No. 624,050. Patented May 2, 1899.

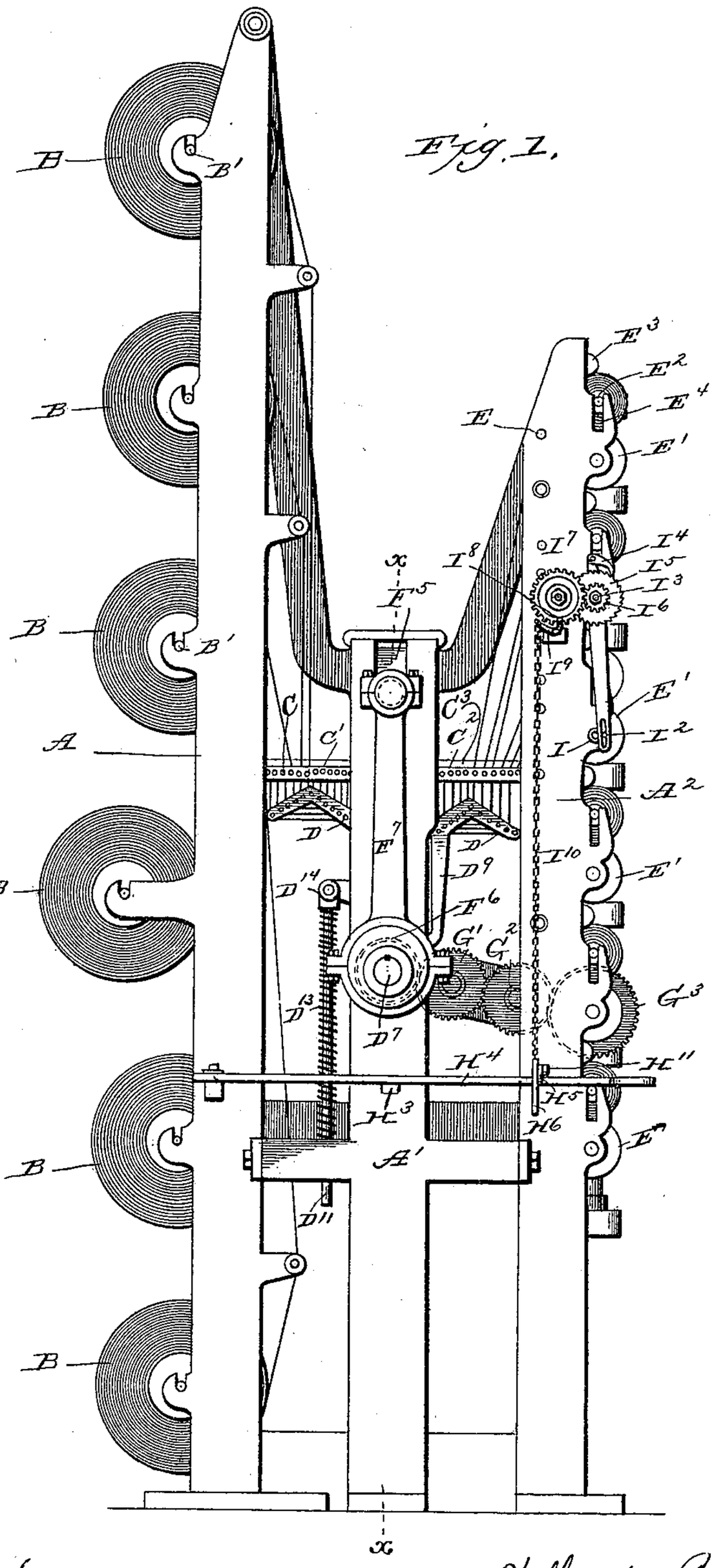
W. P. KIDDER.

MACHINE FOR PERFORATING AND WINDING PAPER.

(Application filed Feb. 3, 1891.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.



