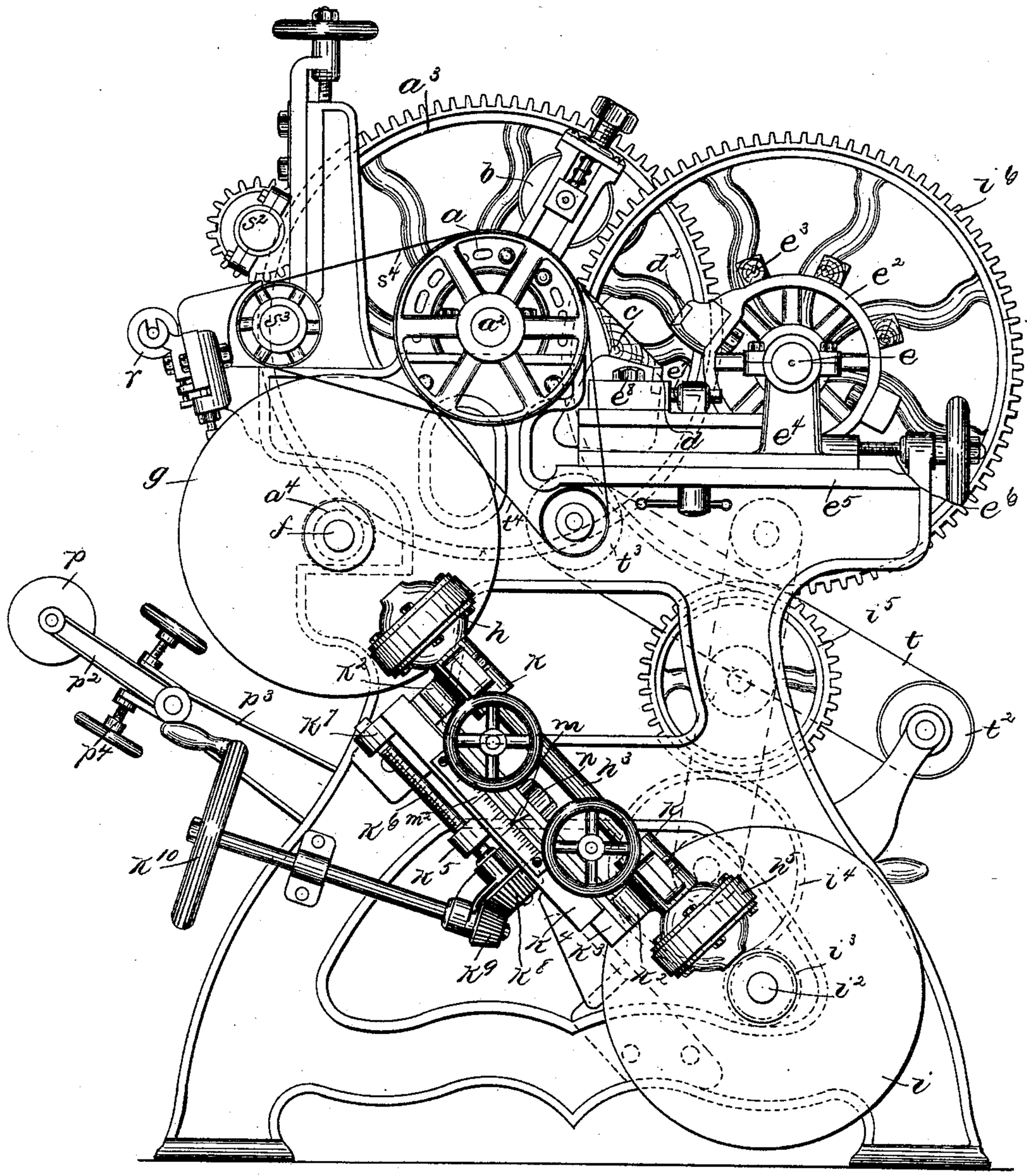
(No Model.) 3 Sheets—Sheet 1.

