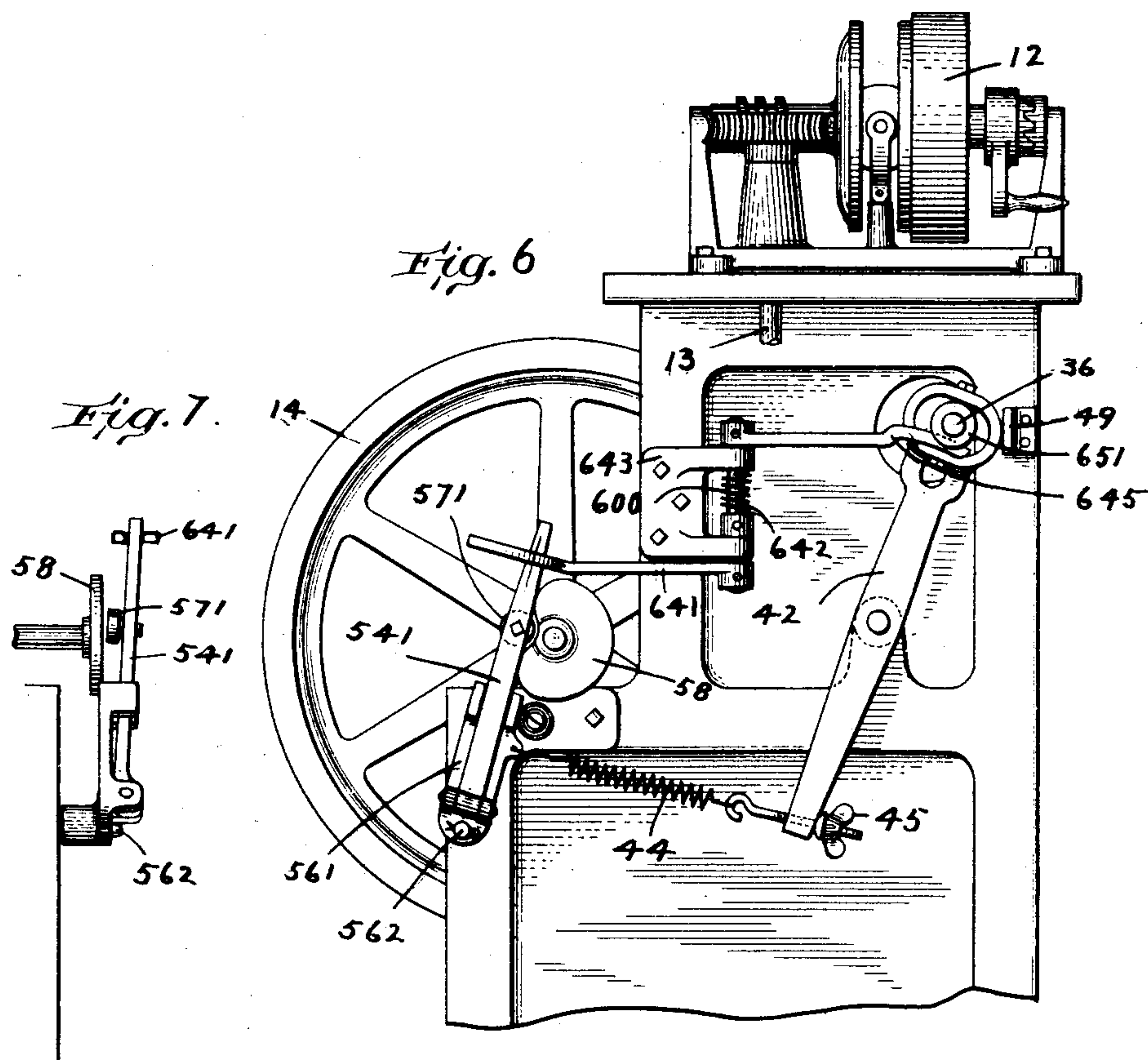
Fig. 5.

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6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

CHARLES SPAULDING, OF BOSTON, MASSACHUSETTS.

PHOTOGRAPHIC-PRINTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 791,834, dated June 6, 1905.

Application filed November 14, 1904. Serial No. 232,565.

