

No. 720,331.

PATENTED FEB. 10, 1903.

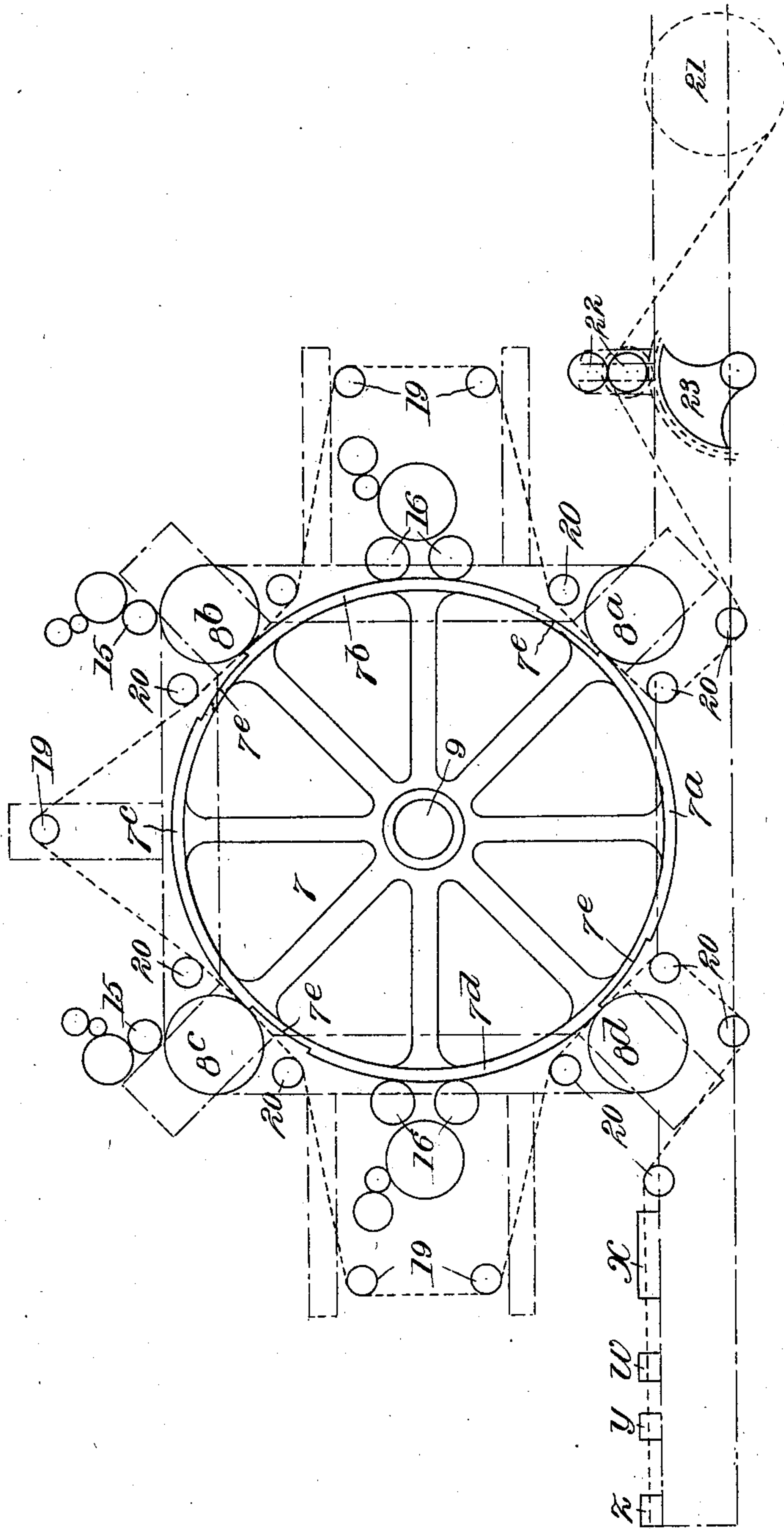
C. R. CULLEY.  
PRINTING PRESS.

APPLICATION FILED MAY 19, 1902.

NO MODEL.

3 SHEETS—SHEET 1.

Fig. 1.



