

No. 726,116.

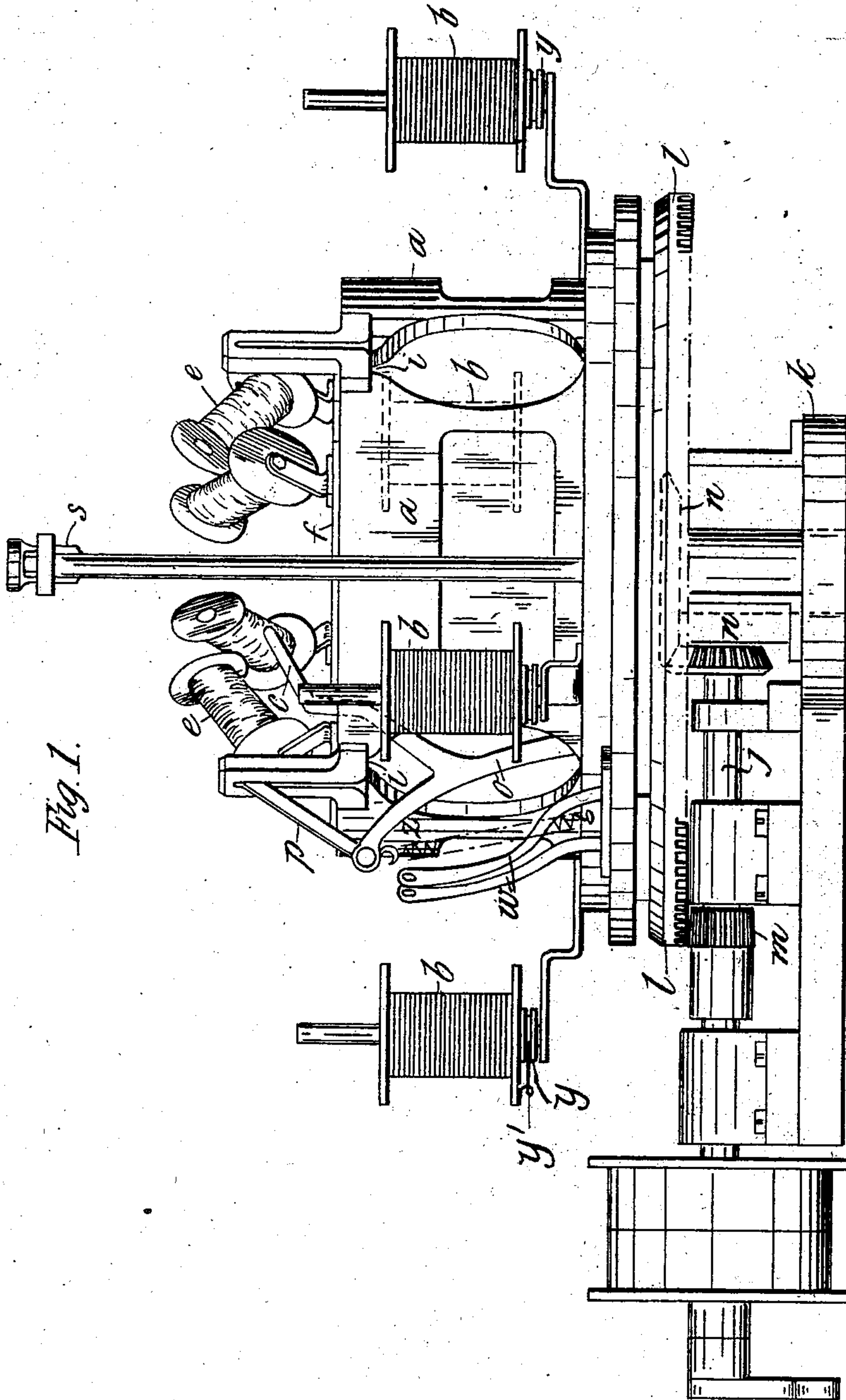
PATENTED APR. 21, 1903.

E. L. THORP.
PLAITING OR BRAIDING MACHINE.

APPLICATION FILED JULY 22, 1901.

NO MODEL.

4 SHEETS—SHEET 1.



Witnesses.
James L. Norris, Jr.
Robert Everett

Inventor.
Edgar L. Thorp.
By James L. Norris,
Atty.

