

(Model.)

5 Sheets—Sheet 1.

H. R. INGLEDUE.

GRAIN BINDER.

No. 262,781.

Patented Aug. 15, 1882.

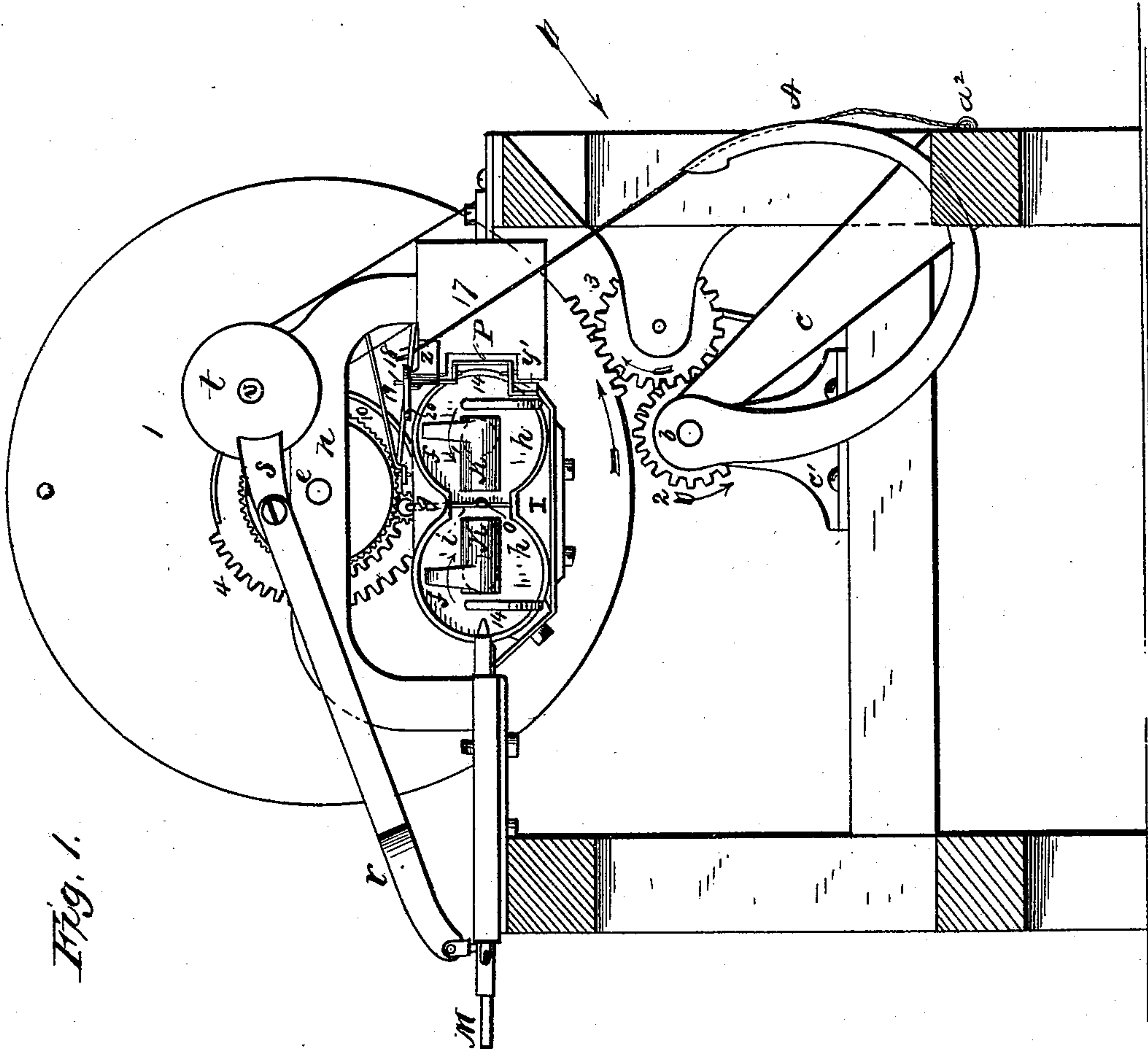
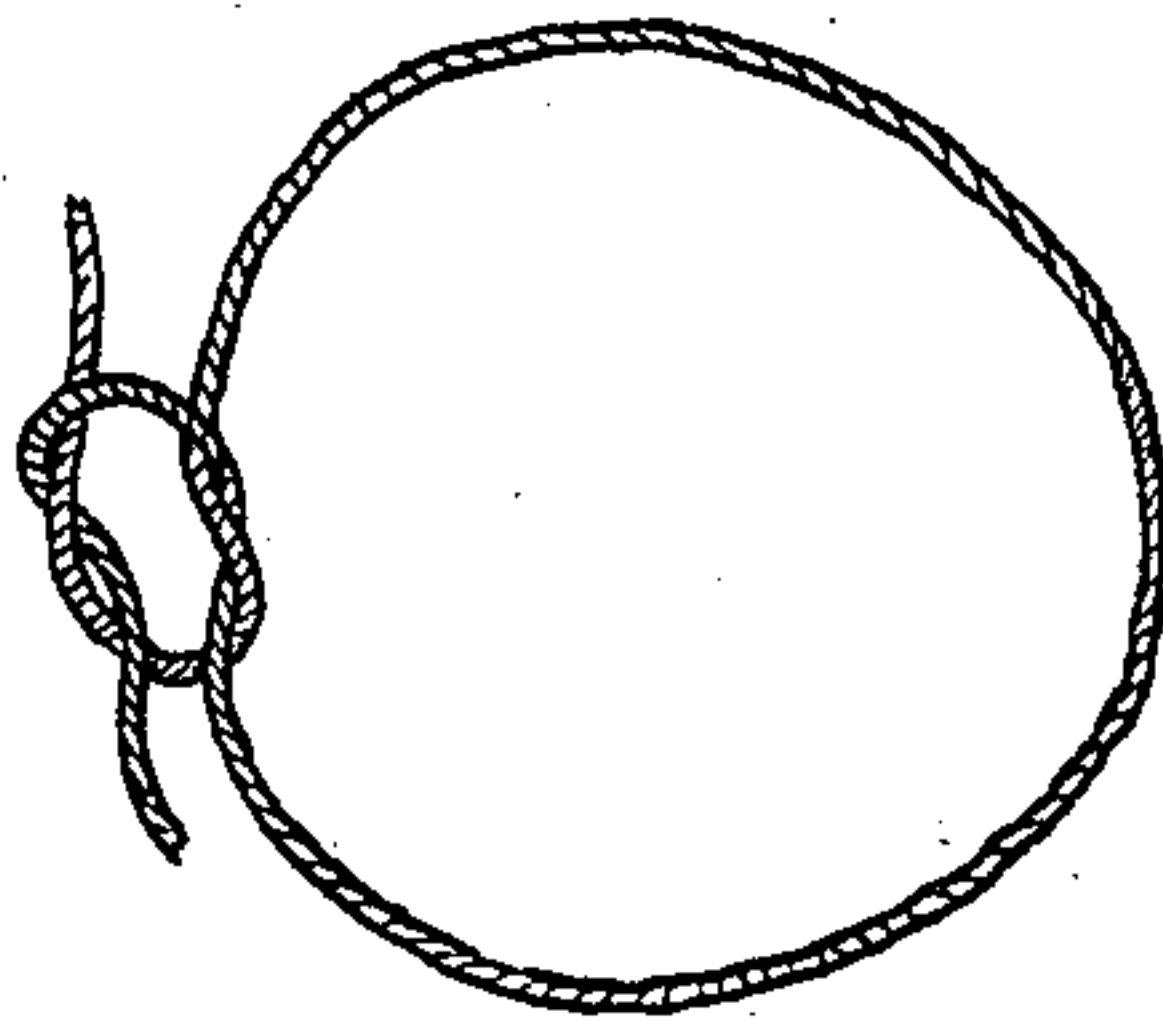