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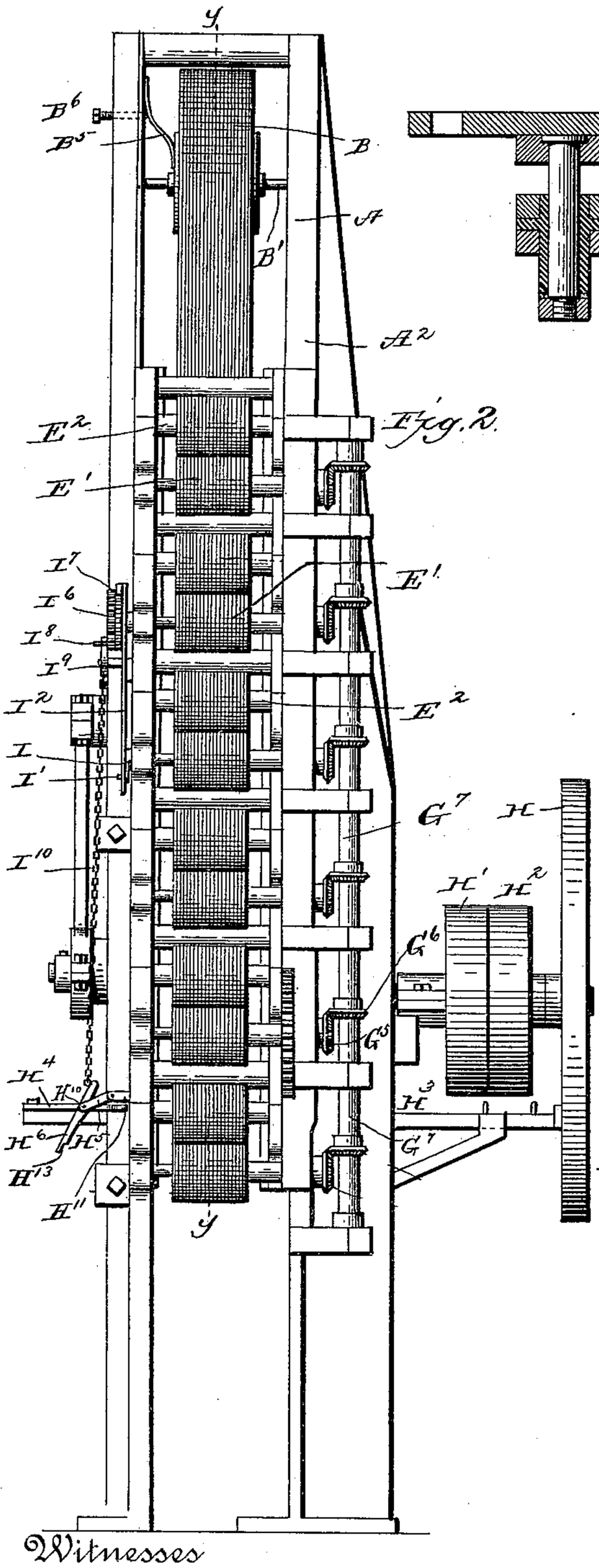

Fig. 2.

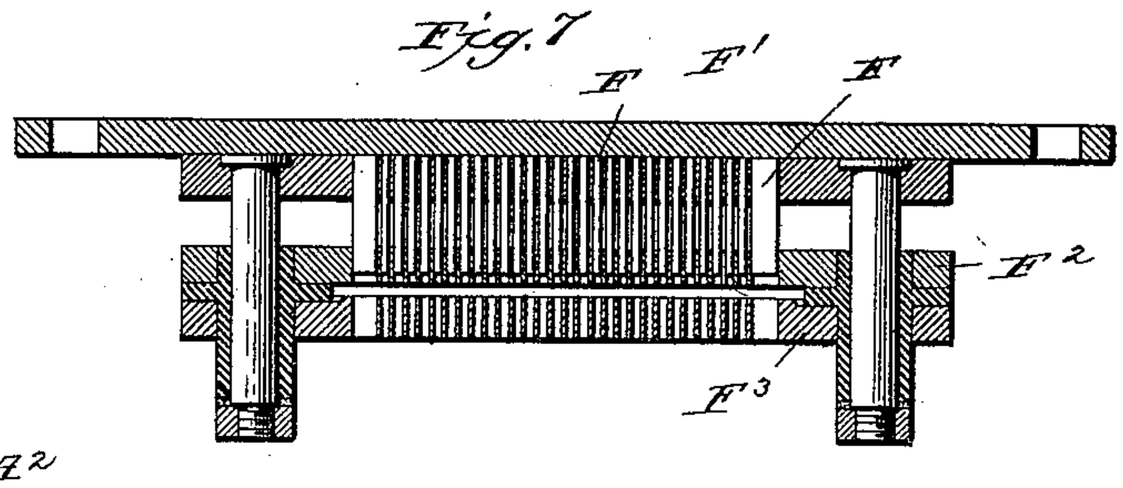

Fig. 7.