To all whom it may concern:

Be it known that I, CHARLES SPAULDING, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and
5 useful Improvements in Photographic-Printing Machines, of which the following is a specification.

This invention relates to machines of the character described in Letters Patent Nos.
10 702,252 and 738,578, granted to me June 10, 1902, and September 8, 1903, respectively, for automatically making photographic prints by a continuous process, the machine comprising, essentially, a rotatable drum and a
15 transparent or translucent apron in contact with a portion of the surface of the drum and traveling therewith, the drawings or negatives from which prints are to be taken and the sensitized sheets being fed between the
20 apron and drum at one point exposed to the action of light as they travel with the drum and apron and discharged therefrom at another point.

The object of the present invention is to
25 improve the machine of Patent No. 738,578 by providing mechanism for automatically varying the tension of one or the other side of the apron, so that it will be guided properly to engage the drum centrally and with-
30 out wrinkling, thereby remedying a defect of the prior machine, in which the apron would sometimes run over the end of the drum, to provide a novel arrangement for printing by artificial light, and to provide a construction
35 by which a continuous endless apron instead of the discontinuous strip may be used.

Of the accompanying drawings, Figure 1 represents a side elevation of the preferred
40 embodiment of my invention. Fig. 2 represents a front elevation of the same. Fig. 3 represents a horizontal section on line 3 3 of Fig. 1. Fig. 4 represents a rear elevation of a form of the machine in which an endless apron is used. Fig. 5 represents a vertical
45 cross-section of the same. Fig. 6 represents another form of the invention, showing the automatic apron-tension regulator applied to the machine of Patent No. 738,578 without change in the general structure. Fig. 7 rep-

resents an elevation of part of the mechanism shown in Fig. 6 as seen from the left of
50 said figure.

The same reference characters indicate the same parts in all the figures.

The machine of the present invention is
55 similar in its main essentials to the machine of my prior patent, No. 738,578, in that it comprises the frame 10, rotatable drum 14, apron 15, which in one embodiment of this invention is wound up on the let-off and take-
60 up rolls 16 and 17 and in another embodiment, to be hereinafter more particularly described, is formed as a continuous endless strip mounted on suitable guide-rolls. The
65 actuating mechanism is also substantially the same as that of the prior patent, except that the transmitting and speed-changing mechanism 12 is mounted on the base instead of the
70 top of the machine and communicates motion, through the worm 2 on the shaft 1 of this mechanism, to a worm-wheel 3, which is connected to the bevel-gear 23, the latter mesh-
75 ing with the gear 22 on the shaft of the pulling-roll 18. The roll 16 is mounted, as in the other machine, so as to be axially mov-
80 able in bearings universally jointed to pivoted arms 42, adapted to yield in the direction of pull of the apron, the pulling tendency of the apron being resisted by springs 44, adjustably connected to the lower ends of the
85 arms 42. This yieldable and axially-adjustable mounting for the roll 16 is provided in order to allow the roll to shift, so that the apron may come smoothly in contact with the
90 drum without slipping thereon and without forming wrinkles in the apron which would cause blurring of the print; but I have found that frequently in practice the apron shows a
95 tendency to creep from one end toward the other of the drum either on account of unequal stretching of the apron, which causes one edge to be tighter than the other, or for some other cause. As the roll 16 is given quite a wide latitude of axial movement, it frequently happens that the apron will shift
so far that its edge will extend over beyond the end of the drum, necessitating stopping the machine until it can be readjusted in

proper central position. The necessity of so stopping the machine retards the production of work and interferes with the efficiency of the machine, and therefore I have by the present invention provided mechanism for automatically adjusting the roll to guide the apron so that it will engage the drum approximately centrally and at the same time be free from wrinkles. This mechanism will now be described.