Fig. 1.

Fig. 2.



Witnesses.
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Inventor,
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per W. H. Doolittle,
Attorney.

(Model.)

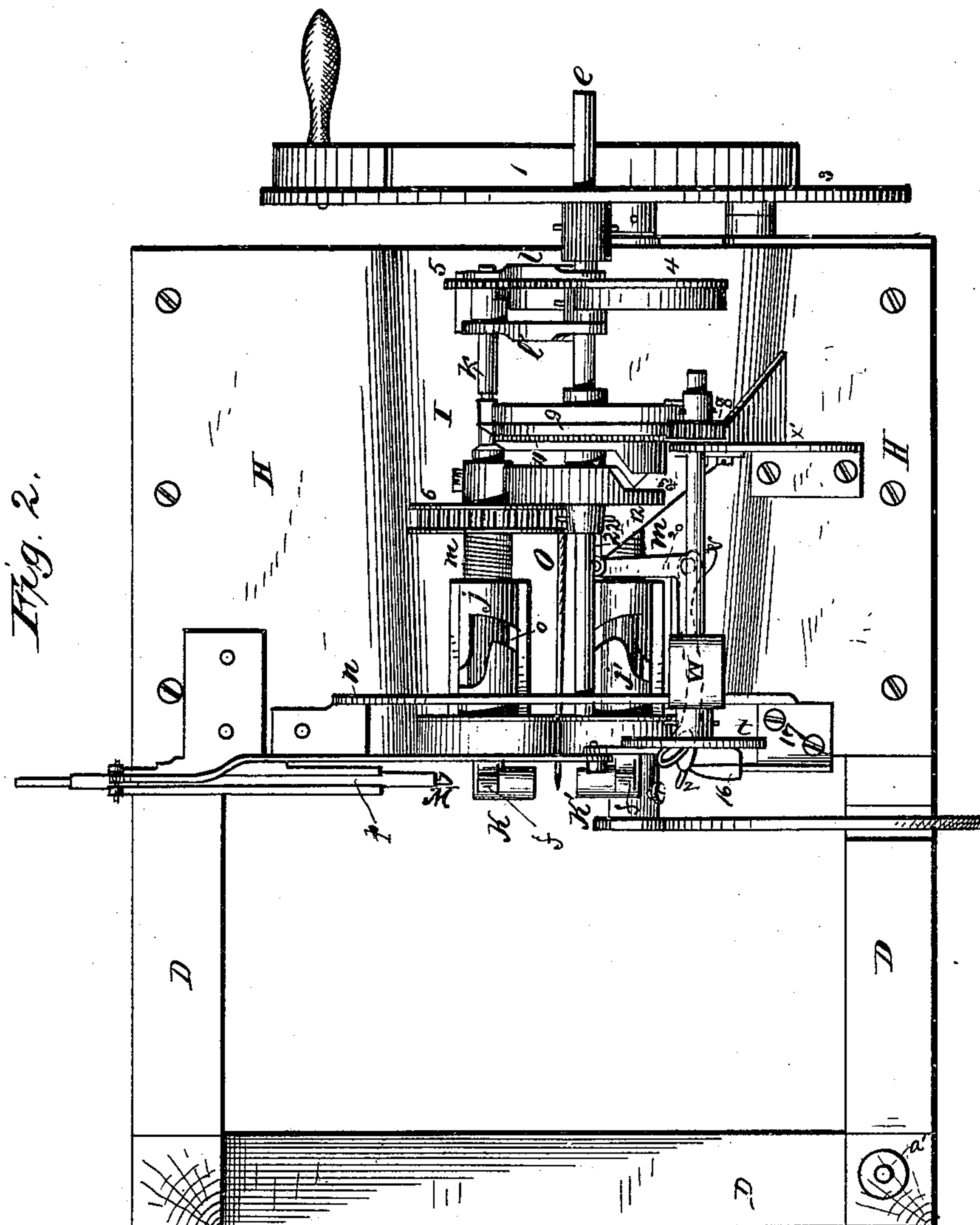
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(Model.)

