

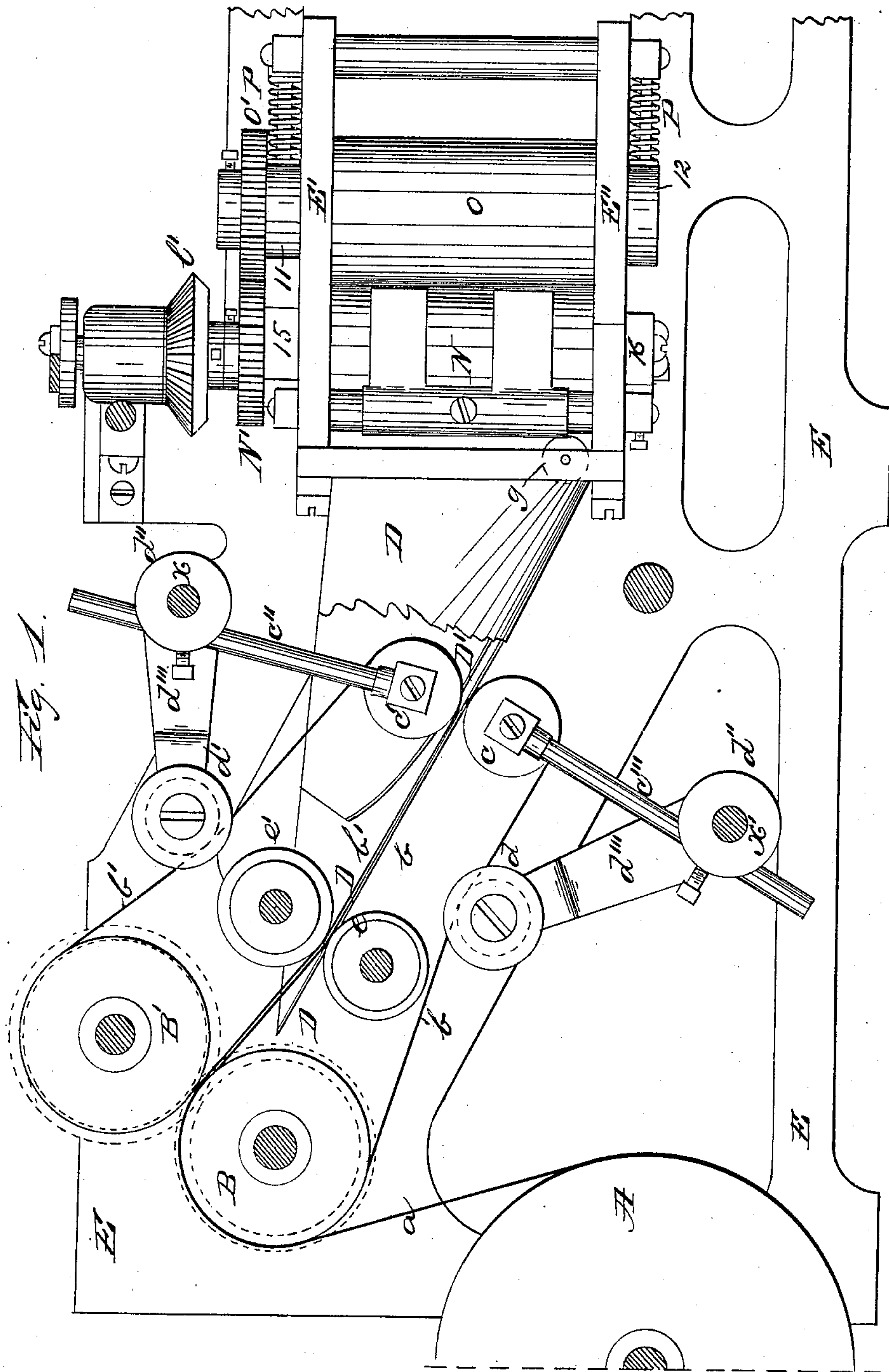
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5 Sheets—Sheet 1.

A. F. MADDEN.
PAPER FOLDING MECHANISM.

No. 324,034.

Patented Aug. 11, 1885.



Witnesses.
Joseph Sullivan
John E. Elmendorf.