Inventor

Witnesses

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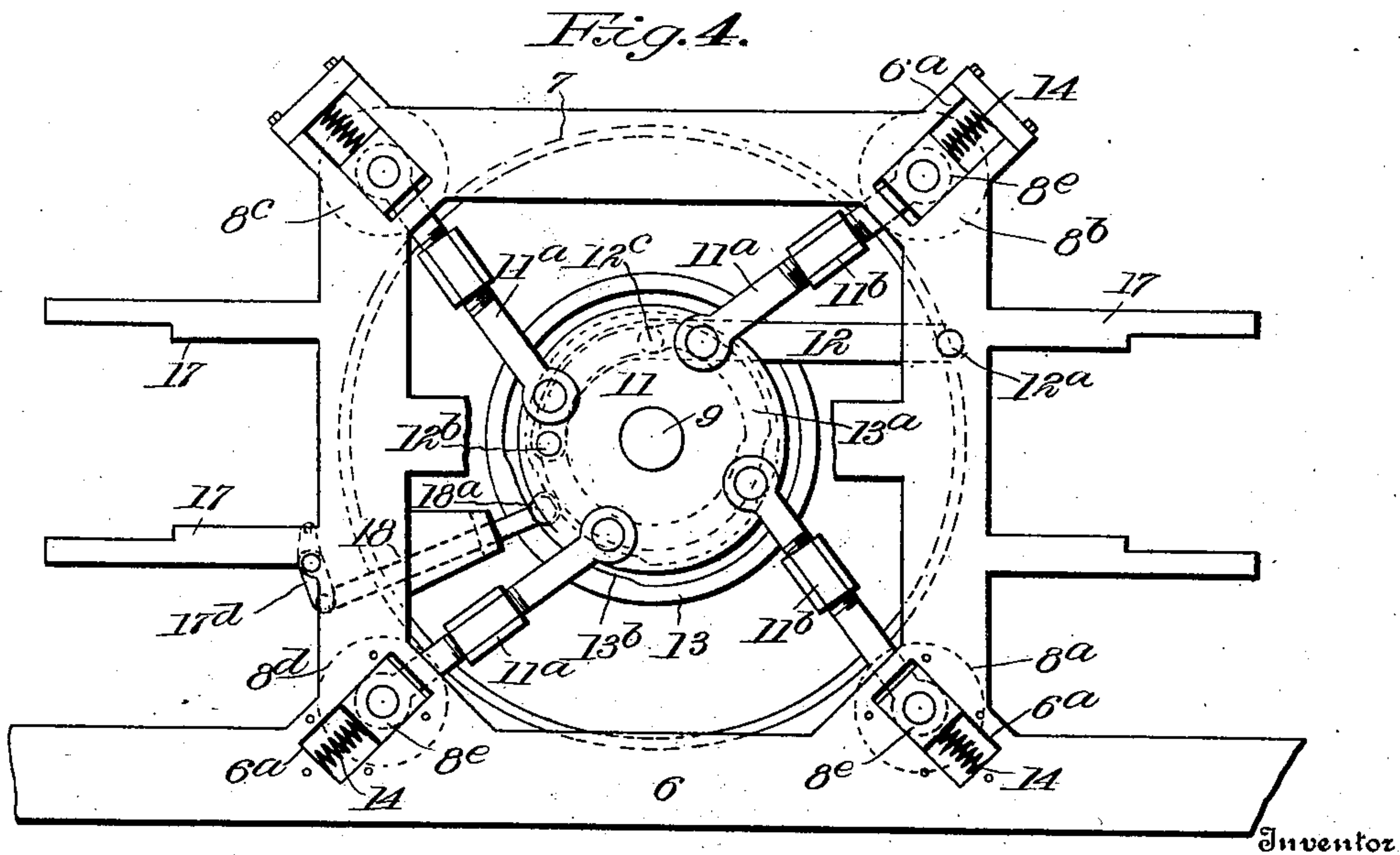
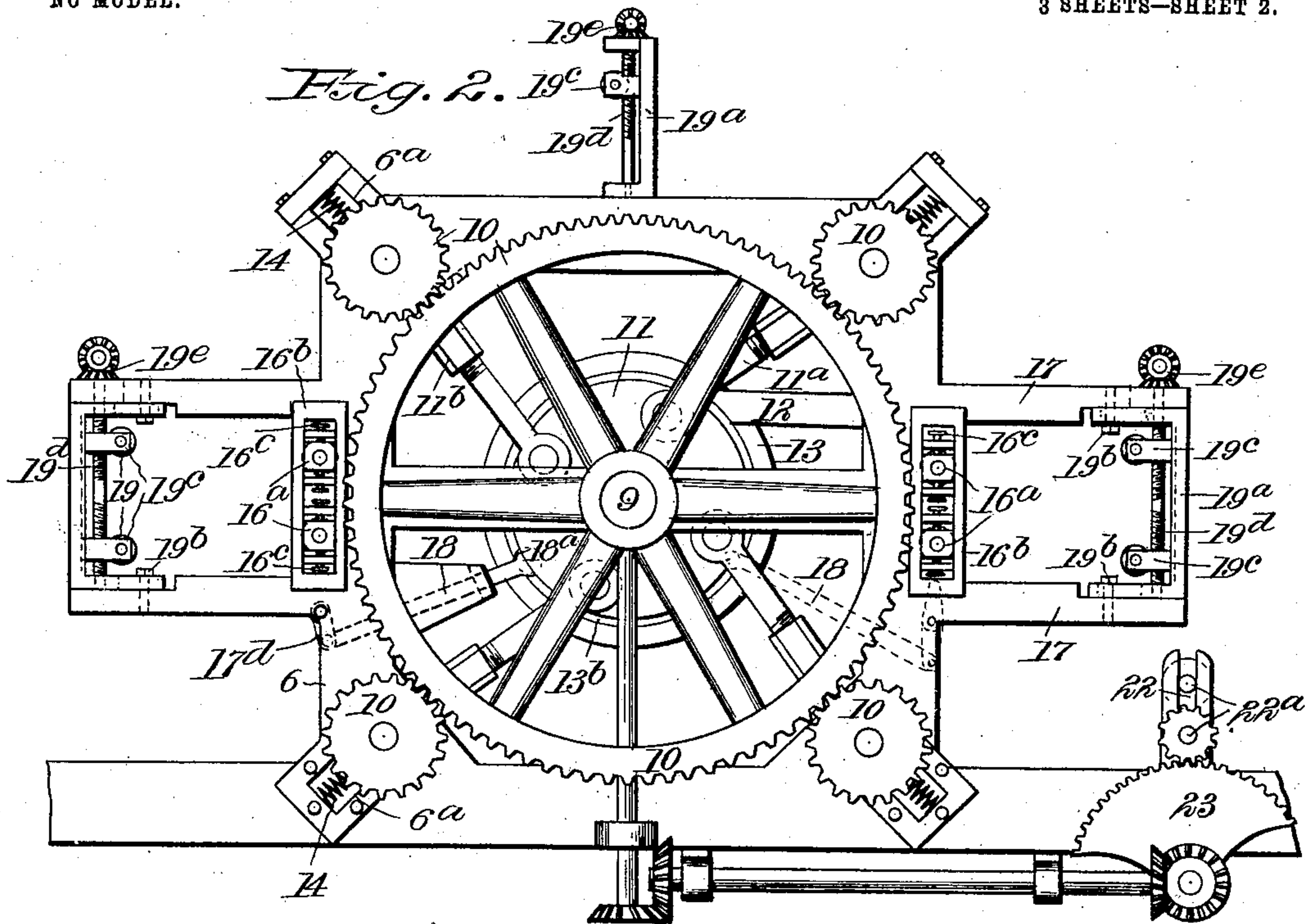
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APPLICATION FILED MAY 19, 1902.