J. H. HORNE & C. E. BARRETT.

PAPER CUTTING MACHINE.

No. 487,739. Patented Dec. 13, 1892.

Fig. 1



Witnesses
Jas. J. Maloney.
H. E. Sales.

Inventors
John H. Horne
and Charles E. Barrett
by Jno. P. Livermore
Att'y.

(No Model.) 3 Sheets—Sheet 2.

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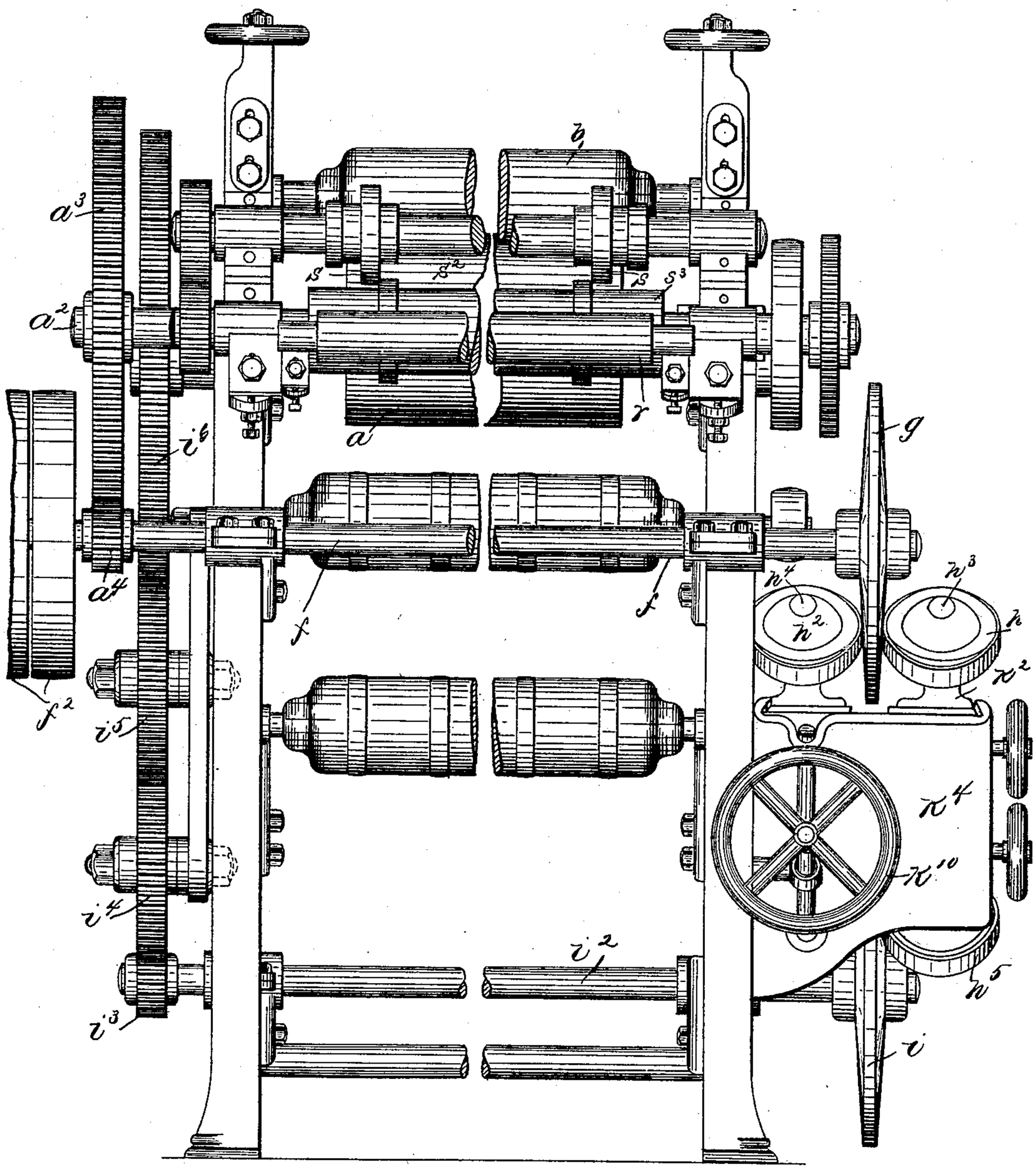
Fig. 2.



