

No. 612,704.

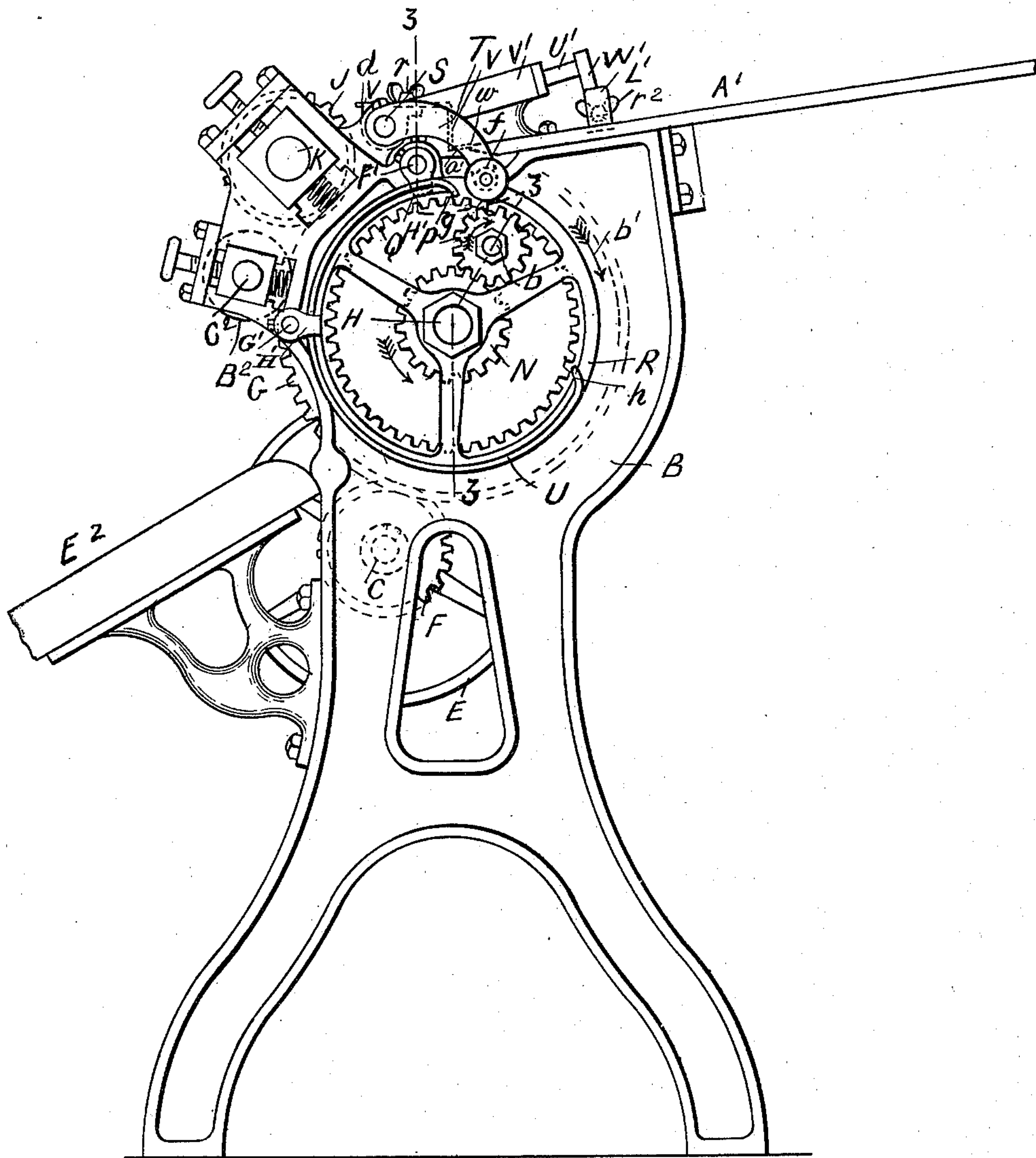
Patented Oct. 18, 1898.

D. S. CLARK.
ROTARY CUTTING MACHINE.

(Application filed June 4, 1896.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES

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John P. Williams Jr.

FIG. 1.

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3 Sheets—Sheet 2.