5 Sheets—Sheet 4.

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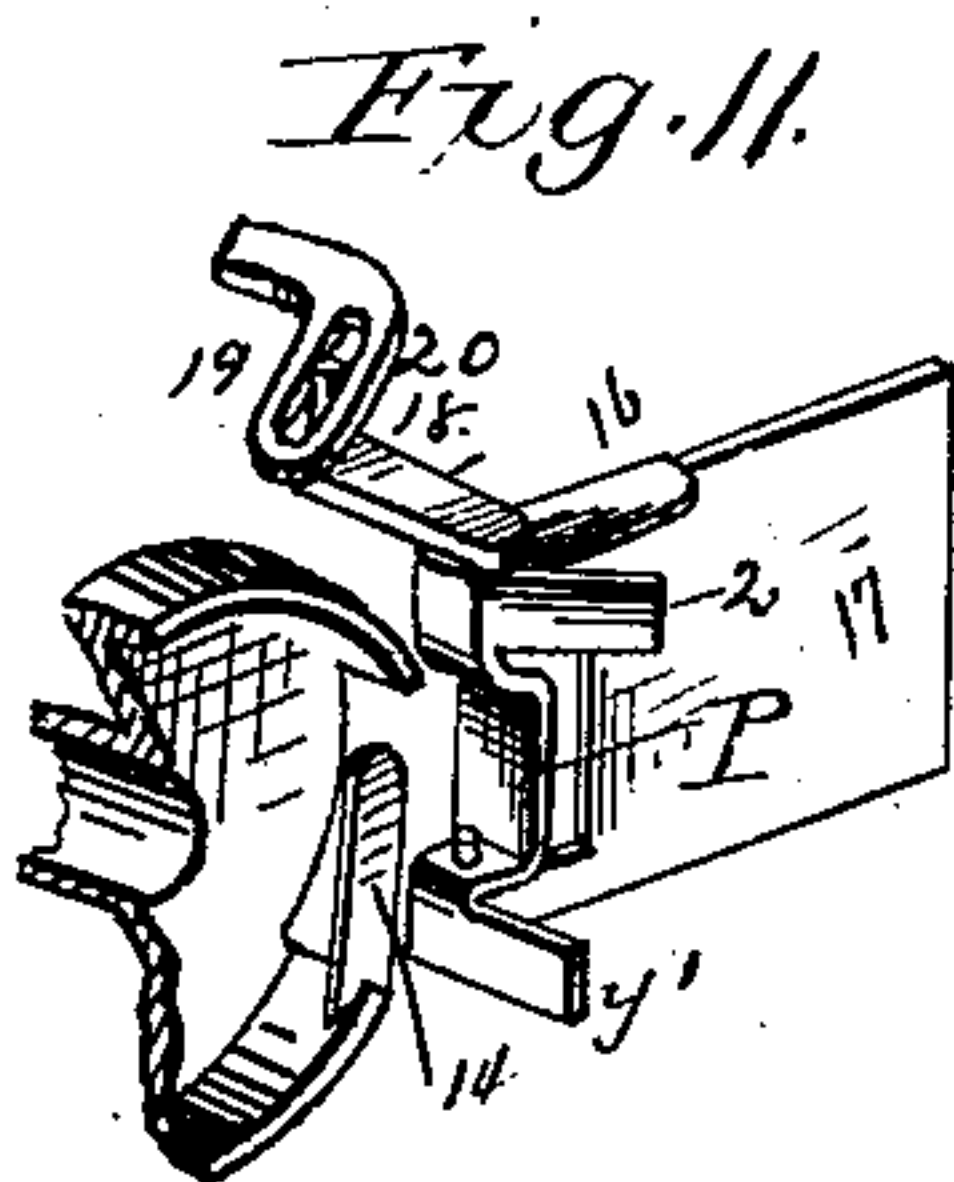
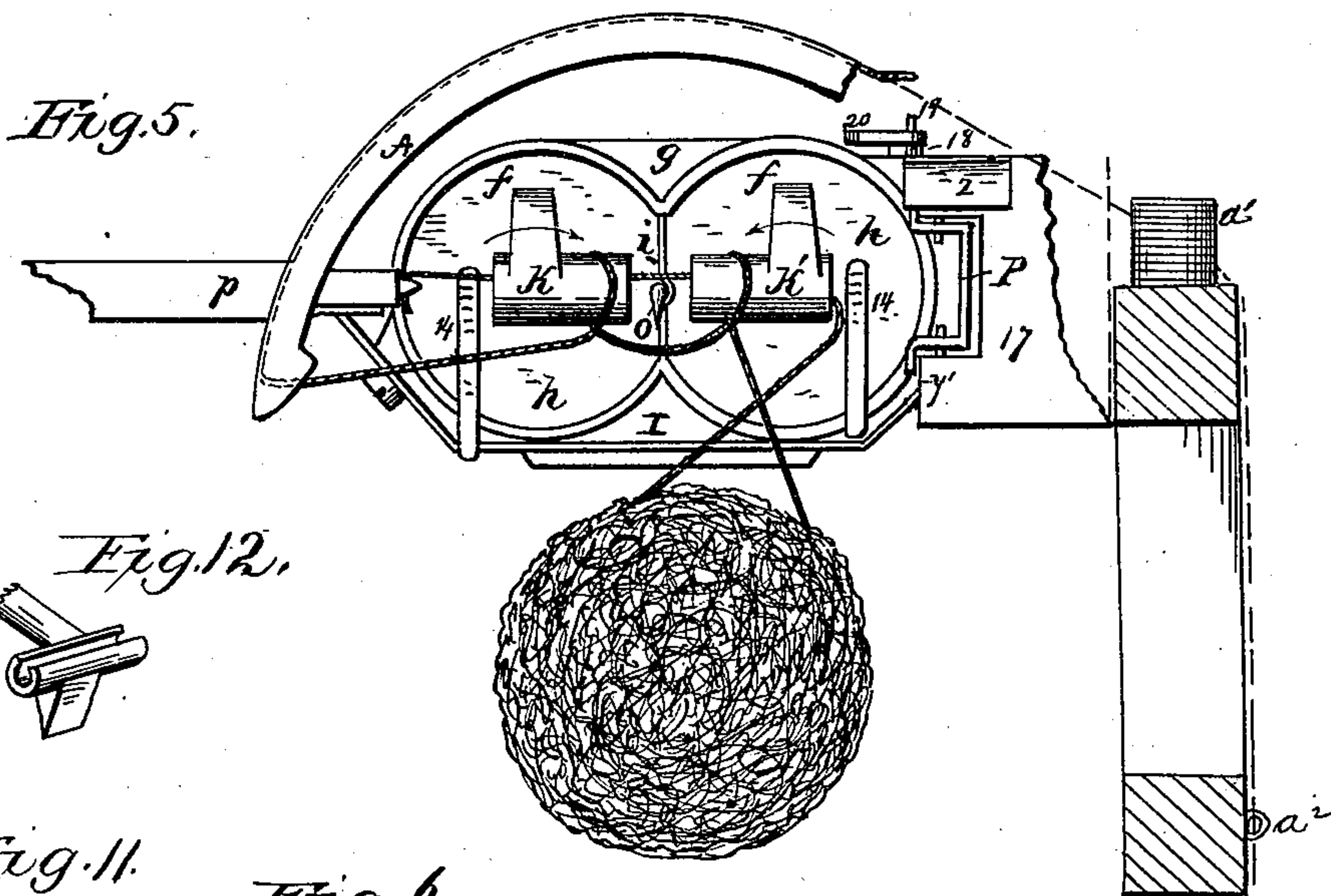