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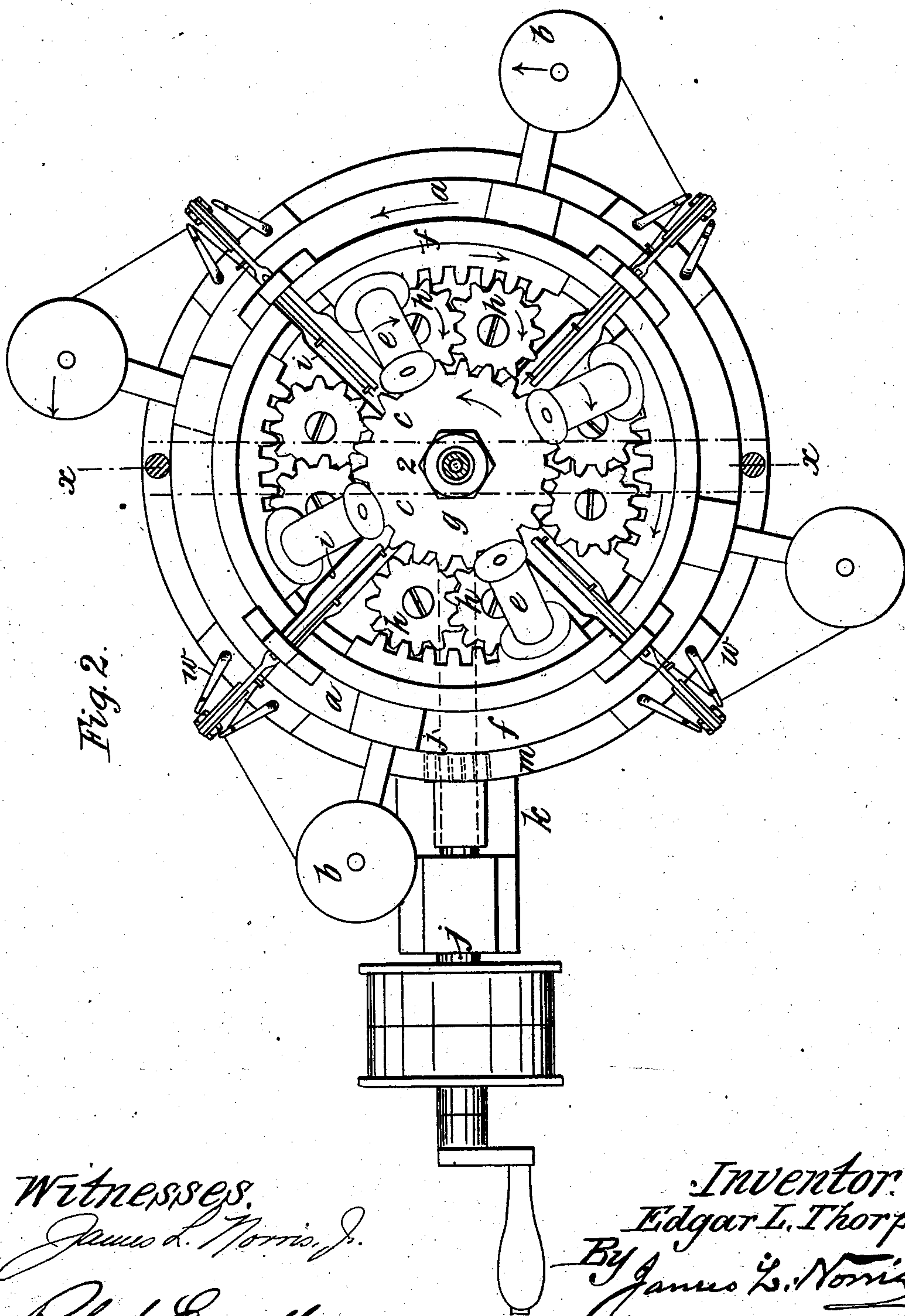
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