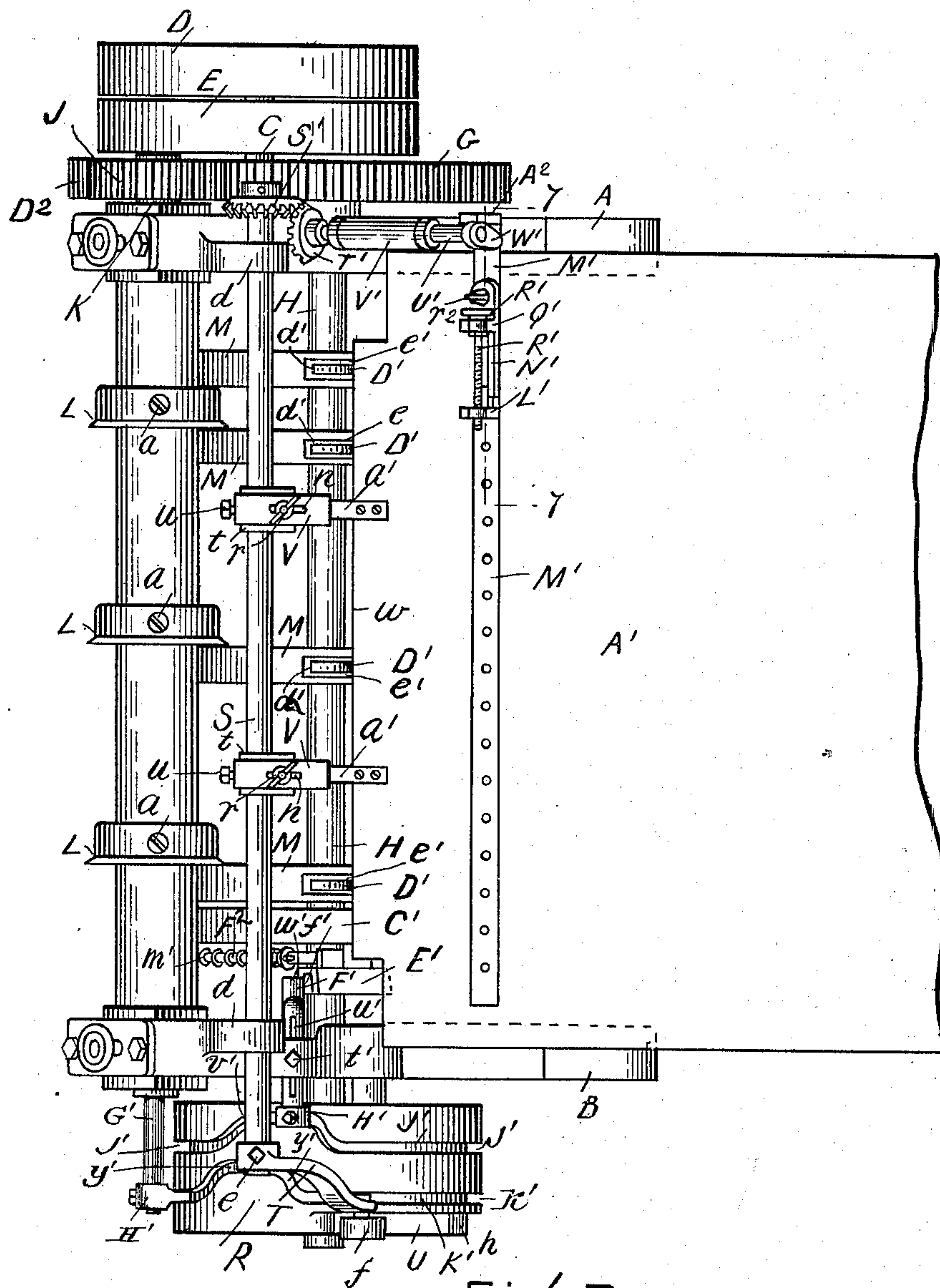


Fig. 2.

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ROTARY CUTTING MACHINE.

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3 Sheets—Sheet 3.

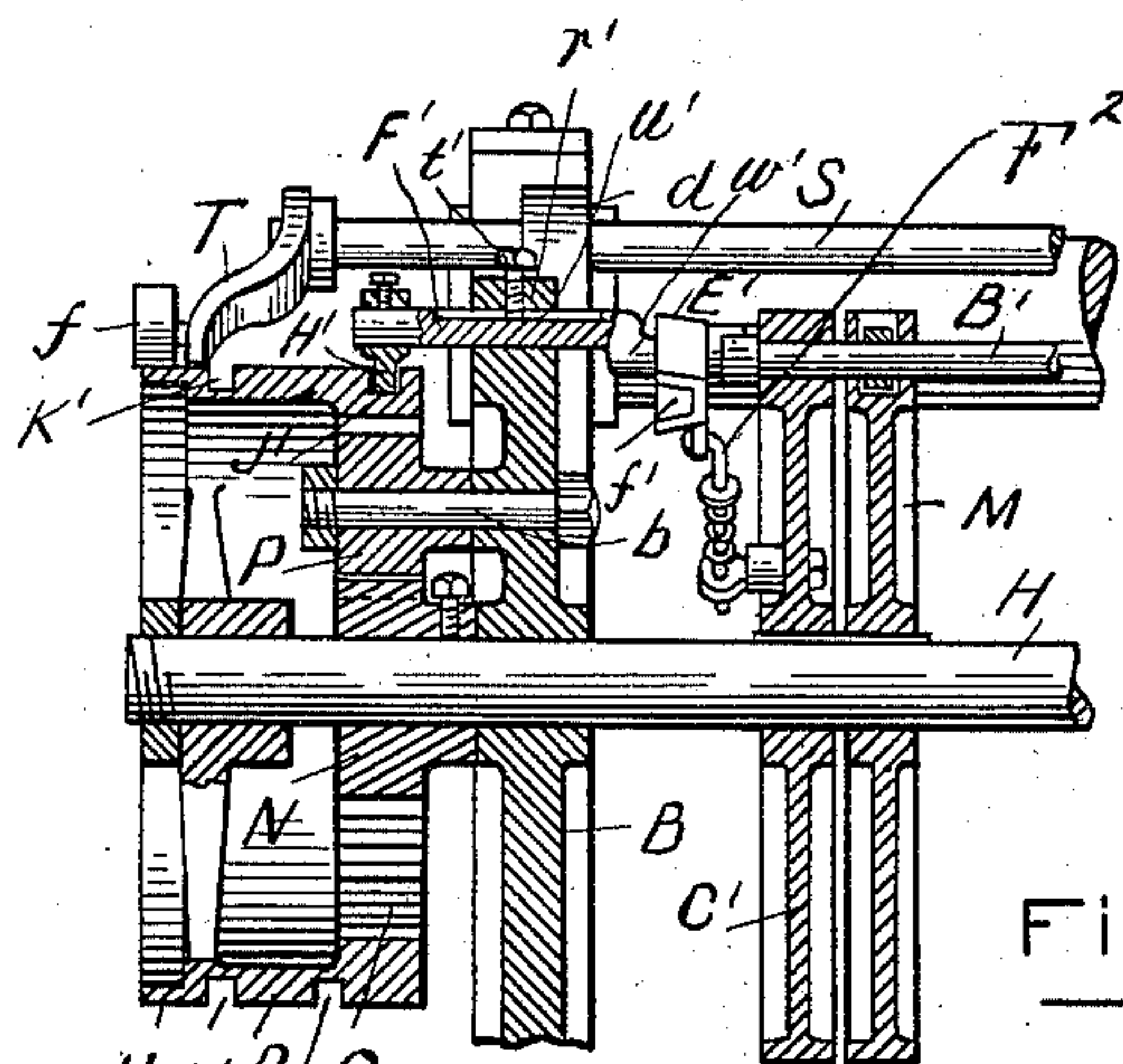


FIG. 3.