The spring 44 instead of being connected to a fixed abutment is attached to one arm of the bell-crank lever 51, pivoted at 52 to the machine-frame and having at the end of its other arm a lateral projection 53, upon which rests an arm 54, pivoted to a bracket 55, so as to be capable of rotating in a substantially horizontal plane, while the bracket itself is pivoted at 56 by a horizontal pivot to the frame. By means of these pivotal connections the arm 54 is capable of universal movement. Near its free end the arm 54 is provided with a roll 57, which when the arm is moved into the proper position laterally is adapted to be engaged by cam 58, mounted on the end of the shaft 59 of drum 14. A spring 60, mounted on an extension of the vertical pivot 61, normally tends to swing the arm 54 inward toward the frame, so that the roll 57 is in the path of the cam 58. When the roll is in this position, the cam acting upon it forces it and the arm 54 downward about the pivot 56. The arm acting upon the projection 53 throws the horizontal arm of the bell-crank 51 downward and the vertical arm to the left, as seen in Fig. 1, thus increasing the tension of the spring 44, and thereby increasing the resistance of that end of the roll 16 to the pull of the apron 50. A lever 62, pivoted at 63 to the arm 42, has a downwardly-extending arm 64, adapted to engage the arm 54 and move the latter away from the cam 58. The other arm of this lever 62 extends upward and is engaged by a collar 65 on the shaft 36 of the roll 16. A similar mechanism is provided upon the other side of the machine. The proportions of the parts are such that when the roll 16 is in the central position (shown in Figs. 2 and 5) the levers 62 are so held by the collars 65 as to engage the arms 54 and hold them away from the paths of the cams 58, so that the latter rotate inoperatively with the drum. When, however, the roll 16 is shifted axially by the uneven unrolling of the apron—say, for instance, toward the left in Fig. 2—the pressure of the collar on the left-hand lever 62 will be relieved, and the arm 54 will then be free to be rotated by its spring 60 to bring the roll 57 into the path of the left-hand cam 58. The latter will then operate to depress the arm 54 and elongate the spring 44, thus increasing the tension of the left-hand edge of the apron 15, with the result that the creeping tendency of the apron

toward the left-hand side will be resisted and the apron will be caused gradually to shift in the other direction until the collar again engages the arm 62 to throw the arm 54 out of engagement with the cam. When the apron and roll become displaced in the other direction, the action of the corresponding mechanism on the right-hand side of the machine is the same as that just described. It will be observed that only the tension-increasing mechanism on that side of the machine toward which the apron has been displaced is operated and that the corresponding mechanism on the side away from which the apron and roll have moved remains inoperative.

Stops 66 are provided for limiting the motion of the bell-cranks 51 under the influence of the springs 44, and thereby maintaining a uniform tension in the springs when the tension-increasing mechanism is not being operated. Stops 67 engage the arms 42 and hold them in position when the drawing-rolls are not operated.

The vertical pieces 49, which are attached to the side frames, are used for indicators to show the operator at a glance just how far the arms 42 have been drawn away from their stops 67. It is necessary while the machine is running to have these arms 42 perfectly free from the stops 67 in order to allow a slight yielding motion backward as well as forward of the roll 16. This yielding movement is necessary to allow for any looseness of the apron due to uneven rewinding on the roll 16, and sufficient tension must be applied by means of a friction device 38, similar to that described in my prior patent, to allow for any slipping back of the roll 16, which might bring the arm 42 suddenly against its stop 67 and cause a looseness of that part of the apron which is in contact with the exposing-surface of the drum. The upper extremity of the piece 49 just touches the upper part of the arm 42 when the latter is against its stop 67. When the two pulling-rolls 18 19 are in close contact and the power applied, the operator screws up on the tension device until he sees the upper extremities of both arms 42 begin to move away from the indicator 49. In actual practice this distance may be one-fourth to three-fourths of an inch, where it will remain with slight variations as long as the machine is in operation. Sometimes the distances which are indicated are exactly equal on both sides of the machine. At other times one of the indicators will show a greater space opened up on one side than on the other. If the distances are equal, it shows that the axes of the roll 16 and the drum are parallel, and there will then be practically no axial movement sideways of the roll 16. Where one space—say at the left-hand side of the machine—is opened out wider than the right-hand, the axes of 16 and 14 are not parallel, and the let-off roll 16 will gradu-

ally work to the left until the automatic mechanism increasing the tension on that side finally brings the roll 16 to its central position again.