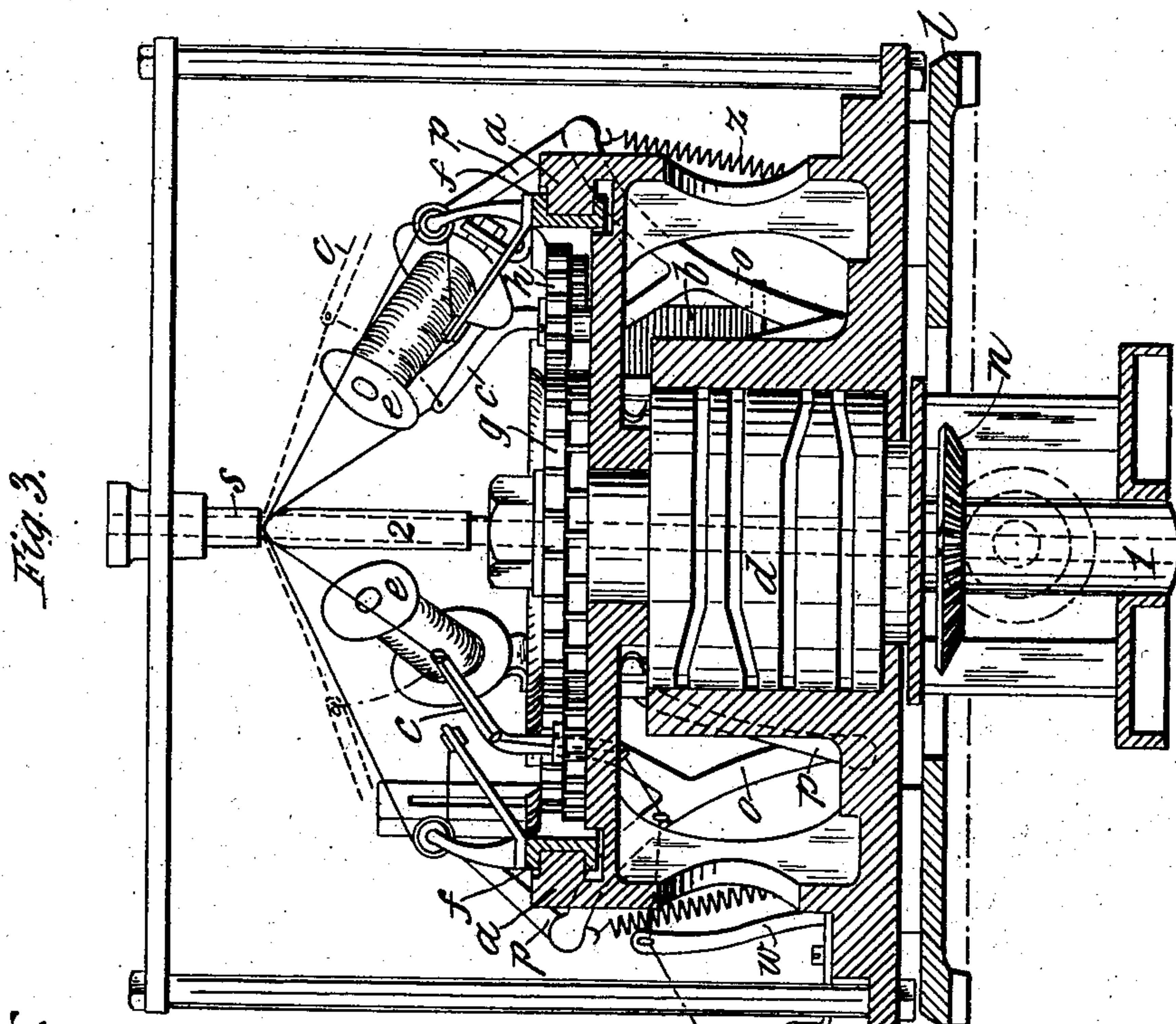
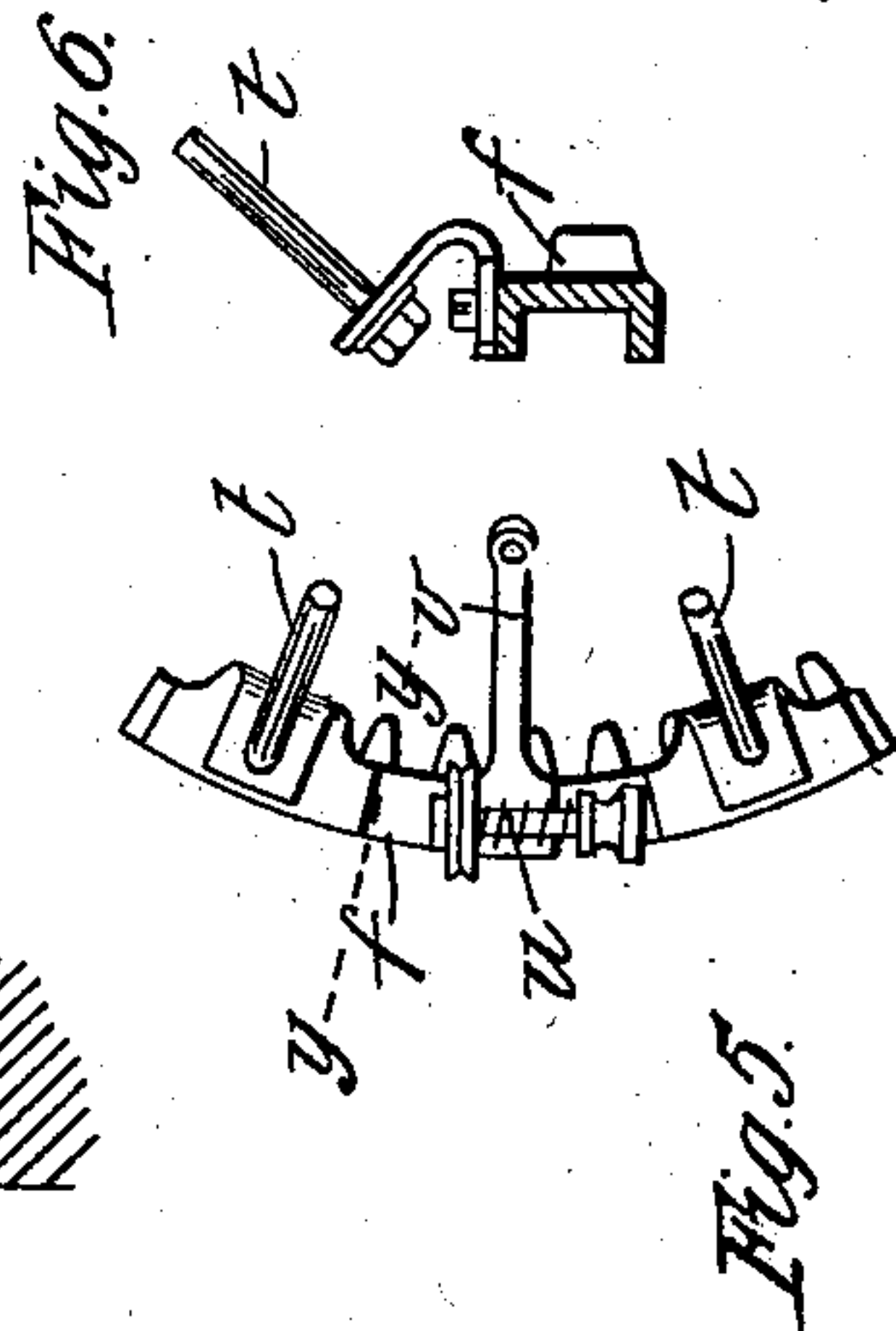
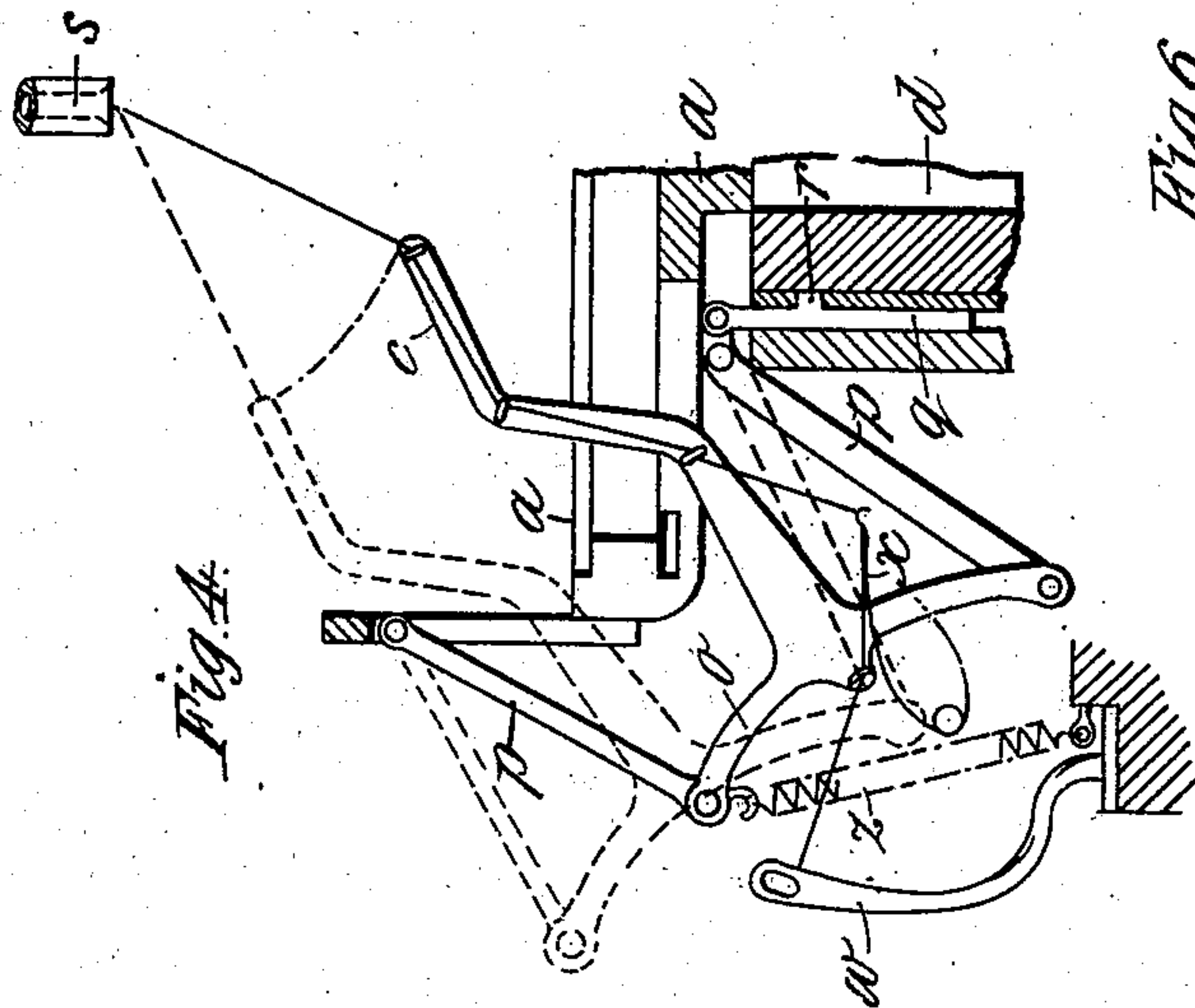