NO MODEL.

3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

Fig. 3.

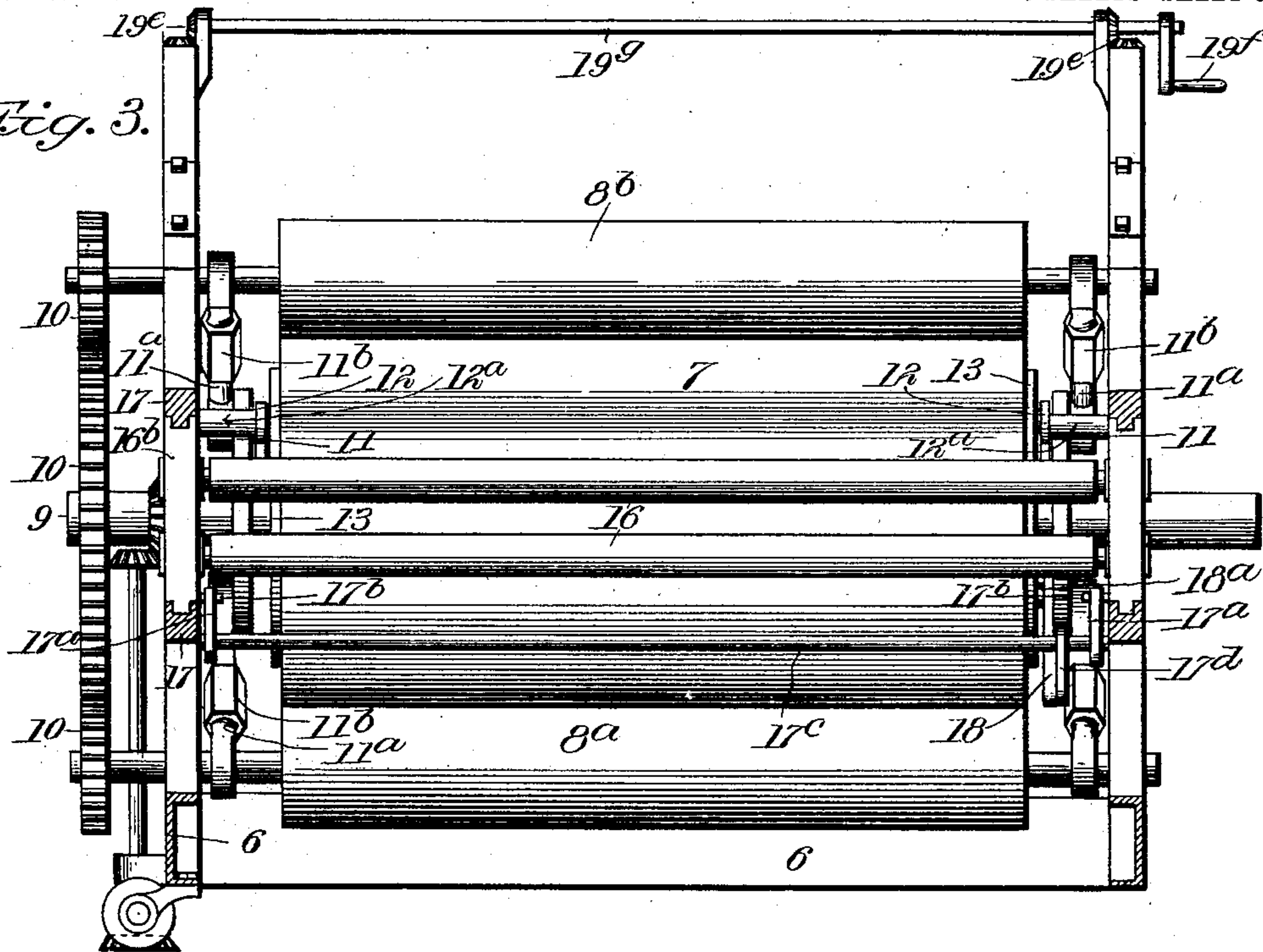
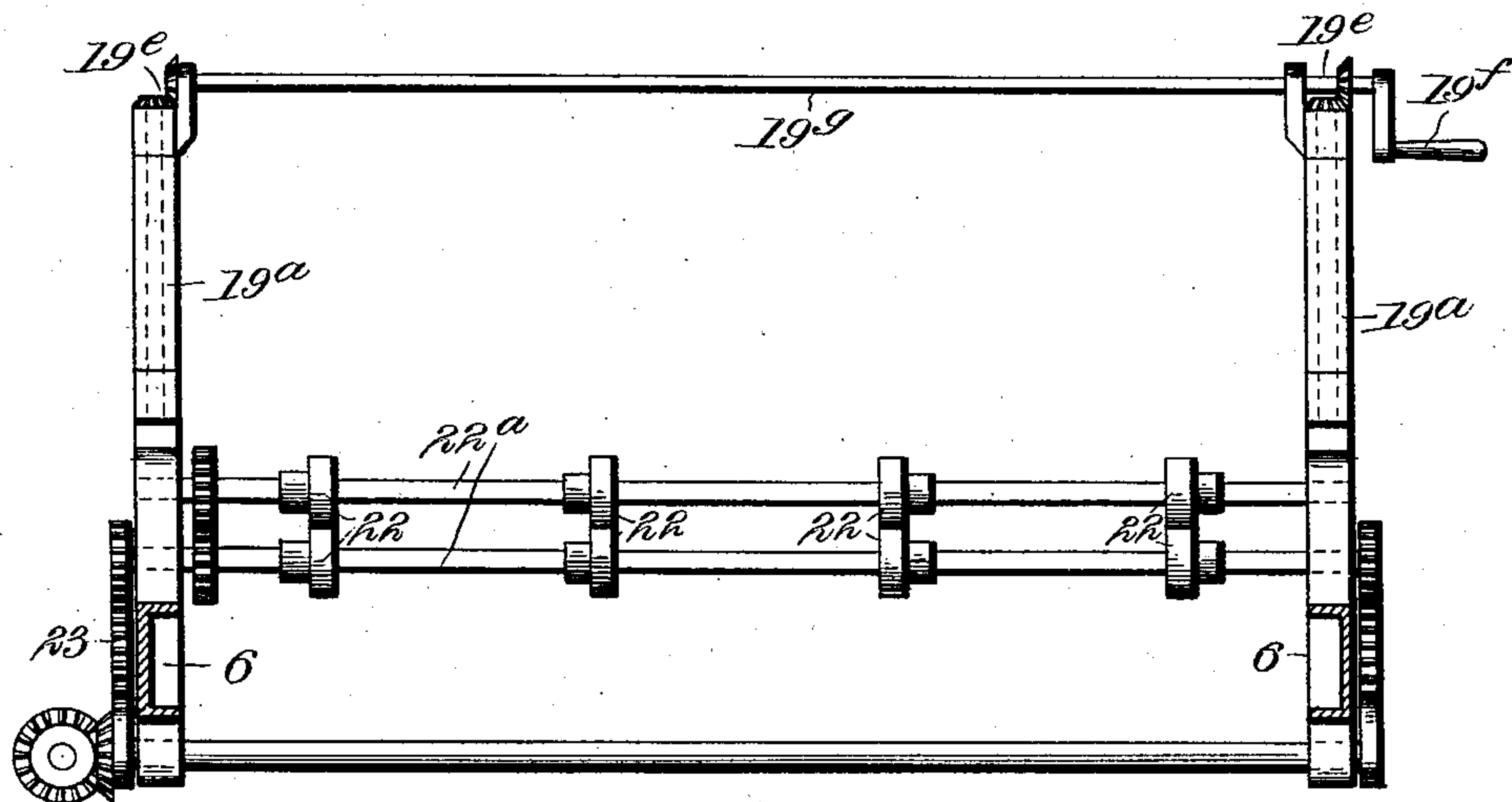