Inventor.
Albert F. Madden
by his atty Wm C. Hicks

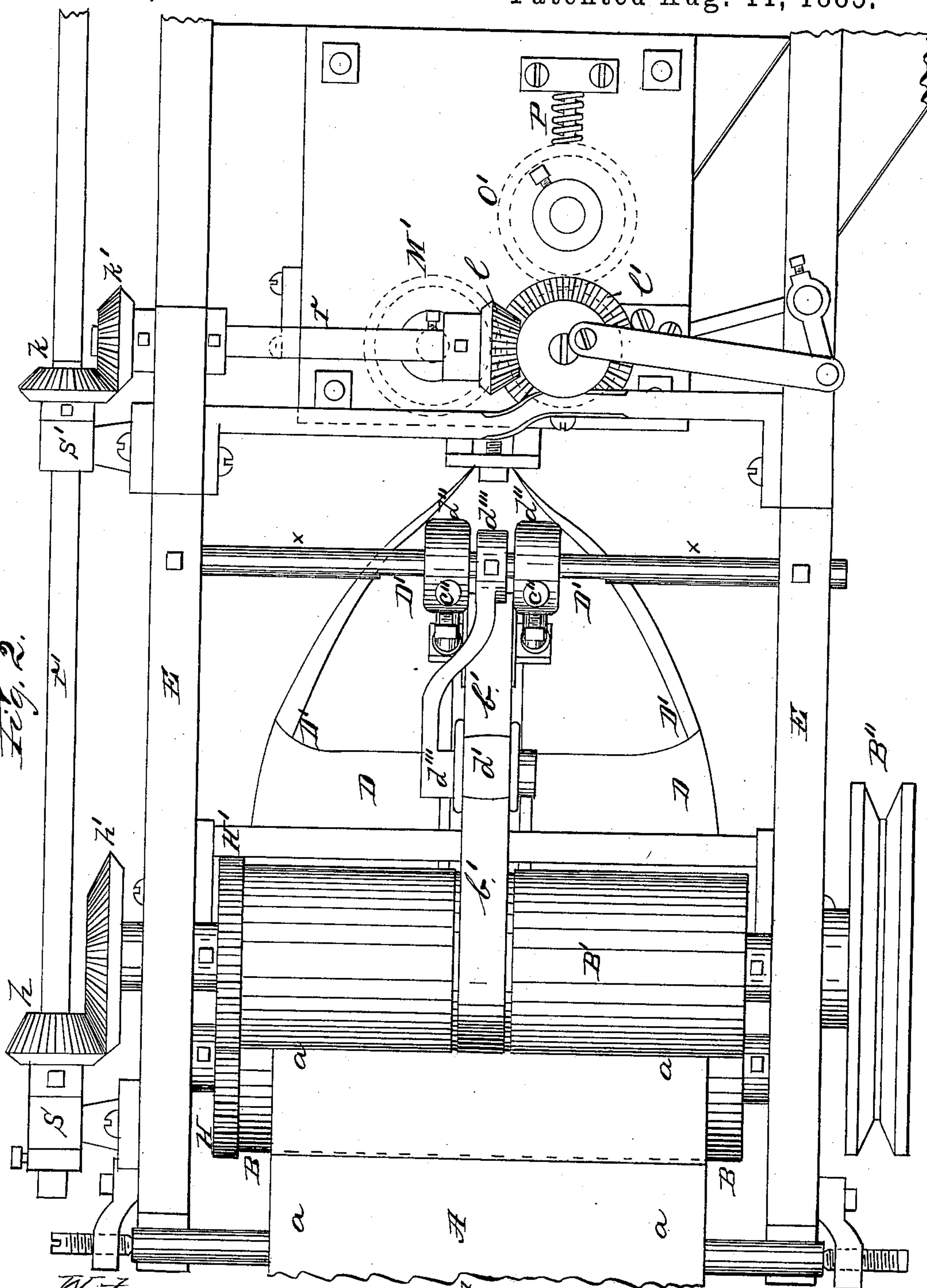
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