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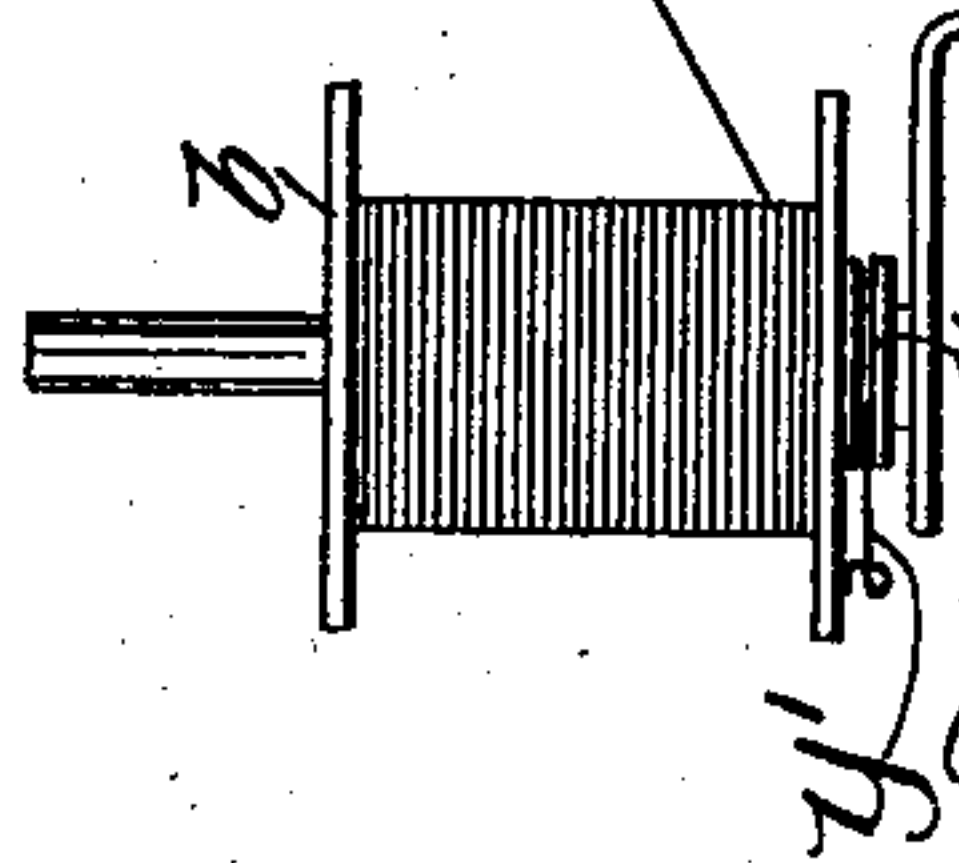
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4 SHEETS—SHEET 3.