Fig. 5.



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# UNITED STATES PATENT OFFICE.

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## PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 720,331, dated February 10, 1903.

Application filed May 19, 1902. Serial No. 107,985. (No model.)

*To all whom it may concern:*

Be it known that I, CARL RODNEY CULLEY, a citizen of the United States, residing at Norwalk, in the county of Huron and State of Ohio, have invented certain new and useful Improvements in Printing-Presses; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to multicolor-printing presses, and particularly to rotary perfecting-presses of that kind.

The main object of the invention is to form a perfecting-machine which will print in several colors on both sides of the paper simultaneously.

A further object is to form such a press to take and print from a roll of paper, avoiding hand-feeding and permitting continuous operation, the sheets being cut after printing.

A further object is to form a rotary press with which a series of impressions may be made of any desired size without waste of paper. This object is effected by an intermittent feed and a construction which permits the web to rest after each impression until the cylinders have rotated to the printing-point of the next impression.

With these and other objects in view a press embodying the invention is hereinafter described, and is illustrated in the accompanying drawings, in which—

Figure 1 is a diagrammatic side elevation of the press. Fig. 2 is a side elevation, parts being removed. Fig. 3 is a similar end elevation. Fig. 4 is a side elevation, the driving gear-wheels being removed to show cam-operated devices to bring the form and impression cylinders together. Fig. 5 is a front view of the feed mechanism.

Speaking generally, the press consists of a main cylinder having both form and impression surfaces, and minor impression and form cylinders corresponding, respectively, to the form and impression surfaces of the main cylinder. The number of form and impres-

sion surfaces on the main cylinder and the number of minor form and impression cylinders correspond to the number of colors desired, and the press is not limited to any specific number of colors.

The machine illustrated in the drawings has four printing-couples and will print two colors on each side, and the frame is indicated at 6, the main cylinder at 7, and the minor cylinders at 8<sup>a</sup>, 8<sup>b</sup>, 8<sup>c</sup>, and 8<sup>d</sup>, said cylinders being mounted on shafts in suitable bearings in the frame of the machine and are driven from the shaft 9 of the main cylinder by gear-wheels 10 on the various shafts. Any proper means of driving the main shaft 9 may be used.

The circumference of the main cylinder in this machine has four equal and equidistant parts 7<sup>a</sup>, 7<sup>b</sup>, 7<sup>c</sup>, and 7<sup>d</sup>, the length of each of which is one-fifth of the circumference of the main cylinder. Of these surfaces 7<sup>a</sup> indicates the form for one color and 7<sup>d</sup> the form for the other color for one side of the paper, and 7<sup>b</sup> and 7<sup>c</sup> are respectively impression-surfaces for the form-cylinders 8<sup>b</sup> and 8<sup>c</sup>, which print the two colors on the other side of the paper.

8<sup>a</sup> and 8<sup>d</sup> are impression-cylinders for the forms 7<sup>a</sup> and 7<sup>d</sup>. Four printing-couples are thus produced, two for each side of the paper, the course of which through the press is indicated by a dotted line in Fig. 1. The spaces 7<sup>e</sup> between the form and impression parts are for the tympan-hooks, form-clamps, &c., and their aggregate length is equal to that of one of the form and impression parts, thereby forming the remaining fifth of the circumference of the main cylinder.