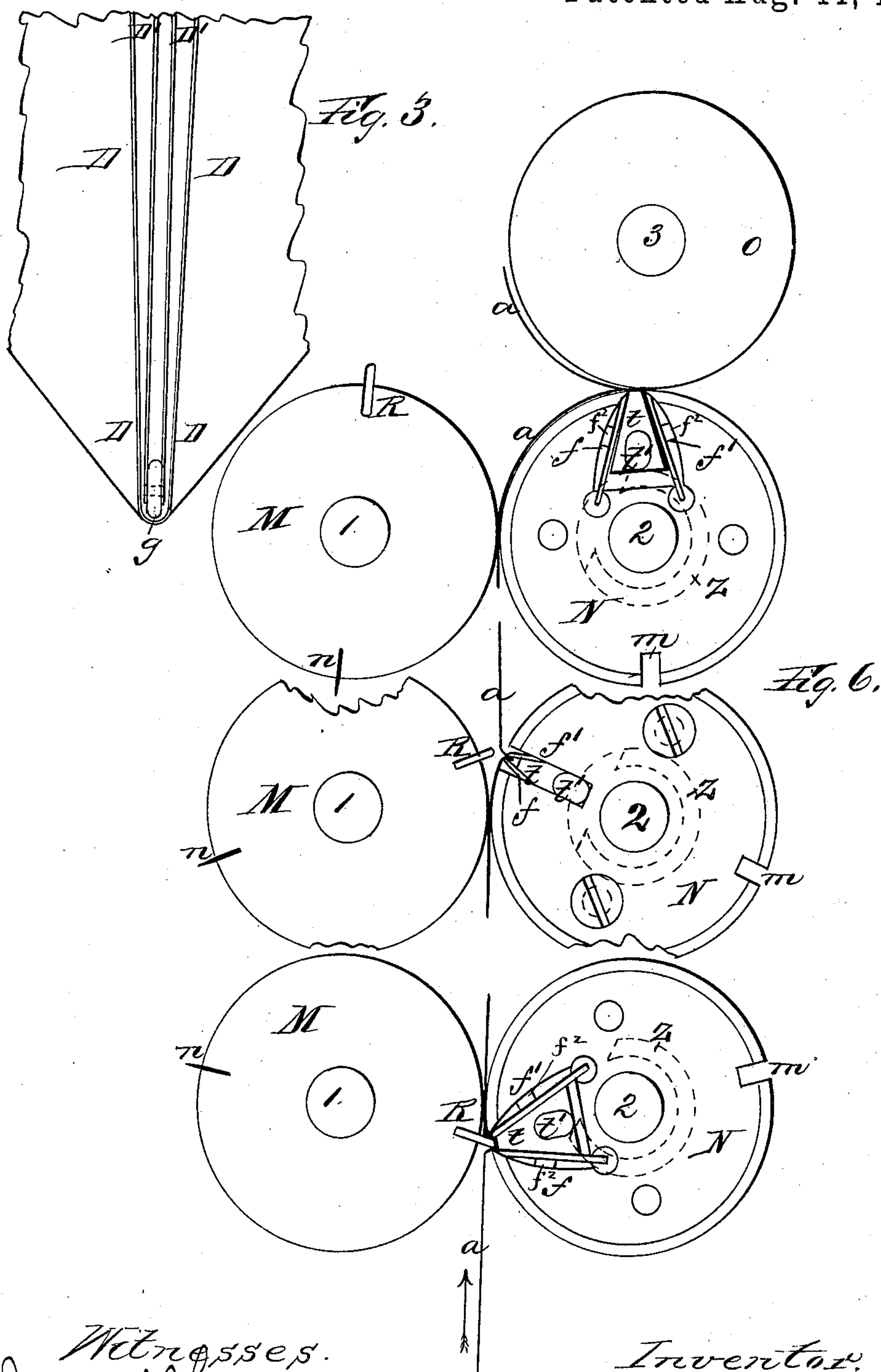
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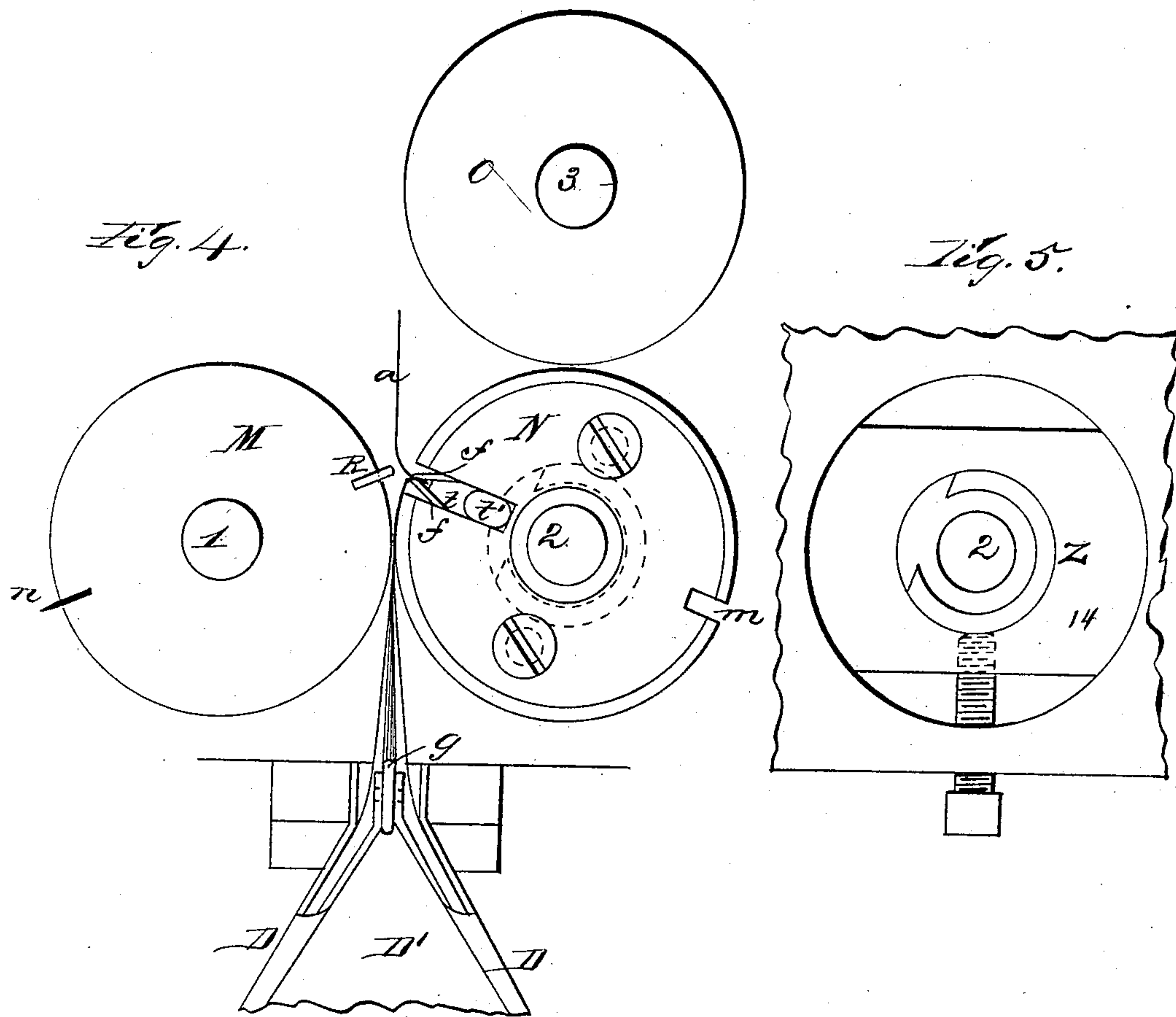