Witnesses
Jas. J. Maloney.
M. E. Hall.

Inventors
John H. Horne
and Charles E. Barrett.
by Jno. P. Livermore
Att'y.

(No Model.) 3 Sheets—Sheet 3.

J. H. HORNE & C. E. BARRETT.

PAPER CUTTING MACHINE.

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Fig. 3.

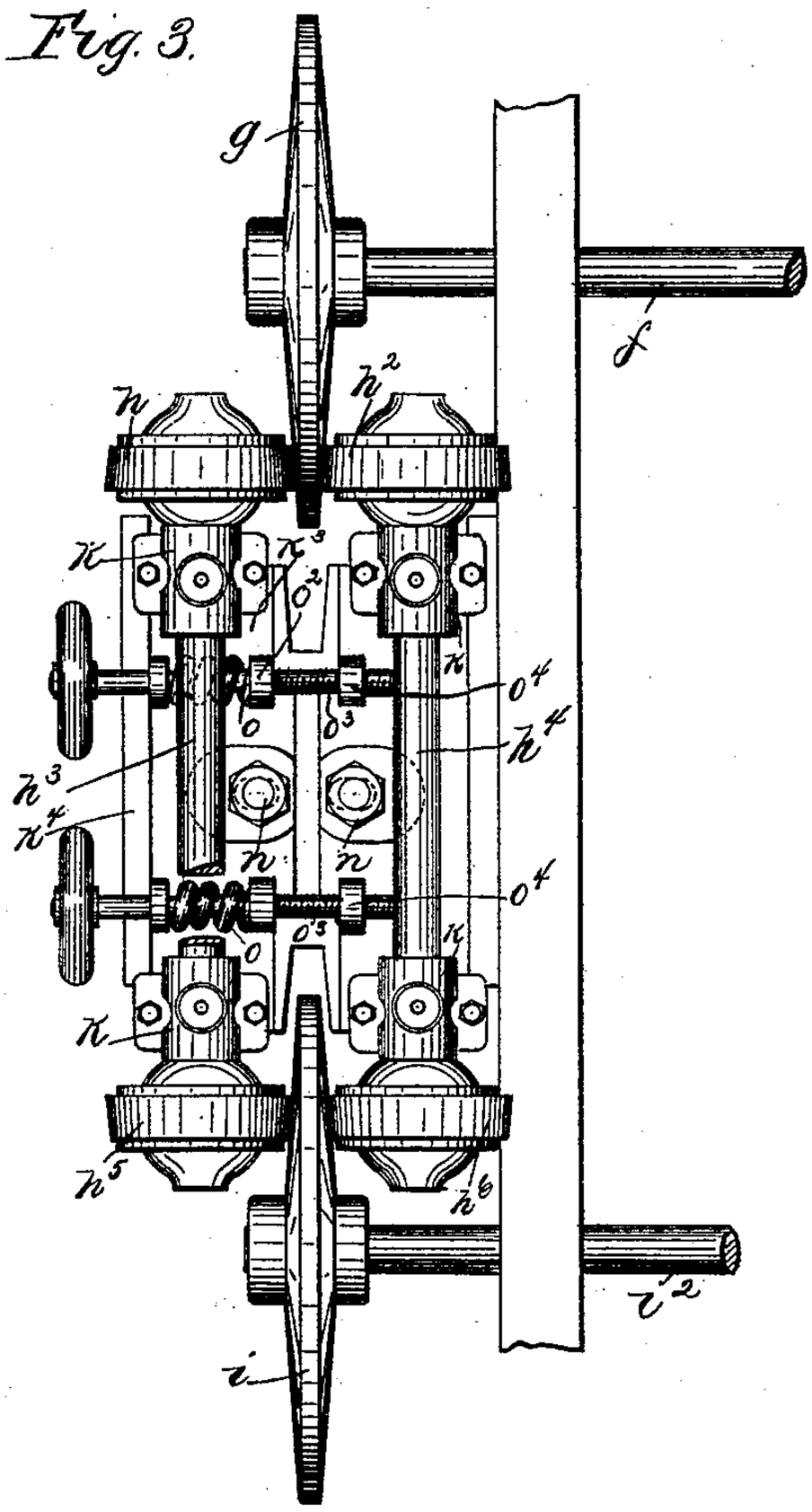
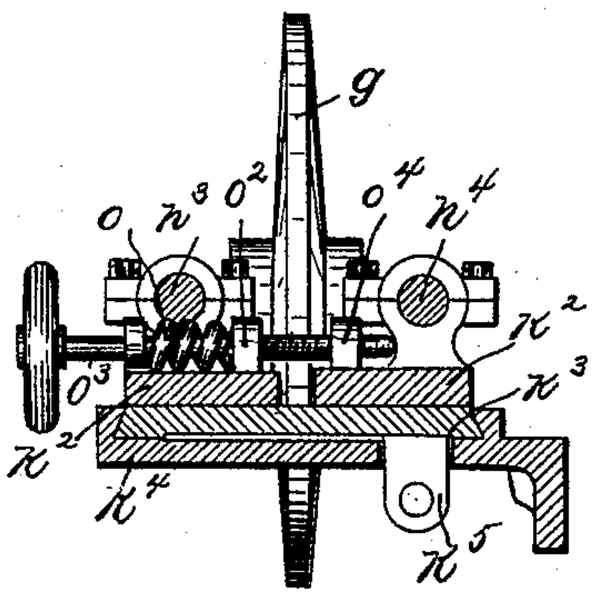