The minor cylinders are spaced an equal distance apart around the circumference of the main cylinder, and the circumference of each is preferably equal to one-fifth of the circumference of the main cylinder, although this equality is not essential. They revolve, however, five times to once of the main cylinder and print at every fifth revolution. They have a simultaneous reciprocal radial movement with respect to the main cylinder, so that each comes into contact with the complementary portion of the periphery of the main cylinder during one-fifth of the rotation



of the latter and is forced out to miss the same during the remainder of its rotation. To effect this, the bearing-blocks 8<sup>c</sup> of the minor-cylinder shafts slide radially in guides 6<sup>a</sup>, forming a part of the frame of the machine, and the shafts are connected by rods 11<sup>a</sup> to a vibrating disk 11, which is loose on the main shaft. The disk is operated by a lever 12 of the third class, which is fulcrumed to the frame at 12<sup>a</sup>, pivotally attached to the disk at 12<sup>b</sup>, and has a roller 12<sup>c</sup>, which runs in a cam-groove 13<sup>a</sup> on the cam-disk 13, which is fast on the main shaft. The lever is bent to bring the point of its attachment to the disk at a right angle to the roller with respect to the shaft, so as to give the disk a throw equal to the eccentricity of the cam. When the roller is moved in or out by the cam, the lever throws or turns the disk correspondingly, which motion is communicated by a toggle action with the rods 11<sup>a</sup> to the minor cylinders, forcing them into or out of contact. The motion is steadied by springs 14 behind the bearing-blocks. The movement, as will be understood, need only be small and is not enough to disengage the gearing. The throw of the cam is such that the minor cylinders will contact only during the proper part of the revolution of the main cylinder, such part being in this instance one-fifth. The length of the rods is adjustable by screw-couplings 11<sup>b</sup>. It is to be understood that the cams and connections to give the radial movement to the minor cylinders are duplicated at each end of the main cylinder.

To ink the form-cylinders 8<sup>b</sup> and 8<sup>c</sup>, any old or proper inking apparatus may be used. I have indicated such an apparatus at 15, supported on the frame adjacent said cylinders. The inks will be different colors, as desired.

To ink the forms 7<sup>a</sup> and 7<sup>d</sup> on the main cylinder each a different color, mechanism is provided to give a radial reciprocating movement to the ink-rollers. The shafts of the ink-rollers 16 on each side of the main cylinder are supported in bearing-blocks 16<sup>a</sup>, which have vertical adjustment in frames 16<sup>b</sup> by thumb-screws 16<sup>c</sup>. The frames 16<sup>b</sup>, carrying the rollers, slide radially with respect to the main cylinder in guides 17 on the frame of the machine, and the motion is given through crank 17<sup>a</sup> and pin 17<sup>b</sup> connection with a rock-shaft 17<sup>c</sup> and its crank 17<sup>d</sup> by a rod 18, which has a bearing-roller 18<sup>a</sup> in an outer cam-groove 13<sup>b</sup> in the cam-disk. Such a rod and cam at opposite ends of the main cylinder operates the inkers on opposite sides of the main cylinder, respectively. The cams are so formed that when the disk rotates the respective rollers are brought to inking contact with their respective and corresponding form, and when such form has passed the rollers of its color are forced back out of contact.

The paper web necessarily passes outside of the inkers just described, and it is threaded through the machine, as shown in Fig. 1,

around register-rolls, (indicated at 19 and 20.) It is essential that the length of the line of travel of the web around the register-rolls between each minor cylinder be an exact multiple of the length of the form being printed; otherwise the impression given at each of the small cylinders will not register with those given at the others. This length is secured by making the register-rolls 19 adjustable in their supporting-frames. I have illustrated a construction to obtain such adjustment, the supporting-frames for the rollers being indicated at 19<sup>a</sup>, mounted on the frame of the machine and adjustable laterally by slot and bolt 19<sup>b</sup>. For vertical adjustment the rolls are carried by bearing-boxes 19<sup>c</sup> upon right-and-left screws 19<sup>d</sup>, supported by the frames and rotatable by hand-crank 19<sup>e</sup> through shafts 19<sup>f</sup> and bevel-gears 19<sup>g</sup>. The rolls may thus be raised, lowered, or extended to bring the distance to an exact multiple of the form. Any other means to effect the same result would do. In this connection I will mention that the form need not be the whole length of the circumference of the minor cylinders, since the paper is fed step by step, the length of each step being equal to the length of the impression and is otherwise at rest, although the cylinders continue rotating.

The rolls 20, adjacent the minor cylinders, are so positioned that the web is out of contact with both main and minor cylinders except during the impression period.