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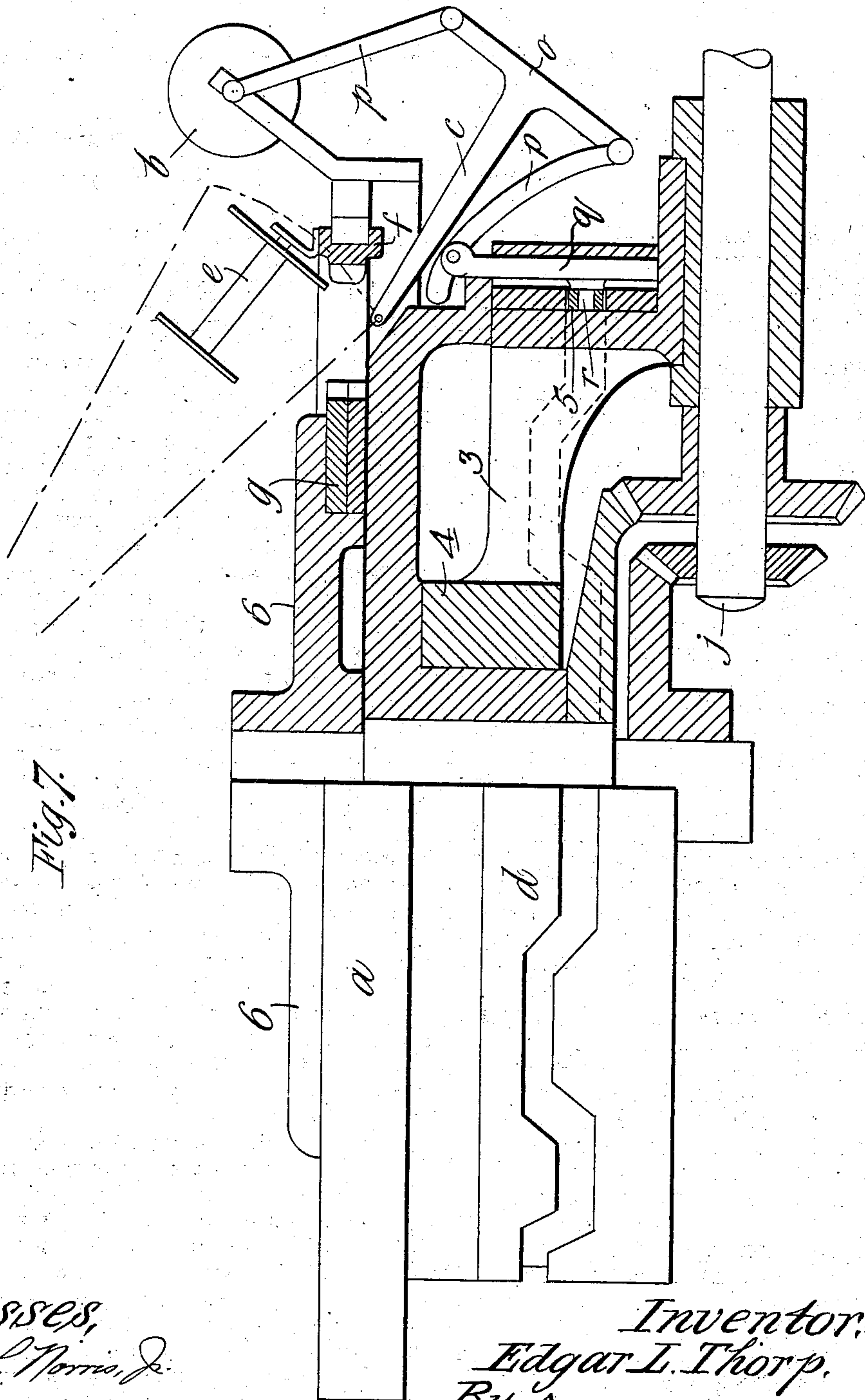