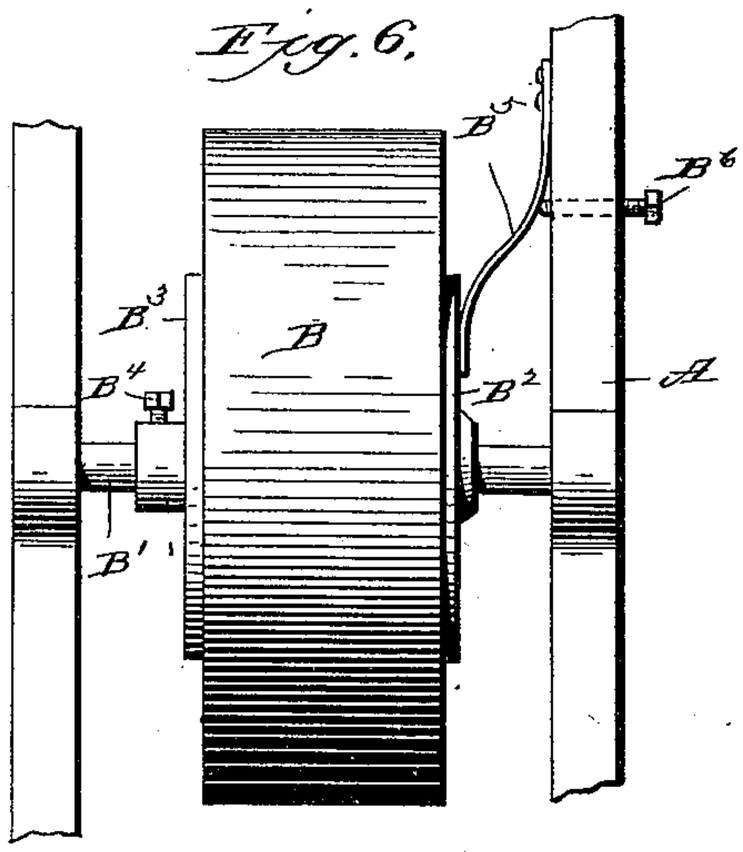

Fig. 6.

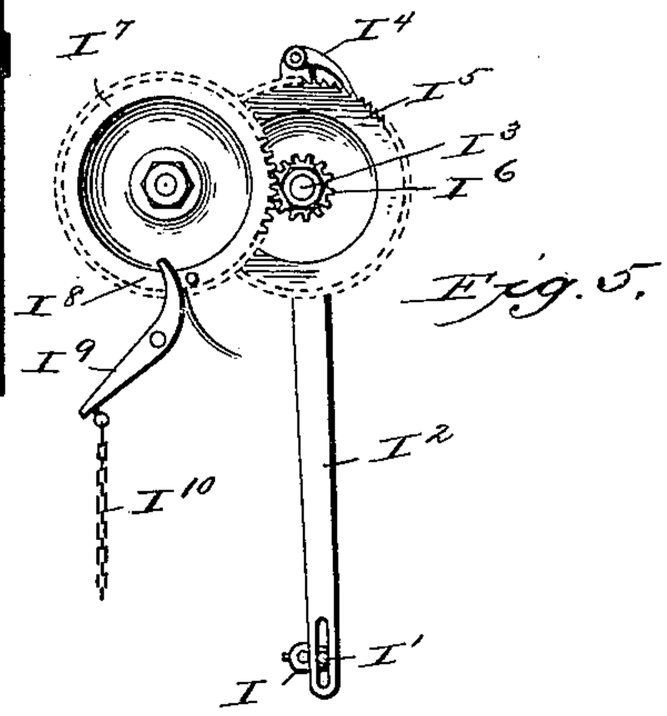

Fig. 5.