Fig. 4.



Witnesses
Jas. J. Maloney
M. E. Hill.

Inventors.
John H. Horne
Charles E. Barrett,
by Jno. P. Livermore
Atty.

UNITED STATES PATENT OFFICE.

JOHN H. HORNE AND CHARLES E. BARRETT, OF LAWRENCE, MASSACHUSETTS, ASSIGNORS TO THE J. H. HORNE & SONS COMPANY, OF SAME PLACE.

PAPER-CUTTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 487,739, dated December 13, 1892.

Application filed July 14, 1891. Serial No. 399,528. (No model.)

To all whom it may concern:

Be it known that we, JOHN H. HORNE and CHARLES E. BARRETT, of Lawrence, county of Essex, State of Massachusetts, have invented an Improvement in Paper-Cutting Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

Our invention relates to a machine for cutting a continuous web of paper into sheets, the object of the invention being to produce a simpler and more efficient machine than those heretofore used for this purpose, and one in which the mechanism can be quickly adjusted to cut sheets of any desired length within the capacity of the machine, it being possible to make such adjustment without stopping the machine.

The paper-cutting machine forming the subject of this invention comprises a feed cylinder or roll by which the web of paper is fed forward and a revolving cutter which acts upon the web fed to it by the feed-roll cutting the same transversely and thus dividing the web into rectangular sheets. The cutter severs the web at each revolution, so that the length of the sheet depends upon the rate of feed of the feed-roll relative to the rate of rotation of the cutter-shaft, the sheets being, for example, ten inches long if the web is fed ten inches during each rotation of the cutter-shaft, or eighty inches long if the web is fed a distance of eighty inches during each rotation of the cutter-shaft, and so on, the above being about the limits that are usually required to be provided for in machines of this kind. It is necessary, therefore, to provide variable connections between the feed-roll shaft and the cutter-shaft in order to enable the machine to be adjusted to cut sheets of different lengths, and such connection has heretofore been commonly provided by changeable gears or by expanding and contracting belt-pulleys, which mechanism as heretofore used requires the stopping of the machine in order to enable the gearing or connecting mechanism to be adjusted.