Fig. 7.

Witnesses,
James L. Norris, Jr.
Robert Crockett,

Inventor,
Edgar L. Thorp.
By James L. Norris,
Att'y.

UNITED STATES PATENT OFFICE.

EDGAR LESLIE THORP, OF NOTTINGHAM, ENGLAND.

PLAITING OR BRAIDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 726,116, dated April 21, 1903.

Application filed July 22, 1901. Serial No. 69,313. (No model.)

To all whom it may concern:

Be it known that I, EDGAR LESLIE THORP, consulting engineer, a subject of the King of Great Britain, residing at the Standard Works, Dame Agnes street, Nottingham, England, have invented certain new and useful Improvements in Plaiting or Braiding Machines, of which the following is a specification.

10 This invention relates to plaiting or braiding machines, and is designed to so construct the same that they can be run at a higher speed and will produce more uniform and regular work than heretofore. To this end
15 two sets of bobbins are employed which revolve in opposite directions, and the twisting is done by means of swinging "plaiting-guides," which pass the threads of one set of bobbins alternately over and under the other
20 set. An important feature of the invention is that these guides have a compound motion such that they always maintain the same distance from the plaiting center, and hence do not vary the tension of their threads. A
25 further feature is the arrangement whereby the inner set of bobbins are carried by revolving slides which are entirely isolated or separate from each other, and hence allow the threads of the outer bobbins to pass freely up
30 and down between them.

The invention also has reference to a special arrangement of epicyclic driving-gear for actuating the inner bobbins and to the cam arrangements for working the guides.

35 Referring now to the drawings, Figure 1 is a side view of one construction of my improved plaiting-machine; Fig. 2, a plan thereof; and Fig. 3 a section on the line xx , Fig. 2. Fig. 4 is a detail view showing one
40 of the plaiting-guides. Fig. 5 shows one of the special slides which carry the inner bobbins; and Fig. 6 is a section on the line yy , Fig. 5. Fig. 7 is a sectional elevation of a modification hereinafter more particularly
45 described.