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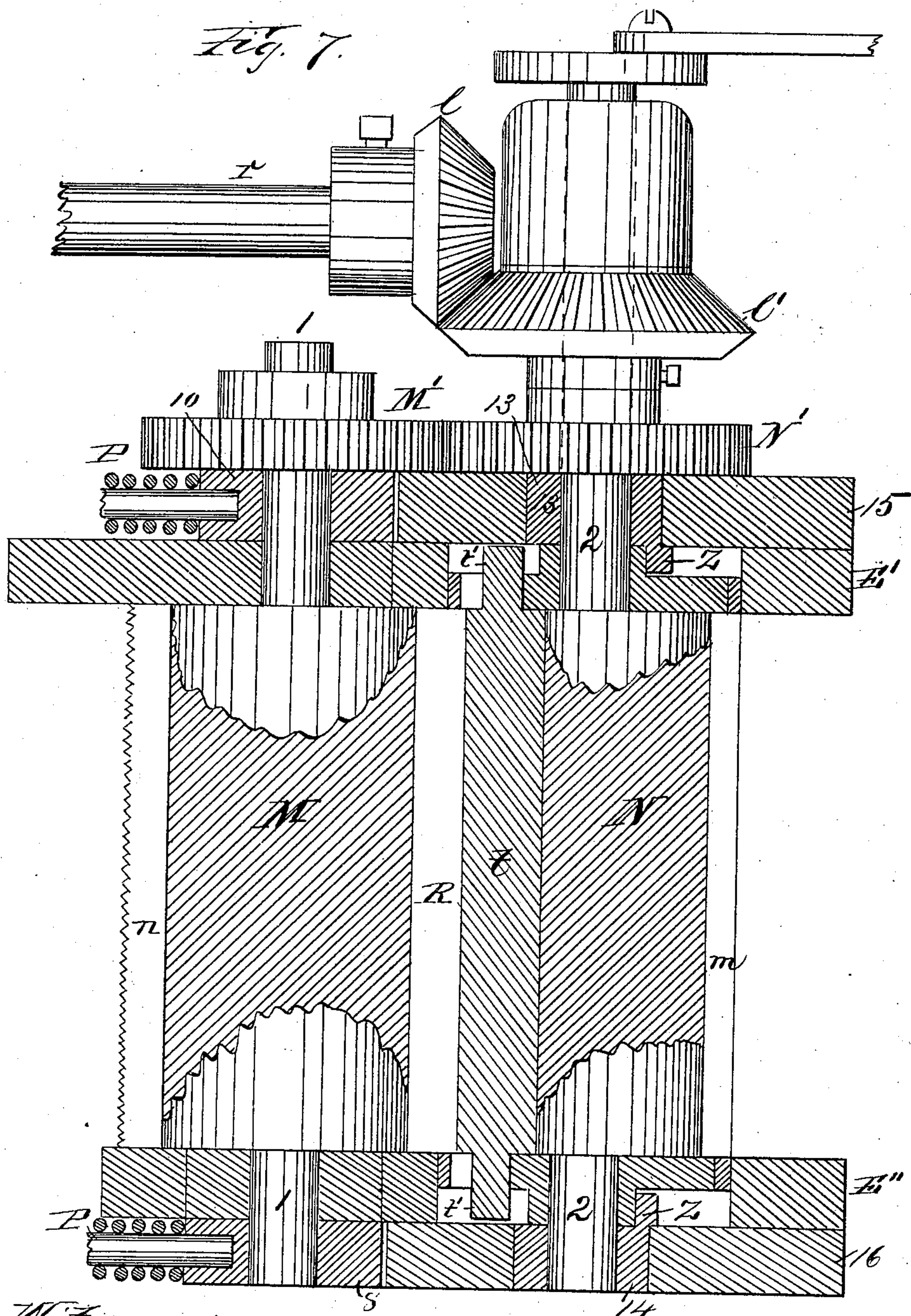
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UNITED STATES PATENT OFFICE.