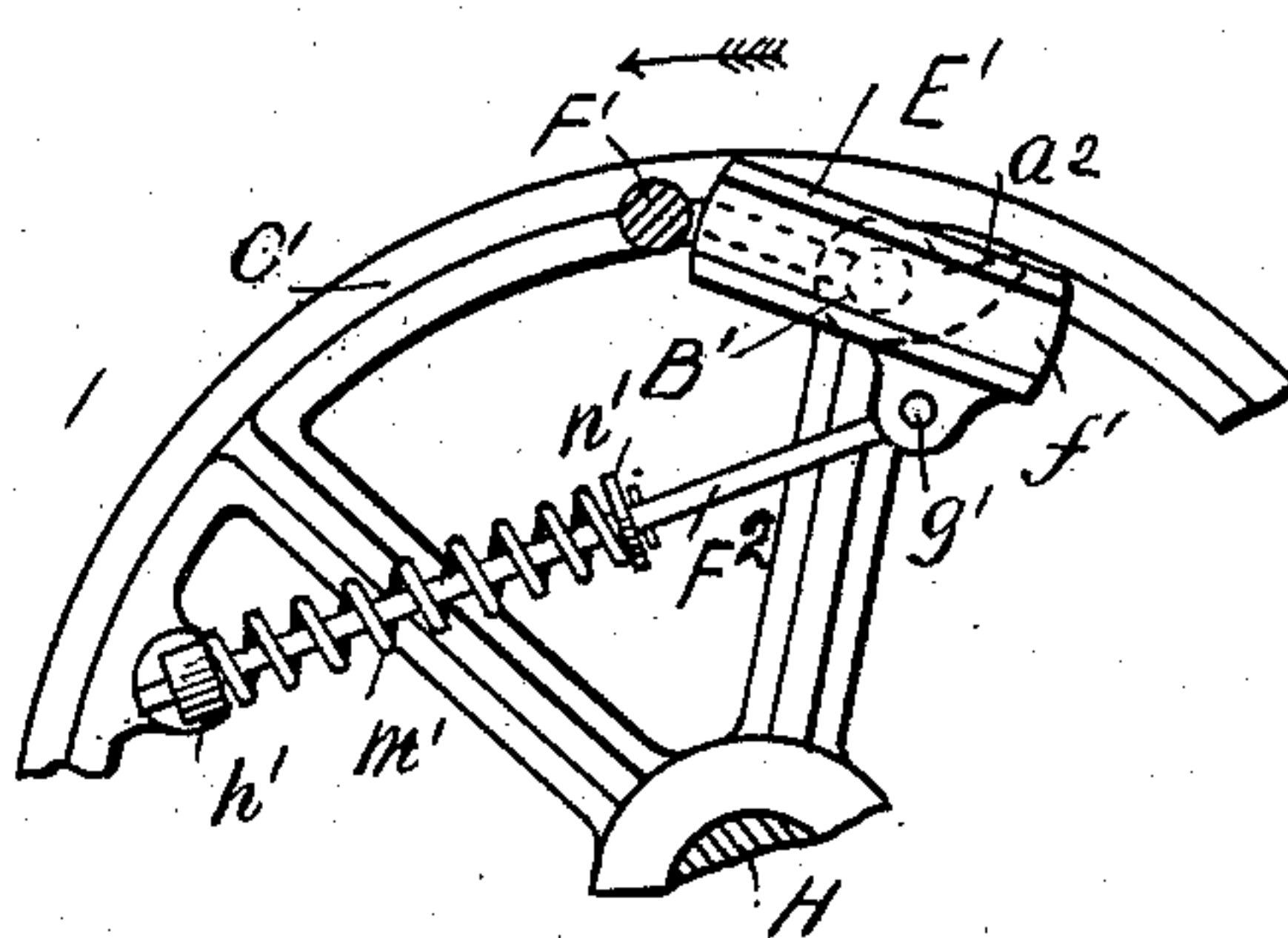


FIG. 4.