In the machine forming the subject of this invention a variable-speed connecting mechanism comprising frictional gearing, as will be hereinafter described, is employed as part of the connecting mechanism between the main driving-shaft and the feed-roll and cutter-shafts of the machine, such gearing being so constructed that the relative speed of movement of the feed-roll shaft and cutter-shaft may be varied to any desired amount within the maximum limits of the machine by the manipulation of a suitable handle, thus setting the machine to cut sheets of any desired length within the maximum limits, it being possible to vary the length of sheet while the machine is running.

Figure 1 is a side elevation of a paper-cutting machine embodying this invention; Fig. 2, an end elevation thereof as seen looking toward the left-hand end of the machine, as represented in Fig. 1; and Figs. 3 and 4, a plan view and transverse section, respectively, of the variable friction-gearing.

The machine comprises a paper-feeding roll or cylinder *a*, between the surface of which and that of a spring-pressed roll *b* the web of paper is fed onto and along the surface of a cutter-bed *c*, provided at its lower end with a stationary cutter-blade *d*, which co-operates with a revolving cutter-blade d^2, carried by the rotating cutter-shaft *e*, the said blades *d* and d^2 co-operating together to sever the web between them on a line at right angles to the length of the web once at each rotation of said cutter-shaft, thereby severing the webs into sheets the length of which is equal to the travel of the web produced by the feed-roll *a* during one complete revolution of the cutter-shaft *e*. In order to vary the length of the sheets, it is necessary, therefore, to vary the relative speed of movement of the feed-roll *a* and cutter-shaft *e*, which is accomplished in accordance with this invention by the actuating mechanism for said parts, which will now be described.

The shaft a^2 of the feed-roll *a* is provided with a gear a^3, meshing with a pinion a^4 on the main driving-shaft *f* of the machine, which

may be driven by a belt-pulley f^2 or in any other suitable manner. The said driving-shaft f is mounted with a friction-disk g, the faces of which are engaged by a pair of friction-rolls h h^2, mounted on shafts h^3 h^4, which shafts are provided at their other ends with a pair of similar friction-rolls h^5 h^6, that engage the faces of a friction-disk i, similar to the one g, the said disk i being fast upon a shaft i^2, connected by gearing i^3 i^4 i^5 i^6 with the cutter-shaft e, which thus receives its movement from the main driving-shaft f through the intervention of the frictional gearing g, h, h^2, &c., and disk i. As the connection between the driving-shaft f and the feed-roll a is positive spur-gearing and the connection between the shaft i^2 and the cutter-shaft e is also positive spur-gearing, it is obvious that any change of speed of the shaft i^2 relative to that of the shaft f will produce a corresponding change in the rate of revolution of the cutter d^2 relative to that of the feed of the roll a, and consequently the length of the sheet cut from the paper may be varied by varying the speed of the shaft i^2 relative to that of the shaft f, which is accomplished by the frictional gearing connecting said shafts, as will now be described.

The intermediate shafts h^3 h^4, which connect the rolls h h^5 and h^2 h^6, that engage the friction-disks g and i, respectively, are of a length less than the distance between the shafts f and i^2, so that when the rolls h h^2 at one end of the shaft are near the periphery of the corresponding friction-disk g the rolls h^5 h^6 at the opposite ends of said shafts are near the axis of the disk i, and as said rolls are of equal size the disk i will under such conditions be driven at a much higher rotary speed than that of the disk g; but if, on the other hand, the rolls h h^2 were brought near the axis of the disk g, the rolls h^5 h^6 would by the same movement be brought near the periphery of the disk i, and said disk i would then be driven at a much lower speed of rotation than that of the disk g. To enable such change of position of the friction-rolls to be made quickly and without necessarily stopping the machine, the shafts h^3 h^4 thereof are mounted in bearings k, on bearing-pieces k^2, connected with a carriage k^3, movable in a guideway k^4 on a line parallel with the line connecting the axes of the shafts f and i^2. The said carriage k^3 is provided with a threaded projection or nut k^5, engaged by a screw k^6, turning without longitudinal movement in a bearing k^7, and provided with a beveled gear k^8, meshing with a beveled gear k^9 on a shaft operated by a hand-wheel k^{10}. Thus by turning the said hand-wheel k^{10} the carriage k^3 and the set of friction-rolls mounted thereon are caused to move from the axis of the shaft f toward the axis of the shaft i^2, or the reverse, thus causing the speed of the shaft i^2 to be increased or diminished with relation to that of the shaft f, and the said movement may take place while the shafts f and i^2 are running. The carriage k^3 is provided with an indicator m, co-operating with a scale m^2 on the carriage, which scale may be marked to indicate the length in inches of the sheets of paper that will be cut when the carriage is in position, with the indicator opposite a given graduation.