ALBERT FRANKLIN MADDEN, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF
AND OSCAR EDWIN MADDEN, OF BOSTON, MASSACHUSETTS.

PAPER-FOLDING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 324,034, dated August 11, 1885.

Application filed May 23, 1884. (No model.)

To all whom it may concern:

Be it known that I, ALBERT FRANKLIN MADDEN, of the city, county, and State of New York, have made an invention of an Improvement in Paper-Folding Mechanism, of which the following is a specification.

My invention relates to the folding of paper by the action of continuously-revolving rolls, either in connection with a printing-press or other mechanism through which the paper passes continuously in an uncut web to said rolls to be cut into sheets by them, or as an independent apparatus for folding sheets of paper; and my invention consists in certain combinations of mechanism specifically pointed out in the claims at the end of this schedule.

In order that persons skilled in the art may understand, make, and use my apparatus, I will proceed to describe the same as constructed by me, referring to the drawings, in which—

Figure 1 is a side elevation of the frame which supports the folding-rolls and mechanism for supplying a continuous web of paper to them. Fig. 2 is a top view of the frame and rolls B B', belts b b', and the guide D D' for directing the web of paper and shaping it before entering between rolls M N O. Fig. 3 is a vertical face view of guide D D' at the position g nearest the rolls M N. Fig. 4 is a top view of the rolls M N O and guide D D', showing the paper a held in the jaws f f' just after the tooth R has revolved away from them and the paper. Fig. 5 shows the shape of the cams Z Z', with the screws for holding the same in a fixed position after proper adjustment. Fig. 6 shows the folding-rolls M N in three different positions, the paper a entering between the rolls M N in the direction of the arrow. Fig. 7 is a vertical central section through rolls M and N and shafts 1 2, looking toward the said rolls from the end of D D', near the small roll g.