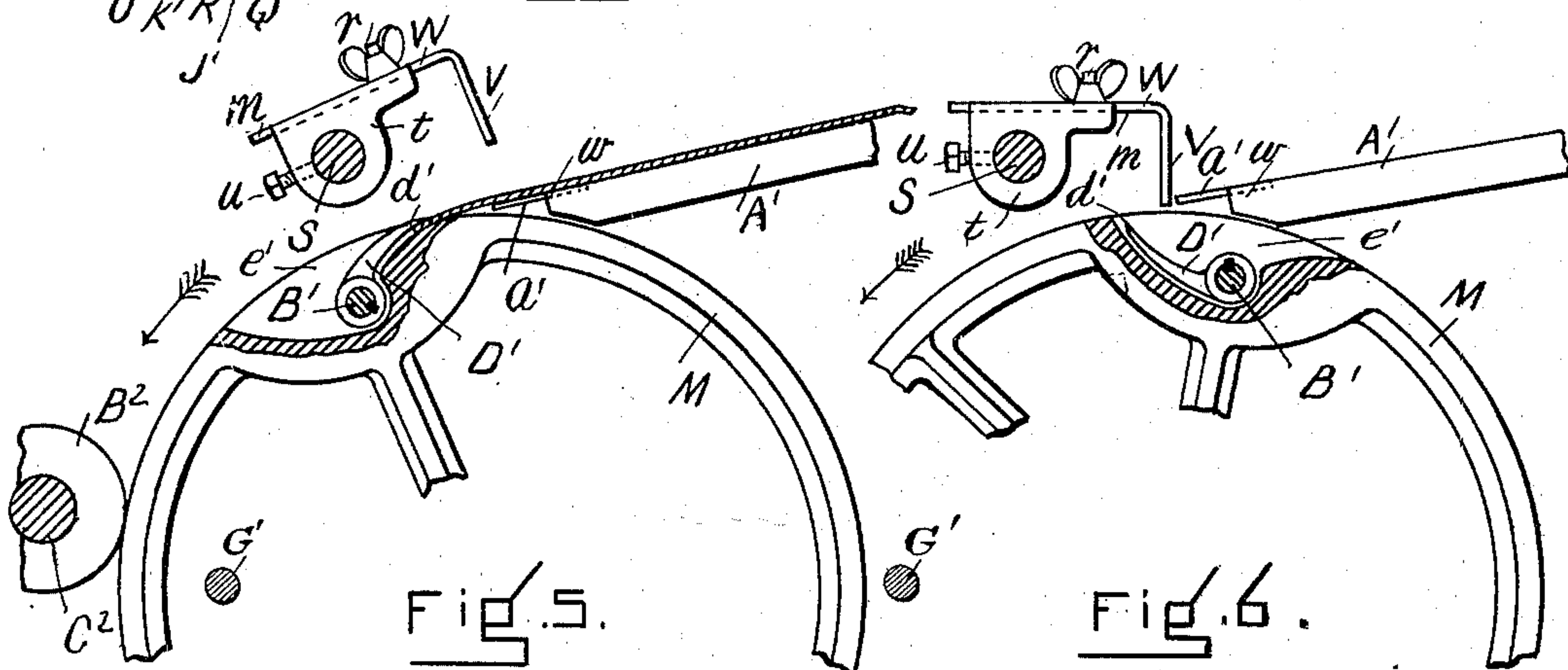


FIG. 5.

FIG. 6.

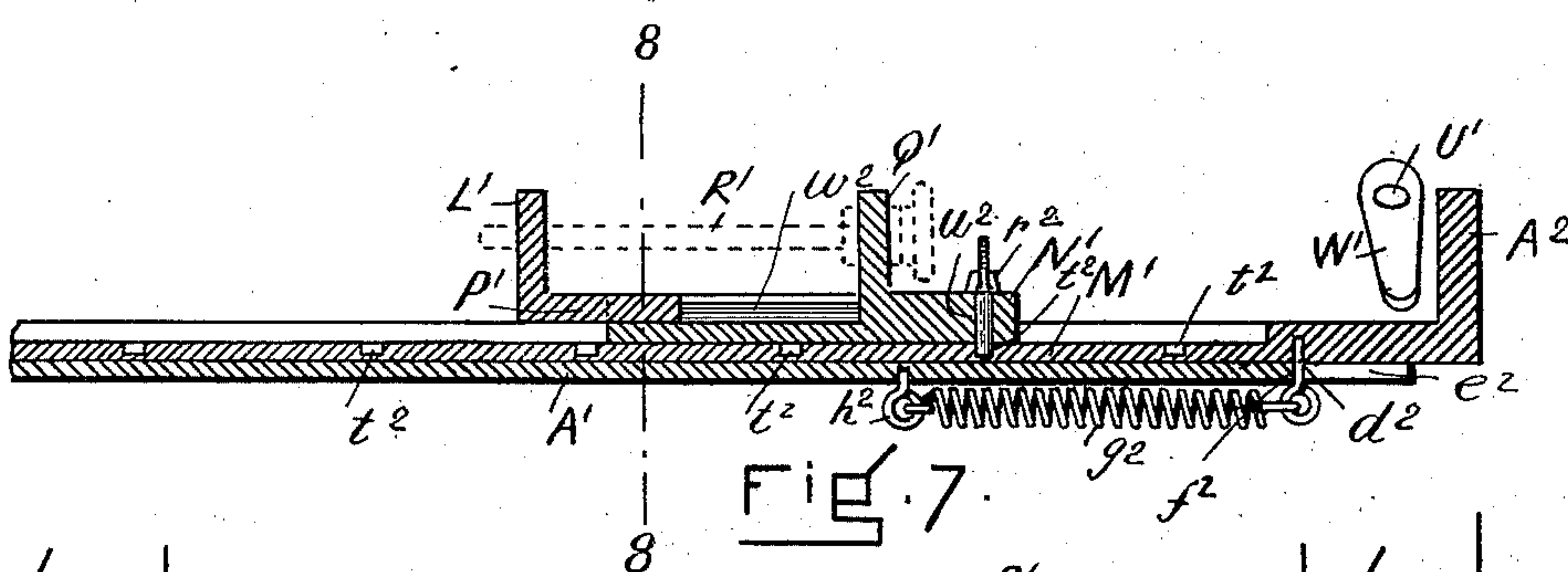


FIG. 7.