In Figs. 6 and 7 is shown an equivalent mechanism to that just described as applied to the machine of my prior patent without any change in the general structure of the machine. In this construction the spring 44 is connected to a bracket 561, which is pivoted at 562 to the frame and carries pivoted to it the arm 541, which supports the roll 571, arranged to be engaged by the cam 58. The roll is thrown toward the path of the cam by an arm 641, provided on a rock-shaft 642, pivoted to a bracket 643 and provided with a spring 600, normally tending to move the arm 641 to force the roll 571 toward the cam. Another arm, 644, extends toward the shaft 36 of the roll 16 and is engaged by a collar 651 on the shaft to hold the parts so that the roll 571 is away from the cam when the guide-roll 16 is in central position. A device for furnishing artificial light by which to print is provided and consists of a casing or reflector 70, in which are mounted inclosed arc-lights 71. The casing is mounted on guideways 72, attached to the frame of the machine in such a position that one side is in close proximity to that portion of the drum with which the apron is engaged. The side of the casing or reflector which is near the drum is open, while the other sides are inclosed, so that a maximum proportion of the light given by the lamps is thrown upon the drum. By the use of inclosed arc-lights it is possible to bring the source of light close to the work without danger of burning the latter. An orifice is formed at the back of the casing, through which access to the lamps may had, and is closed by a cover 73. The casing may be moved on the guideways 72 toward and away from the drum and is held in any position by a set-screw 74, which clamps the flange 76 to the guideway.

In the form of the machine thus far described the apron is non-continuous and is wound up alternately on the rolls 16 and 17. It is desirable, however, in some cases to provide an endless apron, and in Figs. 4 and 5 I have shown a modified structure of the machine which adapts such an apron to be used with it. In this form the apron is supported and guided by the rolls 16, 19, 77, and 78, the roll 16 corresponding to the let-off roll, while the roll 19 constitutes one of the pulling-rolls. Roll 16 is mounted on arms 42 in the same manner as the corresponding roll in the form of the machine already described, and mechanism is provided for automatically causing this roll to guide the apron in the manner already described, such mechanism being shown in Fig. 5, although it is omitted in Fig. 4 for additional clearness. In order to avoid stretching the apron unnecessarily when the machine is not in use, I have provided a cam 79, mounted on

a pivot 80 and operable by a handle 81 to engage the arm 42 and move it in opposition to the pressure of the spring 45, thus relieving the apron of the pressure of this spring. As shown in Fig. 4, a portion of the apron is guided over the drum between the latter and the source of light, while the return portions of the apron are held on the other side of the lighting means. In order to permit the lights to be attended to while the apron is in place, the casing or reflector 70 is hung upon rails or guideways 720, which extend laterally of the machine, and the casing is provided with rolls 721, which run upon these rails and permit the casing to be withdrawn laterally at one side or the other of the machine, as shown in Fig. 5.

Occasionally trouble has been experienced by reason of the drawings and prints failing to separate from the apron at the discharging point, and in order to remedy this defect I have provided a brush 85, located adjacent to the roll 19, with its bristles in contact with the apron and their free ends extended in a direction such that they will engage the edges of the sheets of drawings and prints and separate them from the apron, causing them to fall into the box 51, provided to receive them.

I claim—

1. In a photographic-printing machine, the combination of a light-transmitting, flexible, laterally-movable, traveling apron, a supporting and guiding roll for said apron mounted to yield in the direction of pull of the apron, and mechanism automatically rendered operative by lateral movement of the apron for varying the resistance of one end of the roll to yielding to the pull of the apron.

2. In a photographic-printing machine, the combination of a light-transmitting, flexible traveling apron, a supporting and guiding roll for the apron, bearings at the respective ends of said roll mounted to yield independently in the direction of pull of the apron, and automatic means for varying the resistance of one of said bearings to yielding to the pull of the apron.

3. In a photographic-printing machine, the combination of a light-transmitting, flexible, traveling apron, a supporting and guiding roll for the apron, bearings at the respective ends of said roll mounted to move independently in the direction of pull of the apron, yielding means for holding said bearings in resistance to the pull of the apron, and automatic means for varying the resistance of one of said yielding means.

4. In a photographic-printing machine, the combination of a light-transmitting, flexible, traveling apron, supporting-rolls and a guiding-roll therefor, bearings for said guiding-roll at the ends thereof mounted to yield independently in the direction of pull of the apron, yielding means for holding said bear-

ings in resistance to the pull of the apron, the guiding-roll being movable in an axial direction in said bearings, and automatic means rendered operative by axial displacement of
5 said guiding-roll for varying the resistance of one of said yielding means.