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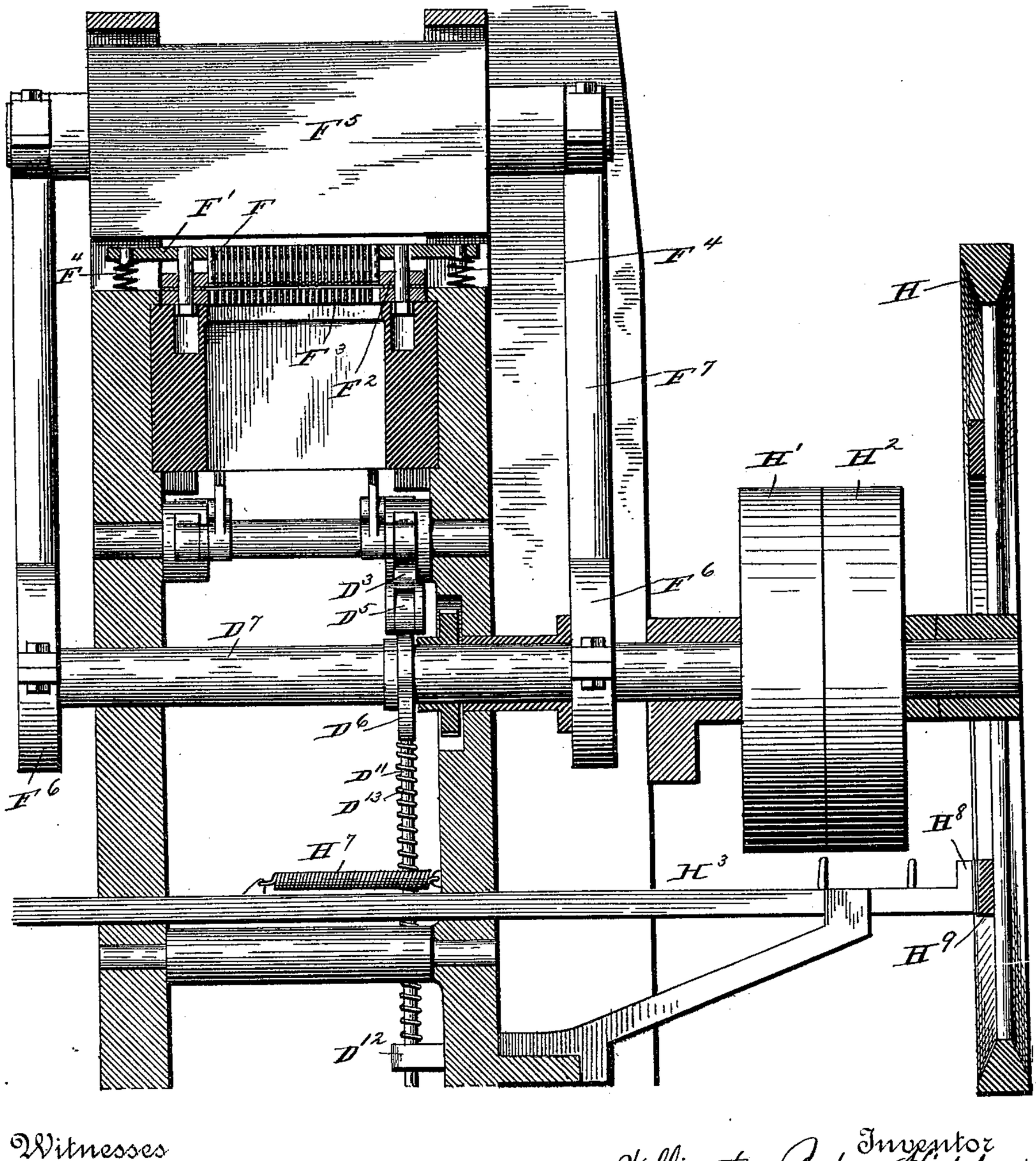
Fig. 3.



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(No Model.) 5 Sheets—Sheet 4.