The folding-rolls M, N, and O are firmly attached to shafts 1 2 3, respectively, and are fitted to revolve in bearings in the frame E' E''. The bearings in which the roll M and the roll O revolve are slightly elongated, to give sufficient play in the frame E' E'' to permit the springs P P, acting against the loose rings 8 10 12 11, to keep the surfaces of rolls M and O in contact with the surface of roll N or with paper passing between the said rolls. The roll

N on the shaft 2 has bearings in rings 13 and 14, adjustably fitted in the bars 15 and 16, Fig. 5, one, 15, bolted to the top of frame E', and the other to the under side of frame E''. The lower flange of 13 and the upper flange of 14 project through the bars toward the end of roll N, and each is cut out to give a bearing for the end of the roll. The remaining portion of the flanges is shaped as shown at Z, Figs. 5 and 6, so as to form cams. The ends of the remaining part of the ring-flange are tapered, as shown, to permit the ends t' t' of the tongue t, after entering the cut-away portion, to be forced outward and remain in line with the circumference of the roll, while the ends t' t' revolve with the roll N around the said fixed cams Z Z. The tongue t thus is caused to move to and from the shaft 2 on a radial line, for the purpose of forcing the spring-jaws f f' apart and to permit them at the proper time to come together by means of the springs f², placed behind them in contact with the walls of the recess in the roll. The tongue t is tapered, as shown, in order to enable it to spread the jaws f f'. The face of the tongue is curved to correspond to the circle of the face of roll N, so that when the tongue t is at its extreme outward position, and its ends t' t' in contact with the outer circumference of the cams Z Z, the points of f f', with the face of the tongue t and the paper grasped between them, fills up the opening in the circumference of N and completes the circle. The rolls M and N revolve together, and are so adjusted that a tooth, R, coming in contact with the face of the tongue t, forces it inward toward shaft 2, which permits the spring-jaws f f' to move toward each other and engage with the paper a, carried between the rolls and into the recess in roll N by tooth R, so that when tooth R, as it revolves, recedes from between the jaws, the loop or double of the paper is seized by the jaws, retained, and carried around with the roll N until the ends t' t' of tongue t hit the taper of the cams Z Z, which spreads the jaws f f' outward and releases the paper from their grasp. This action occurs at the moment the folded paper has entered between rolls N and O and has been caught by these rolls. The roll N is provided with a groove, m, cut in its circumference parallel with its axis, and roll M is provided with a knife, n, which, as it revolves

with its roll, comes in contact with the paper between the rolls and cuts it into sheets while entering the groove *m* of roll N.

In Fig. 5 is shown one of the bearing-blocks 5 14 for the end of the shaft 2, formed of a block of metal, upon which the cam Z is located for operating the tongue *t* for forcing the gripping-jaws apart and to release the paper. These blocks are constructed as shown in said figure, 10 and are provided with the set-screw for securing them in position and permitting them to be adjusted so that the tongue will be projected at the proper time.

A is a roll on which the paper is held. It 15 is fixed to a shaft having bearings in the frame E. B and B' are rolls the shafts of which have also bearings in the frame E.

C C' are two narrow rollers having bearings on the ends of the bars *c'' c''*, respectively, and 20 are adjustably connected with hubs *d'' d''* on rods X X', the ends of which latter are held in frame E E. To X and X' are also attached arms *d'''*, carrying tightening-rollers *d d'*. The rolls B' B have grooves cut in their circumferences, and in the middle of their length, deep 25 enough to hold a belt, *b'* and *b*, respectively. Belt *b'* passes under roller *d'*, around *c'*, under *c'*, and around B'. Belt *b* passes over *c*, around *c*, over *d*, and around B.

30 D D' is a guide for the paper made of two thicknesses of metal so shaped as to double the continuous band of paper into a loop or U when it reaches the roll *g*.