The paper is fed from a roll 21 between feed-rollers 22 on shafts 22<sup>a</sup>, which are geared together and operated intermittently by a segment-gear 23, which is driven by intermediate gearing from the shaft of the main cylinder and at equal speed therewith, so that the feed is equal to the take of the cylinders. In the drawings these feed parts are shown before the cylinders, forming a "push-feed;" but they may well be placed behind the cylinders, forming a "pull-feed," pulling the web through the press.

The length of paper fed at each revolution depends on the number of teeth in the segment-gear, and this length is equal to the length of the form being printed. Various segment-gears having different numbers of teeth may be used to accommodate forms of different lengths, and the segment-gear is so positioned that it operates the feed simultaneously with the impression.

Any proper means of attaching the type or printing-plates to the form-surfaces and tympan to the impression-surfaces may be used.

Fig. 1 illustrates the press at beginning of impression. After making ready the impression-cylinders 8<sup>a</sup> and 8<sup>d</sup> are drawn in to couple with the form-surfaces 7<sup>a</sup> and 7<sup>d</sup>, respectively, and the form-cylinders 8<sup>b</sup> and 8<sup>c</sup> are drawn in to couple with the impression-surfaces 7<sup>b</sup> and 7<sup>c</sup>, respectively, and the feed begins. By the contact of the couples the paper is carried in the length of the form equal to the feed. It then stops, and when the



small cylinders have completed one revolution, or the impression, they are lifted out of contact by the cams, but not out of gear. Consequently they continue to rotate until the main cylinder has made the remaining four-fifths of its rotation, when they are again drawn in for the next impression.

The press is designed particularly for multicolor-work on counter-check books, wherefore I have indicated a numbering-machine at X, perforators at W and Y, and a cutter at Z, which, however, are no part of my invention.

My invention is not limited to the exact mechanical construction shown, and any equivalent means may be used. Additional couples for more colors may be provided by the addition of minor cylinders and surfaces on the main cylinder. The number of colors which may be printed is limited only by the number of minor cylinders and the size of the main cylinder. The size of the minor cylinders as compared to the main cylinder is not limited to the one-to-five proportion described, but may be varied as desired, with corresponding variation of speed and cams.

What I claim is—

1. In a rotary printing-press, the combination with a main cylinder having form and impression surfaces, of complementary impression and form cylinders around the main cylinder, radially movable to couple with said surfaces.

2. In a rotary printing-press, the combination with a main cylinder having form and impression surfaces, of minor impression and form cylinders corresponding respectively to said form and impression surfaces, and means to intermittently couple and uncouple the main and minor cylinders.

3. In a printing-press, the combination with a main cylinder carrying a plurality of forms and a plurality of impression-surfaces, of a plurality of minor impression-cylinders for said forms, and a plurality of minor form-cylinders for said impression-surfaces, said minor cylinders being movable to and from the main cylinder to intermittently form printing-couples.

4. In a rotary printing-press, the combination with a main cylinder having form and impression surfaces, of an impression-cylinder corresponding to the form, and a form-cylinder corresponding to the impression surface, and means to intermittently form printing-couples with said cylinder.

5. In a printing-press, the combination with a rotating main cylinder having form and impression surfaces, of a rotating impression-cylinder corresponding to the form and a rotating form-cylinder corresponding to the impression surface, and means to intermittently form printing-couples with said cylinders without stopping the rotation thereof.

6. In a rotary printing-press, the combination with a main cylinder having form and impression surfaces, of an impression-cylinder

der corresponding to the form and a form-cylinder corresponding to the impression surface, means to intermittently form printing-couples with said cylinders, and means to intermittently feed a web of paper to the couples.

7. In a printing-press, the combination with a cylinder having a plurality of forms and an impression-surface, and different inkers for each form, of a plurality of impression-cylinders for said forms, a form-cylinder for said impression-surface, and means to intermittently couple said forms and impression-surfaces.

8. In a printing-press, the combination with a main cylinder the periphery of which has equal surfaces part of which are form and part impression, of minor complementary impression and form cylinders for each of said surfaces, said minor cylinders being arranged around the main cylinder at equal distances apart, and means to intermittently actuate the minor cylinders to form printing-couples with the main cylinder.

9. In a printing-press, the combination with a main cylinder having a plurality of form and a plurality of impression surfaces of equal length, of a minor impression-cylinder for each form-surface, and a minor form-cylinder for each impression-surface, said minor cylinders being arranged equidistant around the main cylinder, and means to intermittently couple the minor cylinders with the corresponding surfaces of the main cylinder.