Fig. 4

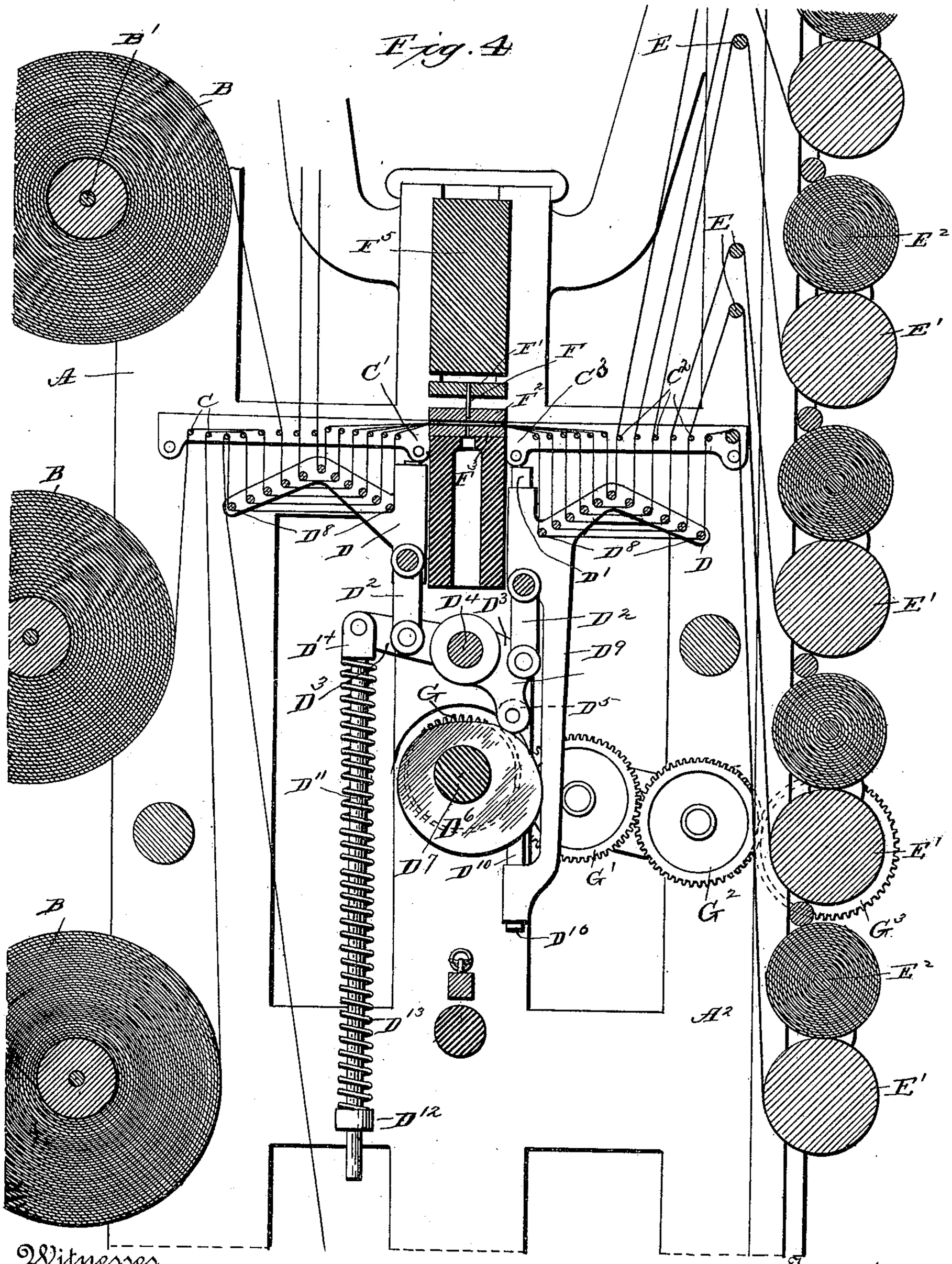

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Fig. 9.