35 D D, Fig. 3, is the lower thickness of metal forming a table for the paper to rest on after leaving the rolls B B'.

D' D' is the upper thickness of metal under which the paper passes. The upper and lower plates, D and D', are gradually shaped or bent 40 upward until the roll *g* is reached, when they stand vertical, and from the rollers *c c'* to the end they are substantially parallel, so that the paper will be formed into a U shape. The lower thickness, D D, of the guide is cut through 45 to make a path for the guiding-belts *b' b* and roller *c*, and the upper thickness, D' D', is also cut out to allow the roller *c'* to pass through, carrying the belt *b'*. The upper thickness, D', is extended toward the roll *e'* from roller *c'*, and 50 the opening between D and D' is somewhat enlarged to aid in guiding the paper between D and D'.

All the rolls and rollers and belts are intended to move with the same circumferential 55 speed, and they are all connected to one prime motor or pulley, as seen at B''. The gear *h'* meshes into *h* on shaft *r'*, held in bearings *s s'*. Gear K meshes into gear *k'* on shaft *r*. Gear *l* meshes into *l'* on shaft 2, roll N. Gears N', 60 M', and O' mesh into each other, and are all driven by gear *l'*.

The operation is as follows: The paper from roll A having been entered between rolls B and B', is carried by the belts *b' b*, which run in the 65 same direction near together to the top of plate D, the belts *b'* and *b* serving to keep the paper central and true as regards the plate D and

rolls B B'. The paper, as it passes through the guide D D' to the small roll *g*, is formed into a U shape. It is then entered between 70 the rolls M and N. As the rolls revolve, the serrated knife *n* comes against the paper, enters groove *m*, and begins to cut a sheet from the paper; but it is not entirely cut free until the rolls have seized the incoming paper be- 75 hind the knife. The rolls continuing to draw forward the paper, the tooth R comes in contact with it, pushes it against the tongue *t* of roll N, and between the jaws *f f'*. As the tooth and depressed paper follow the tongue 80 *t*, and the ends of the latter drop into the openings in cams Z Z, the jaws *f f'* force the paper firmly against the tooth R, and when the tooth R in its revolution leaves the roll N the two 85 thicknesses of doubled paper are held firmly in the grip of the jaws, and are carried around into the bite of the rolls N and O. At this point the knife *n* has again revolved into contact with the paper, and the sheet is cut free 90 from the continuous web. After the sheet has been carried between rolls N and O it is delivered folded to a flyer, or is otherwise disposed of.

My apparatus is constructed with positive motions, is positive in its operation, so that 95 paper is folded much more rapidly than is possible by the use of apparatus having tapes and belts for guides. It also is very reliable and not liable to get out of order.

My folding-rolls and mechanism can be read- 100 ily used without the guides D D' and rolls B B'. In such case the paper should be introduced by hand or from a table, the first rolls being placed in a horizontal position, and if 105 more than two or more folds are desired, a duplicate set of folding-rolls should be geared up with the first.

Having now fully described my folding mechanism, what I claim as my invention is—

1. In a paper-folding machine, the combination of two co-operating rolls, one of which is provided with gripping-jaws having a movable tongue between them, and the other of which is provided with a tooth which operates to insert a fold of paper between the gripping-jaws 115 and at the same time displace the movable tongue and permit the jaws to close upon the fold of paper upon its withdrawal, substantially as described.

2. In a paper-folding machine, the combination of two co-operating rolls, one of which is provided with gripping-jaws having a movable tongue between them, and a device, substantially as described, for projecting said tongue, and the other of which is provided 125 with a tooth which operates to insert a fold of paper between the gripping-jaws and at the same time displace the movable tongue and permit the jaws to close upon the fold of paper upon its withdrawal, substantially as de- 130 scribed.

3. In a paper-folding machine having rolls arranged to revolve together and advance paper pressed between them, the combination of

one roll provided with jaws and a tongue, and a cam which advances the tongue between said jaws to release their hold of the double of paper between them, substantially as described, 5 with another roll provided with a tooth revolving with it, arranged to throw back the said tongue and press a double of paper into the bite of the jaws and leave a fold of paper held between them by revolving out of contact with said jaws, all constructed and arranged to operate substantially in the manner and for the purposes set forth. 10

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Witnesses:

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