In order to insure the proper pressure of the friction-rolls against the faces of the friction-disks, so that there will be no slip and consequently no error in the movement of the cutter relative to the feed of the paper, the bearing-pieces k^2 are movable transversely on the carriage, being fastened to said carriage by bolts n, working in slotted openings in said bearing-pieces, which bearing-pieces are pressed toward one another by springs o, shown as interposed between projections o^2 from the bearing-pieces that carry one of its shafts, as h^3, and a collar on a screw-shaft o^3, screwing into a lug or projection o^4 on the bearing-piece for the other shaft h^4. Thus the springs tend to press the said shafts h^3 h^4 toward one another and thus to press the rolls at the end of the shafts against the corresponding faces of the friction-disks, and the pressure may be adjusted by turning the screw-shafts o^3 by suitable hand-wheels, with which they are provided.

The web of paper to be cut is drawn from a roll, which may be supported in proper position with relation to the machine, said web first passing under a leading-in roll p, the gudgeon of which is supported in an arm p^2, pivotally connected with a bracket p^3 from the framework and adjustable by a set-screw p^4, enabling the inclination of said leading-in roll p to be varied slightly, as may be required, in order to cause the paper to lead in properly and to obviate any tendency of said paper to run toward one or toward the other side of the machine. This leading-in roll serves as a primary guide for the proper introductiou of the paper to the machine to insure its being fed in straight. The web then passes over a guide-roll r, and if it is desired to sever the web longitudinally it passes between slitting-cutters s, adjustable on cutter-shafts s^2 s^3, driven from the main feed-roll shaft a by a belt and pulleys, as shown at s^4, Fig. 1, or by any other suitable connection. The slitting-cutters s are adjustable along their shafts s^2 s^3, so as to divide the web into strips of any required width, and said cutters may be wholly removed if the web is to be used of full width, or two pairs of cutters may be employed merely to trim the edges of the web. The paper then passes over the feed-roll a and under the presser-rolls b, down onto the cutter-bed c, which comes close to the surface of the feed-roll, as shown, so as to clear the web of paper from the feed-roll and cause it to travel down over the bed and across the stationary cutter-blade d, from which it travels downward to a traveling support composed of a number of belts t, running on rolls t^2 t^3,

driven by a belt t^4 from the shaft a^2. When the revolving cutter-blade d^2 arrives at the stationary cutter-blade d, the web is severed and the portion below the cutter-blades drop onto the traveling surface or feed-apron t, and is delivered thereby from the machine while the web fed forward by the cylinder a continues to descend toward said feed-apron t, and is carried along thereby until the cutter d^2 has made a complete revolution and again severed the web, as before. The cutter d^2 is connected with the periphery of a number of wheels e^2, fixed upon the cutter-shaft e and connected by transverse bars e^3, which tend to carry the forward end of the web downward toward the feed-apron t after the sheet has been cut. The cutter-shaft and cutter-bed are supported upon a carriage e^4, adjustable toward and from the feed-roll a upon a guide e^5 on the main framework of the machine, said carriage being moved by adjusting-screws e^6, and the stationary cutter d is adjustable on the carriage e^4 by a set-screw e^7, being fastened when properly adjusted by a bolt e^8, the edges of the cutter-blades d and d^2 thus being brought into proper position with relation to one another to cut effectually.