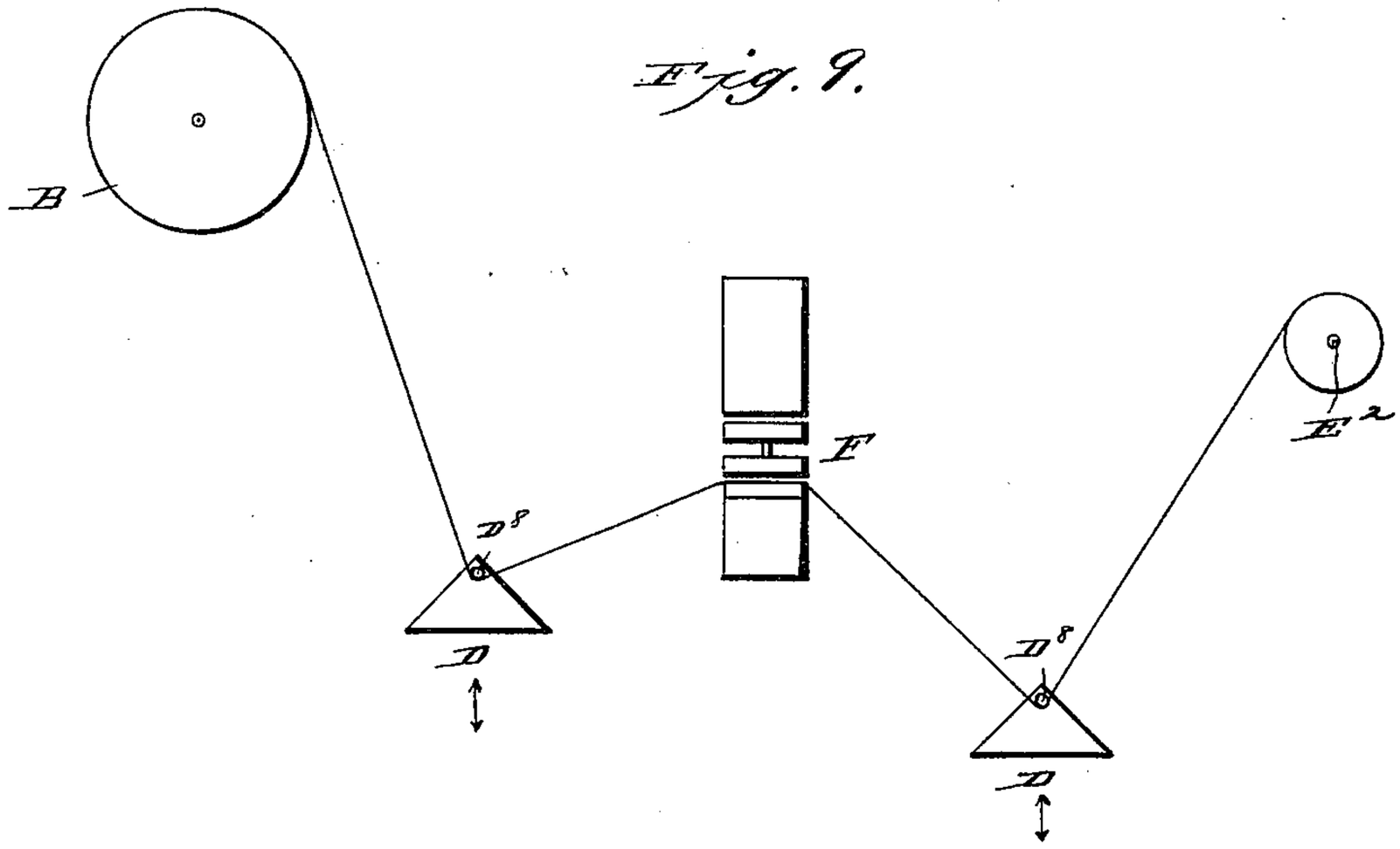
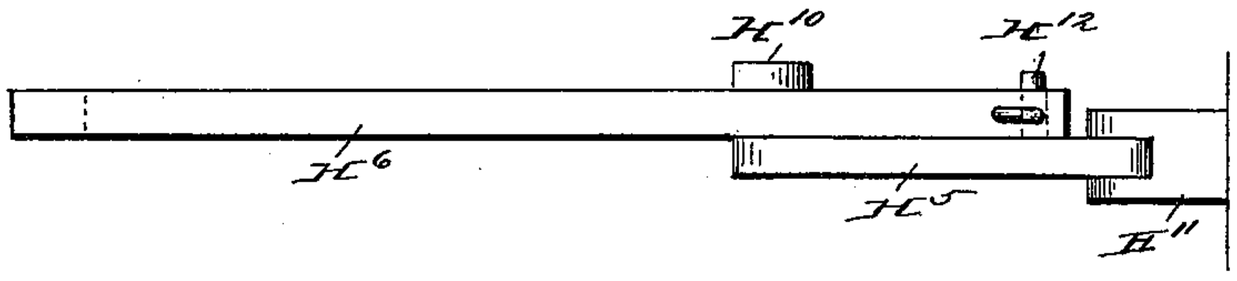


Fig. 8.