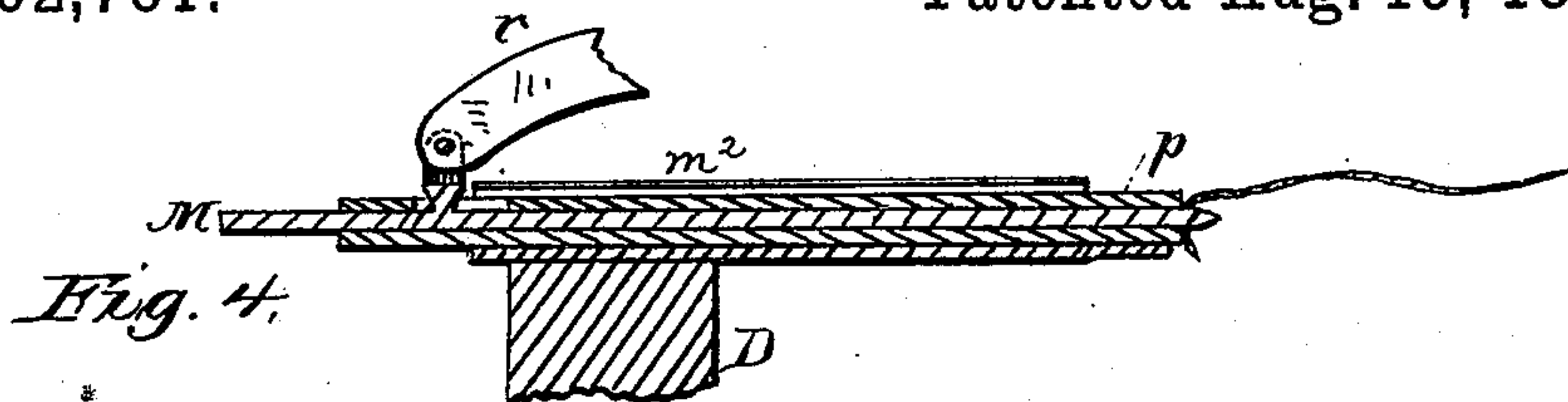
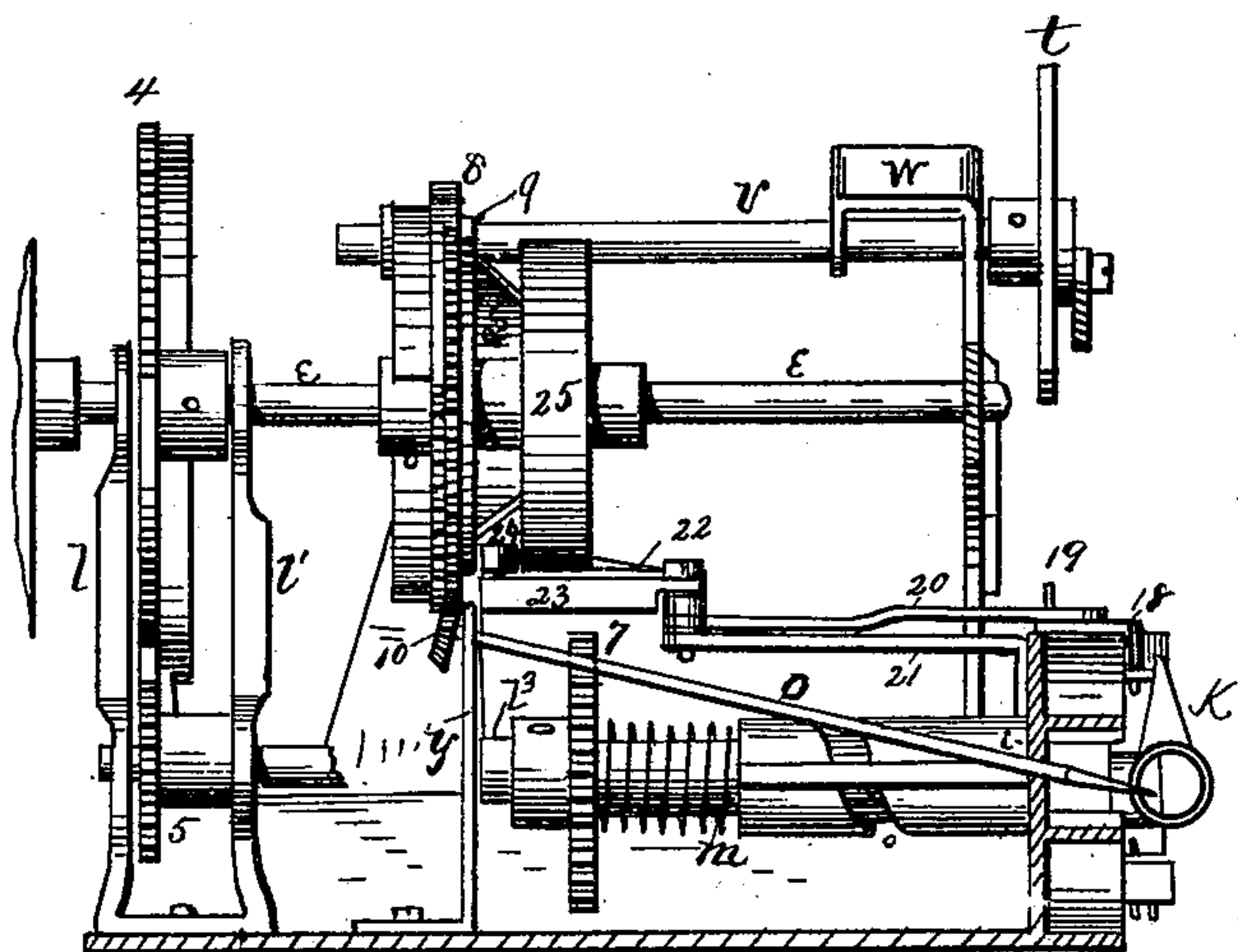