The cutter-blade d and cutter-bed are attached to a cross-beam adjustable on the carriage e^4 by the set-screw e^7, which is adjusted to bring the cutter-blades into proper working relation, after which both said cutters, together with the stationary cutter-bed c, may be adjusted relatively to the feed-roll a by adjustment of the carriage e^4.

The capability of adjustment of the speed of the cutter-shaft relative to that of the feed-shaft while the machine is running is of great advantage, as it enables the machine to be quickly set to cut sheets of the exact length desired independently of the gage, which indicates the length of sheet for any given position for the adjusting mechanism.

Heretofore in machines of this kind when changeable gearing is used it is possible to make only a limited number of variations in the length of sheet that can be cut, while with machines employing a variable connecting mechanism—such, for example, as expansion-pulleys—it is necessary to stop the machine, adjust the pulleys approximately, and then run the machine to cut a sheet, so as to find out whether the adjustment has been properly made, and if not it is necessary to stop the machine and make another adjustment, and so on, until by a number of trials the machine is caused to cut the sheet of just the length required. With the machine forming the subject of this invention, however, the gearing can be set with great accuracy by the simple movement of the handle k^{10}, and if upon measurement the sheet first cut should be found to be not exactly the required length the proper adjustment may be made without stopping the machine and consequently without loss of time and with but little waste of paper from inaccurate cutting.

We claim—

1. In a paper-cutting machine, the combination, with the main driving-shaft, the revolving cutter, its shaft, the stationary cutter, and means for feeding the paper, of direct-contact friction devices receiving prime movement from said driving-shaft, means for altering the relative working positions of said friction devices without stopping their motion or the motion of the machine, and means for transmitting their motion to the shaft of the revolving cutter, substantially as described.

2. In a paper-cutting machine, the combination, with the main driving-shaft, the revolving cutter, its shaft, the stationary cutter, and means for feeding the paper, of a friction-disk on the driving-shaft, friction-rolls bearing upon and rotated by said friction-disk, a carriage for such rolls, means to move said carriage and thereby to adjust such rolls radially with relation to the disk, and means for transmitting the motion of the rolls to the revolving cutter-shaft, substantially as described.

3. A paper-cutting machine comprising a paper-feed roll, a revolving cutter, a shaft for said cutter, a stationary cutter, and a main driving-shaft, combined with friction-disks, one on the main driving-shaft and the other on a supplemental shaft, friction rolls and shafts interposed between these two disks and adjustable relatively thereto, and means for transmitting the motion from the supplemental shaft to the revolving cutter-shaft, substantially as described.

4. A paper-cutting machine comprising a paper-feed roll, a revolving cutter, a shaft for said cutter, a stationary cutter, and a main driving-shaft geared with the paper-feed roll, combined with a friction-disk on the main driving-shaft, a second friction on a supplemental shaft, which latter is geared with the cutter-shaft, friction rolls and shafts interposed between the two disks with the friction-rolls in engagement with the said disks and adjustable radially toward and from the centers of said disks to vary the speed of the paper-feed roll and the revolving cutter, substantially as described.

5. In a paper-cutting machine, the combination, with the paper-feed roll, of a main driving-shaft geared therewith and provided with a friction-disk, a revolving cutter and shaft therefor, a driving-shaft geared to said cutter-shaft and provided with a friction-disk, an intermediate shaft provided with friction-rolls bearing on the said friction-disks and transmitting power from one to the other, an adjustable carriage for said friction-rolls, whereby their position relative to the said disks may be varied and the speed of rotation

of the cutter-shaft relative to that of the feed-rolls correspondingly varied, and a pointer and scale for gaging the movement of said feed-carriage and indicating the length of sheet corresponding to the different positions of the said carriage, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

JOHN H. HORNE.
CHARLES E. BARRETT.

Witnesses:
JOHN W. BOLTON,
PETER DILLON.