WITNESSES

Leona C. Clark
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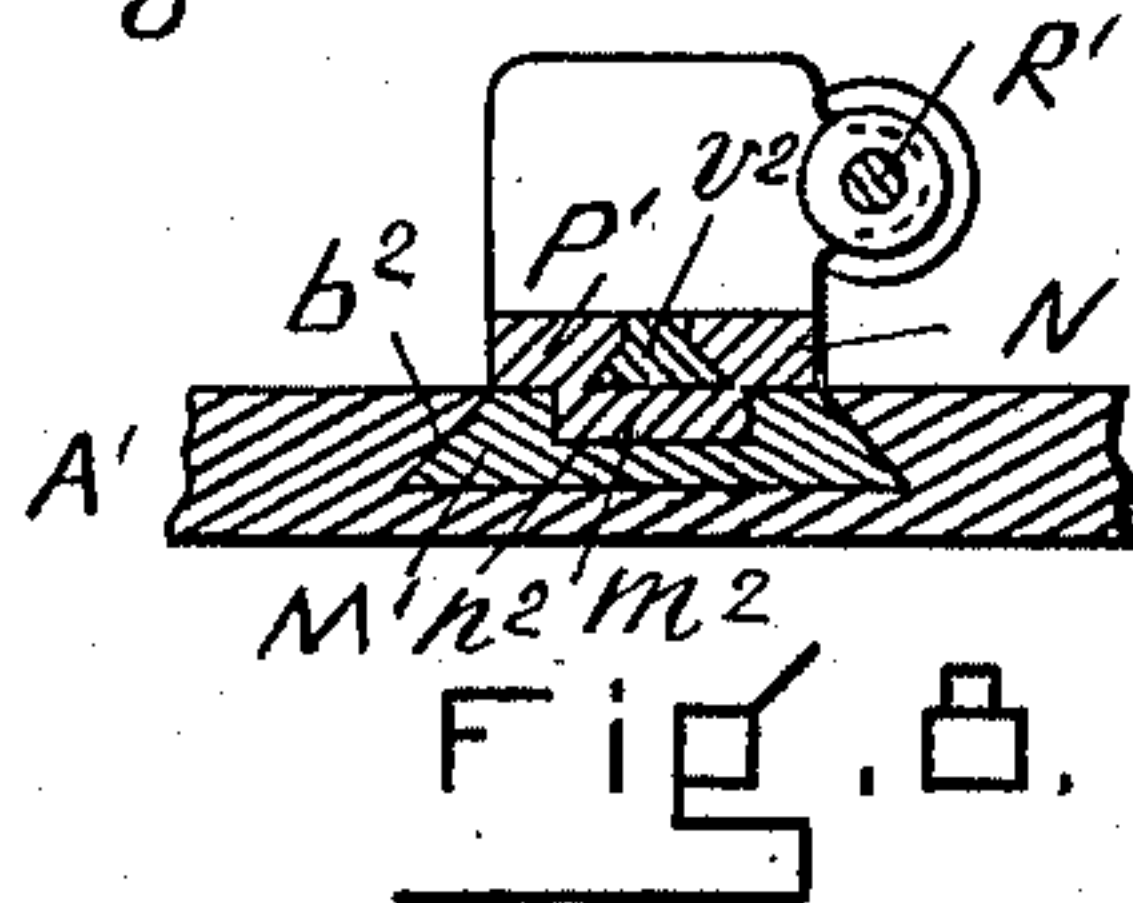


FIG. 8.

INVENTOR

Dwight S. Clark,
Per Edwin H. Brown,
Attorney.

UNITED STATES PATENT OFFICE.

DWIGHT S. CLARK, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE FORBES LITHOGRAPHIC MANUFACTURING COMPANY, OF SAME PLACE.

ROTARY CUTTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 612,704, dated October 18, 1898.

Application filed June 4, 1896. Serial No. 594,307. (No model.)

To all whom it may concern:

Be it known that I, DWIGHT S. CLARK, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Rotary Cutting-Machines, of which the following is a full, clear, and exact description.

This invention relates to a rotary cutting-machine for cutting sheets of paper or other sheet material in lines that are true, more particularly in relation to printed matter thereon, although applicable as well for other purposes, without regard to the outline or edges of the sheet, and more particularly to improvements in a rotary cutting-machine embodied in an application of mine filed in the United States Patent Office January 27, 1896, Serial No. 577,023.

In the above application for patent the cutting-rings, to which the grippers which carry the sheet through the machine are attached, are of large diameter and revolve once to each operation of the grippers; but the large diameter of these cutting-rings make them very expensive; and the object of this invention is to reduce the cost of manufacture of such rings, which is accomplished by making the several cutting-rings of smaller diameter or, as in the present case, of about one-half the usual size. This necessitates that they should travel or revolve more than once to each operation of the grippers and that the grippers should grasp and feed the sheet correspondingly—that is, that the grippers may operate to seize a sheet and start it with the cylinder, and the cylinder will make more than one revolution before the grippers shall again operate to grasp a sheet.

Another object of this invention is to provide means to move the side guide or guides against which the sheet is laid when placed in the machine back out of the way of the sheet while it is being fed through the machine, so as not to interfere with the proper and true movement of the sheet; and the invention consists in a rotary cutting-machine for cutting sheets of paper or other sheet material, of certain mechanism all constructed and arranged for operation substantially as hereinafter fully described, reference being

had to the accompanying sheets of drawings, in which is illustrated the present invention.

Figure 1 is a view in side elevation. Fig. 2 is a plan view. Fig. 3 is a detail section on line 3 3, Fig. 1. Fig. 4 is a broken detail section of the outside ring and gripper-operating mechanism. Figs. 5 and 6 are broken detail sections showing the relation of the feed-board, gage, and ring with gripper thereon in different positions. Fig. 7 is a longitudinal section on line 7 7, Fig. 2; and Fig. 8 is a cross-section on line 8 8, Fig. 7.

In the drawings, A and B represent two end uprights of a frame, which are braced and connected together by horizontal cross-rods in any suitable manner for supporting and carrying the various parts of the machine.