This form of machine comprises as its main parts a revolving body or frame a , to which are connected the outer bobbins b and the plaiting-guides c .

50 d is a revolving cam for working the guides. It is provided with a separate groove for each

guide and is driven in the same direction but much faster than the body a .

e represents the inner bobbins, which are carried by the slide f , working on an inwardly-projecting rib or flange at the top of the frame and traveling in the opposite direction to the bobbins b . 55

g represents two horizontal superposed cog-wheels which revolve with the cam d , but have a relative displacement of half a tooth. Around these are a number of pinions h , there being as many pairs as there are slides f . One pinion of each pair gears with the upper cog-wheel g and also overlaps its fellow pinion, which gears with the lower cog. The two pinions turn on studs or centers secured to the top part of the body a , and they both gear with teeth on the slides f . The distances between the pairs of pinions are so adjusted that before a slide is free from one pair it will have begun to gear with the next pair. In other words, they bridge over the intervals between the slides. 65 70

The purpose of giving the cog-wheels g a displacement of half a tooth is to avoid play of the teeth of the pinions h in the teeth of the slides f and to render more certain their proper engagement with the successive slides. 75

i represents gaps for the guides c to work up and down in. The spaces between the slides and pinions correspond to these gaps. It will be seen that each guide has its own gap, so that the guides do not travel from one gap to the next, but always work in the same gaps. 80 85

The machine is driven by a belt or by hand from a shaft j , mounted in bearings on a suitable base k . The body a has beneath it a large circular rack l in gear with a pinion m on this shaft, while the cam is driven by bevel-gear n , as shown, and hence revolves much faster than the body. 90

The plaiting-guides (see Fig. 4) are carried by a link o , coupled to a pair of outwardly-swinging arms p , pivoted in uprights and lugs, respectively, at the top of the inner and outer portions of the body a . The lower arm is connected to a slide or jack q , which works in a vertical groove and has a butt or nib r engaging one of the grooves in the cam, so that it causes the said arms to swing on their 95 100

pivots. The centers are so chosen that the link arrangement causes the point of the plaiting-guide to move, as it were, on a "virtual pivot" in an arc struck from the plaiting center—i. e., the bottom end of the work-tube *s*, which is carried by a pair of side up-rights and an overhead cross-bar, as shown.

The inner bobbins are carried in a slanting position by inclined spindles *t*, (see Fig. 6,) secured to bent brackets fixed on the slides *f*. These slides also carry a tension device *u* and a thread-guide *v*. The outer bobbins may be upright and are carried by spindles on brackets extending from a flange on the body *a*. Their threads pass through fixed guides *w* and then through guiding-eyes on the plaiting-guide and also through the hook of a spring-tension finger *x*, connected to the link *o*.

Each of the outer bobbins may rest on a grooved ring *y*, fast on the spindles, (see Fig. 1,) and may have a spring-catch *y'* engaging this ring. The purpose of this is to prevent the bobbins flying off the spindles and also to act as a brake to retard the turning of the bobbin.

Each plaiting-guide may have a spring *z* to assist its downward movement. The aforesaid slides *f* are completely isolated from each other, and while their flanges fit the ledge or guide on which they slide they are only maintained in relative position by the engagement of their teeth with the pinions *h*, which engagement also effects the driving, as herein-after described. There is thus nothing to prevent the guides *c* working freely between the adjacent ends of the slides.

The action of this machine is as follows: When the shaft *j* is revolved, the body *a* is driven around, carrying with it the outer bobbins *b*, the plaiting-guides *c*, and the pinions *h*. The said shaft, however, at the same time drives the cam *d* and the wheels *g* in the same direction, but at a higher speed, as stated. Hence the cam-grooves operate the plaiting-guides by overtaking the butts *r* of the jacks *q*, Fig. 4. At the same time the pinions *h* are rotated in the counter direction to the faster-moving wheels *g*, and hence they drive the slides *f* and the inner bobbins *e* around in the opposite direction to the outer bobbins *b*. The ratios of the various gears *g h l m n* are so chosen that the two sets of bobbins revolve at equal angular velocity, and the cam-grooves actuate the plaiting-guides just at the moment when the slides of the inner bobbins have passed the gaps *i*. Thus, assuming the parts to be traveling as indicated by the arrows, Fig. 2, the guides have just been depressed into the gaps after the inner bobbins have passed under them. They will now remain depressed for about one-eighth of a turn until the slides *f* and the bobbins have passed over them. The oppositely-inclined parts of the cam-groove will by this time have come around and will immediately raise the guides into the positions shown in dotted lines, Figs.