Fig. 6.



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UNITED STATES PATENT OFFICE.

HARVEY R. INGLEDUE, OF CARROLL, IOWA.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 262,781, dated August 15, 1882.

Application filed November 17, 1881. (Model.)

To all whom it may concern:

Be it known that I, HARVEY R. INGLEDUE, a citizen of the United States, residing at Carroll, in the county of Carroll and State of Iowa, have invented certain new and useful Improvements in Grain-Binders; 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 ap-

My invention relates to improvements in grain-binders in which cord is used as a binding material; and the objects of my improvements are to form a square knot and tie the same close against the gavel, and while tying to maintain a steady uniform tension of the cord upon the gavel and to take up all slack in the same. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a front end elevation of the apparatus; Fig. 2, a plan view of the same. Fig. 3 is an elevation of the end opposite the end shown in Fig. 1, showing the arrangement of wheels for operating the needle-arm and tying mechanism. Fig. 4 is a sectional view of the reciprocating cord-hook and its connection with the lever. Fig. 5 is a detail view of the loopers, cord-carrying arm, and reciprocating hook, showing one stage of the operation in forming the loops and the knot. Fig. 6 is a sectional side elevation of the apparatus. Fig. 7 is a detached view of the needle-arm shaft with spring and immediate connections, and Fig. 7^a is a view of the form of knot tied by the apparatus. Figs. 8, 9, and 10 are detail views, showing the position of the cord in various steps of the operation. Figs. 11 and 12 are detail views of the holder and cutter and one of the loopers, respectively.

Similar letters refer to similar parts throughout the several views.

The apparatus containing my improvements is of proper form to be conveniently attached to the ordinary harvesting-machine and connected with the running mechanism thereof.

The cord spool or reel may be supported on a spindle extending from the frame at a point,

a', Fig. 2, for instance, and be provided with a spring-tension device at *a*² to prevent the cord from running too freely.

The grain is introduced on a platform of the usual form situated between the needle-arm and the mechanism for forming the knot, a slot being formed in the platform for the passage of the needle-arm.

The needle-arm A is secured to the end of shaft *b*, which shaft is supported on brackets *c c'*, extending from the frame D, and around which is wound the spiral spring *x*. One end of this spring is attached to the bracket *c* and the other end to the shaft, as shown in Fig. 7. The office of the spring *x* is to throw back the needle-arm to its normal position after the cord is carried around the gavel.

Shaft *b* is operated at proper intervals by the action of a large mutilated cog-wheel, 1, through the smaller meshing cogs 2 and 3, cog 2 being mounted on the end of the shaft *b* and the cog 3 on a short arbor extending at right angles from a bracket, *d*.

Motion is communicated to the shaft *e* of large wheel 1 by proper connection with the operating mechanism of the reaper. The shaft *e* has bearings at one end in standards *l l'* and at the other in bridge or yoke *n*.