C is a horizontal shaft turning in bearings in the two uprights and having on its end outside of upright A a loose pulley D and a tight pulley E, by which it is driven from any suitable main driving-shaft. Secured to this shaft C is a small gear F, which engages with a large gear G on a horizontal shaft H, turning in suitable bearings in the uprights, which in turn engages with a small gear J on the end of a horizontal shaft K, turning in bearings in the uprights parallel with the main shaft C, and on this shaft K are placed the circular cutters L, as is usual in rotary cutter-machines, and which are adapted to be moved along the shaft longitudinally and secured in place, as desired, by set-screws *a*. Secured to the large gear-shaft H are cutting-rings M, as many as there are cutters L, which act with the cutters L to cut the paper sheet as it is passed between them in the usual manner of rotary cutting-machines. These cutting-rings M are arranged on their shaft H to be moved thereon longitudinally and secured in position thereon, so that with the adjustment of these cutting-rings and the cutters on their respective shafts longitudinally different lines of cuts can be made for wide and narrow strips, as usual. On the opposite end of the shaft H is secured a small gear N, which engages with a smaller gear P on a short journal or shaft *b*, secured in the upright B, which gear engages with an inter-

nal gear Q of a drum or cylinder R, arranged to turn freely on the shaft H, the diameters of the small gears N P being such as to cause the drum R to make only one revolution to two revolutions of the shaft H.

S is a horizontal rock-shaft above the cutting-rings M, adapted to rock in bearings in arms d of the uprights, and on one end of this shaft, beyond the upright A, is secured an arm T by a set-screw e , which arm projects forward substantially in a horizontal direction, having in its free end a vertical friction roller or wheel f , journaled thereon, the arm being bent laterally sufficient for the roller to rest and run at certain portions of the revolutions of the drum R on a rib-cam U, which is secured to and extends nearly around the drum concentrically, as shown in Fig. 1, its two ends bending inward, as at g h , respectively, as shown.

V V are the front guides for the paper sheet—in the present instance two of them—and each consists of a right-angular plate W, its part m having a longitudinal slot n , through which passes a screw r and by which it is secured to a block t , arranged on the rock-shaft S, to be moved longitudinally thereon and secured by a set-screw u , the downward portion V being the guide against which the paper sheet is placed in the machine to be cut.

A' is the feed-board, which extends across and over the machine, its front edge w being back of the front guides V when down in their normal positions and having projecting narrow strips a' secured thereto which reach close to and in line with the front guides, as shown in Fig. 6, and on this feed-board is laid the sheet of paper to be cut, its front edge resting against the front guides V when they are down in position.

As the gear-drum R revolves in the direction of the arrow b' , Fig. 1, it carries with it the cam-rib U, and as its end g passes under the roller f of the arm T it raises the arm and swings its shaft S so that the front guides V V are swung up out of the way, as shown in Fig. 5, and as the other end h of the cam-rib U reaches the arm T it allows the arm to fall, which then rests upon a suitable stop on the upright, but not shown. As the arm falls it swings the front guides V down into their normal positions (shown in Fig. 6) for the placing of another sheet against them, as before, and as soon as the end g of the cam-rib again passes under the arm T the guides are swung up out of the way, as before, and so on with every revolution of the cam-rib.

B' is another horizontal rock-shaft carried with the cylinder M, turning in bearings in the cutting-rings M and an outside ring C', and to this shaft B' are connected grippers or fingers D', one to each ring M, which are curved, as shown in Figs. 5 and 6, each having a long thin flat end d' , which grippers are located, respectively, in recesses e' in the cutting-rings. On the outer end of this rock-shaft B' is secured a cross-arm E', having

longitudinal groove f' on its outer side, and F² is a rod connected at one end to it by a pivot g' , its other end passing freely through an opening in a lug h' on the side of the ring. Encircling this rod is a spiral spring m' , bearing by its ends, respectively, against the lug h' and a washer or shoulder n' on the rod, the tension of this spring bearing outward. This mechanism which operates the grippers is arranged to close the grippers so as to grasp a sheet at every other revolution of the cutting-rings M, the sheet being held between the gripper-fingers and the body of ring M, as shown in Fig. 5, and this is accomplished by having certain pins or rods F' and G', respectively, which are properly moved forward and backward at the proper times to effect the movement of the grippers, but in this case only at every other revolution of the cutting-rings. The pin F', that operates the rock-shaft for the grippers to grip the paper-sheet, is arranged to slide back and forth in a bearing r' in the side frame B, secured by a screw t in a longitudinal or spline groove w' , which prevents its turning, its outer end projecting over the gear-drum, and such end having an arm H' secured thereto, which projects downward and is disposed in a circumferential groove J' in the gear-drum. This groove J' at one portion of the circumference of the drum extends at one side, as at v' , (shown in plan in Fig. 2,) by which the pin F', as the groove J' travels over its pin-arm H', is moved forward and so held the length of such portion v' of the groove for its inner end w' to be in position for the groove f' of the arm E' of the gripper-shaft B' (see Fig. 4) to travel thereover, which in such movement swings the arm and the shaft so that the grippers are swung over to grasp the paper between them and the cutting-rings, as shown in Fig. 5, firmly holding the sheet by the power of the spring m' . The grippers are swung back by their shaft-arm F² as the rings continue to revolve, passing over the end of the other pin G', which causes the gripper-shaft to turn in the reverse direction, the grippers releasing their hold upon the paper sheet and moving into the position shown in Fig. 6, out the way of the travel of the sheet. This pin G' is arranged to move forward and backward in its bearing in the ring like the pin F', and it has an arm H', which is disposed in a circumferential groove K', having a side portion y' in the gear-drum similar to the groove J' for the other pin, the pin G' being moved into position for the groove f' of the arm E' of the gripper-shaft B' to travel thereover to swing the shaft back and the grippers over, releasing them from their hold upon the sheet, the arm moving into the position shown in Fig. 4, in position for it to be again operated by the first pin to cause the grippers to grasp the next sheet, and so on. The shaft-arm is stopped in each position by its abutment against the shoulder a^2 on the ring.