3 and 4, ready for the next slides *f* and bobbins *e* to pass under them, and thus the two sets of threads become plaited together and form the finished work, which passes away up the work-tube *s*. It will be seen that the virtual pivot action is of the utmost importance, as it enables the guides, while carried outside the machine, to act in the proper way as if centered at the bottom of this work-tube, and thus avoids any alteration in the length of thread between the tip of the guide and the end of the tube, so keeping the tension absolutely constant and avoiding looseness and irregular work.

The arrangement of the inner bobbins in a slanting position enables the guides *c* to work with a swing not much larger than the diameter of the said bobbins, whose length is thus much greater than would be possible if they were upright.

The fact that the cam-groove is constantly overtaking the part it is to operate is also important, as it enables easier inclines to be used, and hence gives in a small machine a much smoother action at high speeds.

In the main figures the bobbins are shown arranged singly. Fig. 5 shows double bobbin-carriers on the slides *f*. In this way the plaiting-threads can be doubled where thicker and stronger work is required.

To enable a core to be supplied, the central stem or axis 1 of the machine is made hollow or tubular and has an upward tubular extension 2, which conducts the core up to the work-tube.

In larger machines substantially the same principles of construction are followed; but as a much wider cam is permissible it may be fixed and be formed with a single groove having as many rises as there are plaiting positions, and obviously the arrangement for obtaining the virtual pivot action for the plaiting-guides may also be modified in various ways without departing from the nature of the invention.

Fig. 7, for example, shows an arrangement for a large machine having a stationary cam. The parts which are not altered are omitted from this figure for the sake of clearness. The cam *d* in this case is much larger than in the first arrangement and has radial arms 3 connected to a fixed boss 4. The "jacks" *q* of the plaiting-guides have friction-rollers 5 where they engage the cam-groove to permit them to work at a high speed with the sharper rises necessitated by the cams being stationary. The outer bobbins *b* are for convenience made horizontal, and the central cogs are formed of two annular toothed rings secured in a revolving disk 6, their action being exactly as in the first arrangement.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In a plaiting-machine, the combination of an inner series of inclined bobbins traveling in one direction and converging toward the plaiting center, an outer series traveling

in the opposite direction, a series of plaiting-guides swinging on a virtual pivot for passing the yarns of one set over and under the other set, and means of actuating said bobbins and guides substantially as described.

2. In a plaiting-machine the combination of two series of oppositely-revolving bobbins, of which the inner set converge toward the plaiting center, a series of plaiting-guides working on a virtual pivot at the center of the machine to keep the tension uniform, means for supporting and controlling the said guides from the outer part of the machine, and means for actuating said guides and bobbins substantially as described.

3. In a plaiting-machine, the combination of two series of oppositely-revolving bobbins, a set of swinging plaiting-guides, a revolving body or frame carrying one set of bobbins and the plaiting-guides and having gaps for said guides to work in, a series of independent toothed slides traveling on a flange at the top of the frame and carrying the other bobbins, epicyclic gearing for driving these slides in the reverse direction to the outer bobbins, and means for actuating said parts, substantially as described.

4. In a plaiting-machine, the combination with the inner bobbins, of isolated slides for carrying the same, and epicyclic pinions overlapping each other arranged in pairs so that they bridge over the space between the slides and insure the latter working properly without any other connection between them, substantially as described.

5. In a plaiting-machine, the combination of oppositely-revolving bobbins, a revolving frame carrying one set, a pair of central superposed cog-wheels turning faster than said frame, a series of planet-pinions disposed around them and centered on the revolving

frame, and a series of slides carrying the other bobbins and working on said frame, substantially as described.

6. In a plaiting-machine, the combination of two series of oppositely-revolving bobbins, a frame carrying one of these sets, a series of plaiting-guides on said frame, a virtual pivot arrangement comprising a pair of outwardly-swinging arms centered on the frame and a link connecting the free ends of said arms, a cam for operating one of said arms and causing the arrangement to oscillate the guide on an arc struck from the plaiting center, substantially as described.

7. In a plaiting-machine, the combination of inner and outer sets of bobbins, of which the inner set converge toward the plaiting center, means for revolving the same in opposite directions, plaiting-guides supported from the outer part of the machine and directed inward toward the plaiting center, and means for operating said guides so as to cause them to swing on a virtual pivot and pass the outer threads alternately over and under the inner bobbins, substantially as described.

8. In a plaiting-machine, the combination of an inner and outer series of bobbins revolving in opposite directions, means for carrying and driving the same, a series of plaiting-guides traveling with one set of bobbins, and a revolving cam turning in the same direction as said guides but having a higher speed so that its inclines overtake the guides and so operate them, substantially as described.

In testimony whereof I have hereunto set my hand, in presence of two subscribing witnesses, this 9th day of July, 1901.

EDGAR LESLIE THORP.

Witnesses:

DOUGLAS E. STORER,
THOS. H. COOK.