5. In a photographic-printing machine, the combination of a light-transmitting, flexible, traveling apron, a supporting and guiding
10 roll therefor, bearings for the ends of said roll, independently-pivoted arms supporting and having universal connection with said bearings, movable to permit the roll to yield in the direction of pull of the apron, yielding
15 members connected to each of said arms to resist the pull of the apron, said roll being axially movable in said bearings, automatic mechanism normally inoperative for increasing the tension of said yielding members, and
20 means operated upon axial displacement of the roll in the bearings arranged to render operative the automatic mechanism for increasing the tension of one of said yielding members.

25 6. In a photographic-printing machine having a work-support and a light-transmitting, flexible apron traveling in contact with a portion of the support, means for guiding the apron into proper relation with the support,
30 comprising a supporting and guiding roll axially self-adjusting and mounted to yield in the direction of pull of the apron, yielding members connected to opposite ends of the roll to hold the roll in opposition to the pull
35 of the apron, and means automatically put into operation upon axial displacement of the roll for varying the tension of one of the yielding members.

40 7. In a photographic-printing machine having a work-support and a light-transmitting, flexible apron traveling in contact with a portion of the support, means for guiding the apron into proper relation with the support,
45 comprising a supporting and guiding roll axially self-adjusting and mounted to yield in the direction of pull of the apron, yielding members connected to opposite ends of the roll to hold the roll in opposition to the pull of the apron, and means automatically put into
50 operation upon axial displacement of the roll for increasing the tension of that yielding member toward which the roll is displaced.

8. In a photographic-printing machine having a traveling apron arranged to hold the
55 work while being printed, a flexible device mounted in contact with the apron and arranged to remove the work therefrom.

9. In a photographic-printing machine having a traveling apron arranged to hold the
60 work while being printed, means for removing the work from the apron comprising a brush mounted with its bristles in contact with the apron and extending toward the advancing work.

10. In a photographic-printing machine, the
65 combination with a movable bed and a source of light adjacent thereto, of an endless light-transmitting apron supported with a portion of its length in contact with a part of the surface of the bed, the said portion of the apron
70 being located between the source of light and the bed and constituting with the bed a holding and feeding means for the work to bring the same under the action of the light, and the remaining portion of the apron being
75 guided outside of the source of light.

11. In a photographic-printing machine, the combination with a movable bed of an endless light-transmitting, flexible, apron mounted with a portion in contact with a part of
80 the surface of the bed and traveling therewith to constitute with the bed a work holding and feeding means, and with its remaining portion held away from the bed, and a source of light supported adjacent the bed
85 between the said portions of the apron.

12. In a photographic-printing machine having traveling means for holding a sensitized sheet and a sheet from which a print is to be taken, means for throwing light on said
90 sheets comprising a casing open on the side adjacent the holding means and closed on all other sides, and a source of light supported within said casing.

13. In a photographic-printing machine
95 having means for holding a sensitized sheet and a sheet from which a print is to be taken, means for throwing light on said sheets comprising a casing open on the side adjacent the holding means and closed on all other sides,
100 a source of light supported within said casing, and a support for said casing arranged to permit the latter to be moved away from the sheet-holding means.

14. In a photographic-printing machine, a
105 frame, guideways thereon, means for holding and feeding the work, a casing supported on said guideways with one side adjacent said holding and feeding means and arranged to move on the guideways, and a source of light
110 contained in said casing, the latter being open on the side adjacent the holding and feeding means and closed on all other sides.

15. In a photographic-printing machine having a work-support and a light-transmitting apron traveling in contact with a portion thereof, means for causing the apron to engage the support in proper lateral relation thereto comprising automatic mechanism for
115 varying the tension of one side of the apron.

16. In a photographic-printing machine having a work-support and a light-transmitting apron traveling in contact with a portion thereof, means automatically set into operation by lateral displacement of the apron
125 for causing the same to shift laterally into proper relation with the work-support.

17. In a photographic-printing machine

5 having a work-support and a light-transmitting apron traveling in contact with a portion thereof, mechanism actuated by the machine arranged to be set in operation by lateral displacement of the apron to act upon and cause the same to be shifted laterally into proper relation with the work-support.

In testimony whereof I have affixed my signature in presence of two witnesses.

CHARLES SPAULDING.

Witnesses:

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