L' is a side guide for the paper sheet, and

this is arranged to be moved laterally automatically out of the way of the sheet as soon as it or just before it has been grasped by the grippers, so that if there are any irregularities of the edge of the paper sheet the guide will not be in the way to interfere with its travel to the cutters. It is constructed and arranged for operation as follows:

M' is a flat strip having dovetail edges, and it is arranged to slide back and forth within certain limits in a corresponding dovetail transverse groove b^2 in the feed-board A' . It has a pin d^2 , projecting downward from one end through a slot e^2 in the feed-board, arranged to abut against one end f^2 of the slot to stop any further movement of the strip in such direction, and it is held in such position by a spring g^2 , secured by one end to the pin d^2 and by its other end to an eye h^2 , secured to the under side of the feed-board, it also serving to return the slip to its resting-place. Arranged to be moved along on this strip on its upper side is a plate N' , having a longitudinal under rib m^2 disposed in a longitudinal corresponding groove n^2 in the strip M' , so the plate can be moved along by hand on the strip, and when in the proper position thereon a pin r^2 is inserted in a hole u^2 in the plate N' , which projects down into a hole t^2 in the strip, holding the plate from movement on the strip.

On top of the plate N' is a bar P' , having a dovetail rib v^2 on its under side to fit a corresponding longitudinal dovetail groove w^2 in the plate N' , so it can move freely along therein. The end of this bar extends up at right angles, making the side guide L' , and on the plate N' is an upright piece Q' , through which projects a screw R' , arranged to turn freely therein, but prevented from longitudinal movement therethrough and screwing into the guide-arm L' , so that by turning the screw in one direction or the other the bar is made to move back and forth correspondingly on the plate. With the adjustment of the strip by its holes t^2 and the plate-pin r^2 in connection with the operation of the screw R' the guide L' can be set at any point desired on the strip and feed-board.

On the end of the rock-shaft S is a bevel-gear S' , which engages with a bevel-gear T' on a rod U' , arranged to turn in bearings V' of the frame and having on its other end an arm W' at right angles and projecting downward in front of an upright arm A^2 on the end of the sliding strip M' , carrying the side guide.

As the rock-shaft S , carrying the front guides, is turned, as described, to raise them out of the way of the feed of the paper sheet the bevel-gear S' operates the short shaft, and, turning it, its arm W' is moved against the upright arm A^2 of the strip, which moves it and the guide L' back out of the way of the side edge of the sheet being cut, so that no matter whether the edge of the paper sheet is in line with the cut or irregular or not the guide, being moved back, will not interfere

with its clear passage to the cutters. B^2 is a feed-roll which is arranged on a horizontal shaft C^2 , parallel with the other shafts and turning in bearings in the frame, having a gear D^2 engaging with the large gear G , this shaft being located in front of the cutting-rings and arranged to bear upon the same, between which roll and the cutting-rings the sheet after it is cut is fed. The strips, after the sheets have been cut by the cutters, pass to and between the cutting-rings and this roll B^2 , which then feed the strips to and deliver them into the receptacle E^2 . The grippers are arranged to release their hold upon the sheet at the time the roll B^2 takes hold of the strips cut, so that then the sheet being cut is fed the rest of the way through the machine by the feed-roll B^2 and the cutting-rings acting in conjunction therewith.

Although this invention is described and shown for the cutting-rings to revolve twice to each operation of the grippers, it is not to be limited to such, as the cutting-rings can be arranged to make more than one revolution but less than two revolutions or more than two revolutions to the action of the grippers once; but twice, as is described, is practical and satisfactory.

The operation of the machine is as follows: With the machine set in motion place the paper sheet by its front edge against the front guides V and its side edge against the side guide L' . When the cutting-rings have moved around for their grippers to have passed by the longitudinal line of the front guides, the grooved arm E' of their shaft will be turned and its grippers swung over quickly and their ends d' press down upon the paper sheet at its front edge on the face of the cutting-rings just beyond the recesses, and as the cutting-rings continue to revolve they, with the grippers, carry the paper sheet with it. Just before the grippers grasp the paper sheet the arm T of the shaft S , by its roller f , passes up onto the cam-rib U at its end g , which swings the shaft, and thus the front guides, up and holds them there out of the way of the free travel of the paper sheet by the grippers and the cutting-rings M . As the rock-shaft swings the front guide up the bevel-gear S' turns the rod U' , and by its arm W the plate or strip M' , carrying the side guide L' , is moved back against its spring out of the way of the side edge of the sheet of paper being cut, leaving it free to travel along the feed-board, as described. The grippers carry the sheet to and between the cutters, which cut the sheet into the desired strips, and then carry the strips to the feed-roll B^2 , which, with the cutting-rings, then feeds or carries the strips to and delivers them into the receptacle or tray. As has been stated, the grippers release their grasp on the sheet or strips directly after the front edge of the sheet or strips has been grasped between the feed-roll B^2 and the peripheries of the cutting-rings M . The sheet, now partly divided,

is drawn forward by and between this roll and the rings, but the leading edge of the sheet or the strips being no longer held by the grippers falls on the delivery-board E^2 and slides along said board in a common way. As the grippers cannot be operated to grasp a second sheet until the second passage of the grippers past the front edge of the feed-board, the first sheet may continue to pass over the front edge of the feed-board after the grippers have made one complete revolution. As the gear-drum revolves the cam U is moved with it, so that its end h passes beyond the arm T and allows it to drop and the front guides into position for the next sheet. At the same time by the movements of the bevel-gears $S T$ and arm W' the side guide L' is left free to be moved back by its spring g^2 into its normal position for the next sheet.