The various mechanisms constituting the knot-tying and cord-cutting devices are mounted upon the table or platform H, which is provided with a curved central depression, I, in which part of the loop-forming mechanism rests, and which platform is secured, as shown, to the top of the frame D.

The device for forming the loops consists of two loopers, K K', consisting of tubular and slotted heads projecting at right angles from and carried by rotary and reciprocating stems or shafts *k* and *k'*, from which heads project beveled arms *f f'*, as illustrated in Fig. 12. The loopers are cast on the ends of shafts *k* and *k'*, which pass back through the plate *g*, the shaft *k* to the standards *l l'* on the back of the table, and the shaft *k'* to wheel 7, carried on said shaft, and which meshes with wheel 6, carried on shaft *k*. Plate *g* is provided on its face with annular flanges, which, with the plate *g*, form circular spaces or recesses separated by a thin partition, *i*, into which circular spaces the loopers recede and in which they

revolve, as hereinafter described. Cast on the back of plate *g* are sleeves *j j'*, which form bearings, respectively, for the shafts of the loopers *K K'*. These loopers are given both an intermittent rotary and reciprocating motion. A rotary motion from the large wheel 1 through intermediate mutilated wheel 4 and wheel 5 is communicated to shaft *k* and wheel 6, and thence to wheel 7 on shaft of looper *K'*. The small wheel 5 is mounted on the end of the shaft *k*, between two standards, *l l'*, which also are extended above wheel 5 to form supports for an upper wheel, 4, and shaft *e*, which shaft carries the large mutilated wheel 1, as shown in Figs. 2 and 6.

The reciprocating motion is given as follows: As the looper-shafts are rotated a pin on each of the said shafts engages with a cam-slot, or it may be a groove, *o*, in each of the sleeves *j j'*, and by these means the loopers are carried forward as they are rotated in opposite directions simultaneously. They are moved back as they are rotated together, but in opposite directions from their first rotation, by the same means, and in the backward movement the pin in the cam slot or groove is assisted by the controlling action of the spiral springs *m m*, wound around the shafts of the loopers and located back of the sleeves *j j'*. On receding the loopers rotate in opposite directions and twist the cords to form the loopers, as hereinafter described.

M is a reciprocating hooked arm or grasper located in a guideway, *m²*, and sliding in a sheath, *p*, also in the guideway. The grasper is given a reciprocating movement through the tubular loopers by means of the lever *r*, and grasps and carries back the cord from a cord-holder through the loops formed on and lying on the loopers at the proper time, and for the purposes hereinafter set forth. The sheath *p* is provided with a slot on its upper surface, in which slides a pin on the grasper, which connects the grasper with one end of the lever *r*. When the grasper is forced forward through the tubular loopers and seizes the cord held by the cord-holder *P* it is allowed by means of the above-described slot and pin on the grasper to recede within the sheath in its backward motion, and thus hold the cord between the end of the sheath and the hook on the grasper. The lever *r* at one end is pivoted to arm *S*, rigidly attached to disk *t*. This disk is mounted on and rotated by shaft *v*, which is supported by standards *w* and *x'*. The standard *w* is a projection from bridge *n*. Shaft *v* is rotated by means of pinion 8 meshing with mutilated wheel 9, carried on shaft *e*.

O represents a shaft or rotating pin with a tapering point, used to hold the loops in position while being formed and to aid the binder-arm to take up the slack in the cord while the knot is being tied. It is supported at its heel by standard *y*, and its point extends through the center of the thin partition *i* upon plate *g*, and out at and between the loopers *K K'*, as shown in Fig. 5. Pin *O* is provided with a pinion, 10,

which engages with a wheel, 11, on the side of mutilated wheel 9, mounted on shaft *e*, by which means it receives a continuous rotary motion.

The purpose of rotating the center pin, *O*, is to prevent all friction and restraint of the cord while it is being drawn rapidly on the pin by the descent of the binder-arm, and while the knot is being tied. The great advantage accomplished by its use is to aid the binder arm in taking up all slack in the cord, so that the sheaf is tied as tightly as it is compressed; and not only a tightly-bound sheaf is thus obtained, but a great amount of cord is saved, which otherwise would be wasted in slack.