10. In a printing-press, the combination with a main cylinder having a plurality of form and impression surfaces of equal length, of a minor impression-cylinder for each form and a minor form-cylinder for each impression surface, said minor cylinders being arranged equidistant around the main cylinder, and means to simultaneously and intermittently couple the minor cylinders with the corresponding surfaces of the main cylinder.

11. In a rotary printing-press, the combination with a plurality of continuous web-perfecting couples printing in succession on the same web-space, the units of which revolve in one direction only, of an intermittent feed, advancing the web, at each step, at the least the length of the form.

12. In a rotary printing-press, the combination with a main cylinder and several minor cylinders around the same, forming a plurality of perfecting-couples printing a continuous web intermittently, of an intermittent feed, advancing the web simultaneously with the printing operation.

13. In a multicolor-printing press, the combination with a plurality of intermittent perfecting-couples printing in succession on the same web-space the units of which revolve in one direction only, and means to severally and differently ink the forms thereof, of an intermittent feed simultaneous with the operation of the printing-couples.

14. In a printing-press, the combination



with a main cylinder and minor cylinders around the same, forming intermittent perfecting printing-couples, of adjustable registers between each couple.

5 15. In a printing-press, the combination with cylinders having continuous motion in one direction and forming intermittent perfecting printing-couples and different inkers for each couple, of intermittent feed mechanism acting simultaneously with the printing-couples, and adjustable registers between each couple.

15 16. In a multicolor-printing press, the combination with intermittent perfecting-couples printing a plurality of colors on each side of the web, of mechanism intermittently feeding the web, simultaneous with the operation of the couples, a length equal to the length of the form, and registers between the couples variable according to different lengths of forms, whereby the color-impressions will register.

25 17. In a printing-press, the combination with a main rotatable cylinder having form and impression surfaces thereon of equal length, of minor rotatable impression and form cylinders arranged at equal distances around the main cylinder and corresponding to said form and impression surfaces, and 30 radially movable to form printing-couples therewith, and cam mechanism connected to the main cylinder to radially move the minor cylinders.

35 18. In a rotary printing-press, the combination with a main cylinder having a plurality of forms and of impression-surfaces, of equal length, and inkers severally inking the forms, of a plurality of minor form-cylinders corresponding to said impression-surfaces, and independent inkers therefor, and a plurality of 40 minor impression-cylinders corresponding to said main-cylinder forms, the minor cylinders being arranged at equal distances around the periphery of the main cylinder, and means to simultaneously actuate the minor cylinders to form printing-couples with the main cylinder.

50 19. In a rotary printing-press, the combination with a main cylinder having form and impression surfaces, and inkers for the forms, of a plurality of equidistant impression and form cylinders around the main cylinder, forming perfecting printing-couples therewith, and means to carry a web outside said 55 inkers, comprising registers adjustable to make the length of line of travel of the web, between the couples, an exact multiple of the length of the impression.

60 20. In a printing-press, the combination with a main rotatable cylinder having form

and impression surfaces, of rotatable radially-movable minor cylinders around the main cylinder, having corresponding impression and form surfaces, means to intermittently couple the cylinders, and means to retain the 65 paper or other material out of contact with all the cylinders except during the impression period.

21. In a rotary printing-press, the combination with cylinders revolving in one direction 70 only, forming intermittent perfecting printing-couples, and different inkers for each couple, of feed-rolls, and a segment-gear actuating the rolls simultaneously with the operation of the couples. 75

22. In a printing-press, in combination, a rotatable main cylinder having form and impression surfaces and its shaft, a plurality of minor rotatable cylinders intermittently forming printing-couples with the main cylinder, a cam-disk on said shaft, and connection 80 between the disk and the minor cylinders to intermittently move the same to form the couples.

23. In a rotary web-perfecting printing-press, the combination with a web-feed, of a 85 main cylinder having form and impression surfaces, and complementary impression and form cylinders around the main cylinder, forming printing-couples therewith. 90

24. In a printing-press, the combination with rotary cylinders having a continuous motion in one direction and forming, intermittently, couples printing in succession on the same web-space, of an intermittent web-feed simultaneous with the impression and 95 adjustable according to length of form.

25. In a multicolor-printing press, the combination with cylinders forming, intermittently, different color-couples, of an intermittent feed variable according to different 100 lengths of forms, and registers between the couples adjustable to make the length of the line of web travel a multiple of the length of the form. 105

26. In a rotary printing-press, the combination with a main cylinder having form and impression surfaces, and minor cylinders around the same, forming printing-couples therewith, of inkers for said forms, between 110 the couples, and means to carry the web outside the inkers and maintain the register, between the couples.

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

CARL RODNEY CULLEY.

Witnesses:

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