In laying the sheet of paper on the printing-press to be printed it is laid against two narrow front guides or stops and one narrow side guide or stop, and in adjusting the front and side guides in the cutting-machine they are moved and secured so as to be in the same relative positions in relation to the sheet as on the printing-press, so that when the paper sheet is placed on the feed-board of the cutting-machines the front and side stops will be in position for the same parts or places on the front edge and side edge of the sheet to bear, respectively, against the front and side guides, and as the guides are narrow it makes no difference whether the side edge of the sheet is true or not, whether it is cut at an angle or not in relation to the front edge, or as to the printing matter on the sheet, for the paper sheet will be laid upon the feed-board of the cutting-machine in the same relation to it as it was on the printing-press, so that then if the cutters are adjusted on their respective shafts to cut on the lines desired or between the printed matter the paper sheet will be cut true in relation thereto, and every sheet thereafter having the same printing matter thereon will cut the same.

The rings or short cylinders M , as shown, each have a continuous edge, rim, or periphery, against which edge the cutters L work in coöperation, said edge or rim constituting a continuous cutter; but that part of the ring which carries the gripper is broken away or sunk to allow for the gripper-finger, as is common in printing-presses and other paper-carrying cylinders having grippers.

As the operation of the feed-guides has a definite relation to the grasping operation of the grippers, it is important that these guides be timed to retire at the proper instant, and this synchronism is effected by actuating the grippers and the guides from the same prime mover.

Having thus described my invention, what I claim is—

1. In a rotary cutting-machine, a pair of rotary cutters, a gripper suitably arranged in one of said cutters to seize and hold with said

cutter the sheet to be cut, said cutter arranged to revolve twice to each action of the gripper, a rock-shaft to which guides are secured, means for moving said rock-shaft to raise said guides, a side guide arranged to move backward and forward in a suitable guideway and connected to said rock-shaft for operation thereof.

2. In a rotary cutting-machine, a pair of rotary cutters, a gripper suitably arranged in one of said cutters to seize and hold with said cutter the sheet to be cut, said cutter arranged to revolve twice to each action of the gripper, a rock-shaft to which guides are secured, means for moving said rock-shaft to raise said guides, a side guide arranged to move backward and forward in a suitable guideway, a bevel-gear on said rock-shaft, another shaft, a bevel-gear on said latter shaft engaging with said first bevel-gear, and an arm on said latter shaft arranged to engage with said side guide, and a spring connected to said side guide.

3. In a paper-slitting machine, a rotary cutting-ring with a sheet-gripper connected thereto and rotating therewith, means for actuating said gripper to grasp a sheet to the cutting-ring only after a plurality of revolutions, and means to release the gripper before the completion of the first rotation, and a second cutting-ring coöperating with the first to slit the sheet, in combination, substantially as described.

4. In a paper-slitting machine, the feed-board, a rotary cutter-shaft having a cutting-ring, a sheet-gripping finger grasping the edge of sheet and clasp the sheet to the cutting-ring, a second cutting-ring coöperating with the first, means for releasing the gripping-finger after a partial rotation of the ring with which the finger travels, and means to retain and draw the sheet after the release of the gripping-finger, all combined.

5. In a paper-cutting machine, the feed-board, the series of rotating cutting-rings and the series of synchronously-moving grippers, means for closing these grippers upon a sheet on the feed-board operating at alternate revolutions of the cutting-rings, means for releasing the grippers from the sheet before the first complete revolution of the cutting-rings, and a second series of rotary cutting-rings with their edges in cutting relation with the first set, all combined substantially as described.

6. In a paper-cutting machine, a series of rotating cutters having grippers rotating therewith, a rotating cam having operative engagement with the grippers to release the same before the completion of the first revolution, and a rotating cam operating on the grippers to close them at alternate revolutions of the cutters and cutters coöperating with the cutting-rings, all combined substantially as described.

7. In a paper-feeding machine, a rotating slitting-cylinder provided with grippers,

means for opening and closing said grippers, and a second cooperating slitting device, a feed-board and stops at the front edge thereof and usual means for lifting said stops at intervals, a side guide above the feed-board, and means for reciprocating said guide laterally and at stated intervals relatively to the rotation of the cylinder, all combined substantially as described.

8. In a paper-cutting machine, the rotating shaft and a short cylinder carried thereby and having a complete annular circumference or cutting rim, a rotating cutter acting against said rim, and a second short cylinder on the shaft and rotating with the first-mentioned cylinder, the latter cylinder having a recess in which a gripper is carried and operated, all combined substantially as described.

9. In a paper-cutting machine a rotating shaft and a ring having an unbroken periphery carried thereby, and a second ring in proximity thereto and having a recess with a gripper therein, and a cutter cooperating with the unbroken ring to slit sheets carried against the same, all in combination.

10. In a paper-cutting machine, the rotating shaft and a ring having continuous periphery carried thereby, and a second ring on the shaft with the first and with a recess in its surface having a gripping-finger therein, and means for operating said gripper, substantially as described.

11. In a paper-cutting machine, a driving-shaft and a continuous-rim ring-cutter thereon, said ring having a recess provided with a gripper-finger, means for closing the grip-

per-finger once during a plurality of rotations of the ring, and a second cutter cooperating with the cutting-ring, all combined.

12. In a paper-cutting machine, a continuous-ring cutter and a second cutter cooperating therewith, a gripper-finger rotating synchronously with the ring-cutter and means for opening and closing said gripper at proper intervals, a feed-board having a side guide, and means for withdrawing the side guide simultaneously with the gripper movement, substantially as described.

13. In a paper-cutting machine, a rotating cutting-ring and its cooperating cutter, a gripper moving synchronously with the cutter, means for opening and closing said gripper, a feed-board and a side guide carried thereby, and means actuated from the gripper-carrier to withdraw the side guide on the feed-board, all combined substantially as described.

14. In a paper-feeding machine, the feed-board, the side guide, and the front guides, a rotating cylinder and gripper carried thereby and means for opening and closing said gripper, and means connected to the cylinder for retiring the front guides and for reciprocating the side guide at the proper intervals relatively to the gripper movement, all combined substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

DWIGHT S. CLARK.

Witnesses:

EDWIN W. BROWN,
LEONA C. ARNO.