P is a device for holding and retaining the cord while the loops are forming, and it also cuts the cord and holds the ends after it is severed. It is provided with two arms, *y'* and *z*. The lower arm, *y'*, forms a shoulder around which the cord is bent as it passes from the holder *z* around the bundle to the eye of the needle-arm, and over which also the cord is again bent when the needle carries its end forward to the loopers. The arm *z* releases the free end of the cord just after the grasper has seized it, and on the backward movement of the needle-arm it presses the cord against the knife 16, fixed to the top of plate 17, thus severing it at the proper time and retaining the spool end against plate 17. The guards 14 guide the cord as it is carried forward by the needle-arm, and while the loops are being formed by the loopers, to keep the same in line and prevent entanglement. This cord-holder *P* is pivoted to short projections on the plate 17, and to receive its swinging motion is provided with an arm, 18, and pin 19, connected with one end of the slotted bell-crank lever 20, as shown in Fig. 11, which lever is pivoted at its angle to arm 21, extending back from plate *g*, and at its other end to an arm, 22, sliding in a way attached to brackets 23, said arm 22 being provided on its outer end with pin 24, and which is reciprocated by means of the cam-groove formed by the cams 25, mounted on shaft *e*. Before operating the machine the cord is first adjusted by carrying its end from the spool through the tension device, then through the eye of the needle, and then securing it back of arm *z* of the cord-holder against plate 17, as shown in Fig. 1.

The operation of the machine is then as follows: The grain passes over the needle in the direction of the arrow toward and under the loopers and against the cord, carrying the cord with it, the tension of the cord serving to partly form the sheaf. The needle-arm now rises through the grain, drawing the cord tighter around the sheaf and carrying the cord directly below the loopers and against the partition *i*, and under the revolving center pin, *O*, as shown in Fig. 8. While this is being done the loopers are extended outwardly to their farthest extent, with their beveled arms *f* pointing upward. The said beveled arms prevent the cord from being carried back and on the upper

side of the loopers as the needle-arm advances. The loopers now begin to revolve toward each other, and when they have performed a quarter-revolution they are retracted, by means
 5 already described, to within the recesses *h h*, bending the cord behind them. The loopers, continuing to revolve, twist the cords around them, forming thereon two separate loops, as shown in Fig. 9. The loopers are now carried
 10 outward, and when they reach their farthest outward movement and have completed an entire revolution the grasper *M* is carried quickly forward through the heads of the loopers and grasps the end of the cord retained by
 15 arm *z* of cord-holder *P*, as also shown in Fig. 9. The cord-holder at the same time releases its hold of the cord and the grasper recedes within its sheath, thus firmly holding the cord, and both sheath and grasper are then carried
 20 back through the loopers. At this moment the needle-arm, which has in the meantime remained in the position shown in Figs. 5, 8, and 9, moves backward and draws the cord from off the heads of the loopers through the slots
 25 in the same and onto the revolving center pin. The loops are then quickly tightened on the center pin, all slack in the cord being taken up thereon by the backward movement of the needle-arm, as shown in Fig. 10, which also at
 30 the same time withdraws the opposite end of the cord from the grasper. As the cord passes off from the revolving pin the knot is tied tightly upon the gavel. As the needle-arm falls back to its lowest position it carries the
 35 cord back of the arms *z* and *y'* of the cord-holder *P*, which then close upon it, *z* pressing the gavel end of the cord against knife 16, which severs it, while the spool end of the cord is at the same time retained, ready for binding
 40 the next sheaf.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

45 1. The loopers provided with arms having beveled faces, in combination with a plate having circular recesses formed on its face, into which the said loopers are withdrawn and revolved by suitable mechanism in opposite directions, substantially as described.

2. The combination of the rotary and reciprocating loopers, the plate, with its circular recesses, and the revolving tapering pin, substantially as described.

3. The combination of the loopers, the plate having the recesses, the revolving tapered pin, the reciprocating cord-grasper and its sheath, and the cord-holder, substantially as described.

4. The combination of the needle-arm, the loopers *K K'*, the reciprocating grasper *M*, the revolving tapered pin *O*, the guards 14, and the cord-holding device *P*, substantially as described.

5. In a grain-binder, the independently-rotating center pin, upon which the cord is drawn after the knot is formed, and on which the
 65 slack of the cord is taken up while the knot is being tied, in combination with a suitable knot-tying mechanism, substantially as described.

6. In a grain-binding machine, the cord holding and cutting device *P*, provided with
 70 the arms *y'* and *z*, and the knife 16 for holding and cutting the cord and retaining the spool end after the cord is severed, substantially as described.

7. In a grain-binding machine, the plate *g*,
 75 provided with circular flanges and the partition *i*, forming two circular recesses, *h h*, into which the loopers are withdrawn and revolve, substantially as described.

8. The combination of the rotary and reciprocating loopers *K K'*, spiral springs *m*, surrounding the looper-shafts, plate *g*, with its slotted sleeves *j j'*, and the connecting and operating mechanism, substantially as described.

9. The combination of the platform *H*, having
 85 the central depression, *I*, the rotary and reciprocating loopers, the plate *g*, with its recesses, the reciprocating cord-grasper, the revolving tapering pin, and the holding and cutting device, substantially as described.

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

HARVEY R. INGLEDUE.

Witnesses:

JNO. R. YOUNG,
 W. H. DOOLITTLE.