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MACHINE FOR PERFORATING AND WINDING PAPER.

SPECIFICATION forming part of Letters Patent No. 624,050, dated May 2, 1899.

Application filed February 3, 1891. Serial No. 380,049. (No model.)

To all whom it may concern:

Be it known that I, WELLINGTON PARKER KIDDER, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Machines for Perforating and Winding Paper; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

This invention has for its object to provide a machine for perforating one or more lengths or webs of paper and for automatically winding said web or webs into roll form; and it consists in the novel construction of the separate devices or instrumentalities which enter into the structure of said machine and in the several combinations and subcombinations of such devices, all of which will be hereinafter particularly described, and pointed out in the claims at the close of this specification.

In the drawings, Figure 1 represents a side elevation of the machine embodying my improvements. Fig. 2 is a front elevation. Fig. 3 is a vertical sectional view taken on the line $x\,x$, Fig. 1. Fig. 4 is a longitudinal sectional view taken on the line $y\,y$ of Fig. 2. Fig. 5 is a detailed view of the device by means of which the shipping-lever which throws the machine into and out of action is locked and unlocked. Fig. 6 is a view of one of the axes or spindles upon which one of the unperforated rolls of paper is mounted. Fig. 7 is a detail sectional view of the perforating mechanism. Fig. 8 is plan view of the shipping-lever lock. Fig. 9 is a diagrammatic detail showing the parts especially arranged for perforating single webs.

Similar letters of reference in the several figures indicate the same parts.

The main frame of the machine is preferably constructed of metal and made strong and steady, so that there will be the minimum amount of vibration when the machine is in operation. While this frame is made practically integral, it may for convenience of description be said to be divided into three parts, which are lettered A A' A^2, respectively, in the drawings. The part A supports the rolls of unperforated paper, the webs composing which are designed to be perforated; the part A', the perforating devices and mechanism for controlling said webs before and after perforation, while the part A^2 constitutes the support for the rewinding mechanism, or, in other words, the mechanism which winds the webs after perforation into roll form.

B B, &c., represent the rolls of unperforated paper, each of which is mounted upon a spindle or axis B', which in turn is mounted in suitable bearings upon the portion A of the frame, so as to be capable of rotating therein and of being removed therefrom whenever a roll of paper becomes entirely used up and it is desired to replace it by another. The axis or spindle B' is provided with heads B^2 and B^3, Fig. 6, between which the roll of paper is retained, the head B^3 being made adjustable and adapted to be secured in place by means of a screw B^4.

Secured to the portion A of the frame is a spring B^5, which is adapted to bear against the head B^2 with a degree of pressure that can be regulated by means of an adjusting-screw B^6, working through the portion A of the frame and impinging upon said spring, as shown. This spring B^5 operates as a friction-brake, and its adjustment regulates the amount of tension that is applied to the web unwound from the roll.

C C, &c., represent a series of guide-rollers mounted so as to turn freely in a stationary frame C'. These guide-rollers C C, &c., are located behind the perforating mechanism. Another series of similar guide-rollers C^2 are located in a corresponding stationary frame C^3 on the front side of the perforating mechanism, as shown clearly in Figs. 1 and 4.

Mounted in suitable guides D' upon the portion A' of the frame of the machine are two vibrating frames D, that are connected by links D^2 to arms D^3 on a rock-shaft D^4, one of said arms D^3 being provided with a downward extension, upon which is mounted a fric-

tion-roller D^5, which coöperates with and receives motion from a cam or eccentric D^6, secured to the main driving-shaft D^7. The arrangement of these parts is such that when the cam or eccentric D^6 is revolved the frames D will be caused to alternately move up and down, as will be readily understood. Each of the said vibrating frames D is provided with a series of guide-rollers D^8, around which the paper-webs pass, said parts forming in effect vibrating or movable guides.

The course of the paper from the several rolls is as follows: The web from the top roll passes first over one of the guide-rollers C of the stationary frame or guide C', thence around the topmost guide-roller D^8 of the vibrating frame or guide D in the rear of the perforating mechanism, thence upward and over another of the stationary guide-rollers C, thence horizontally through the perforating mechanism to one of the guide-rollers C^2 of the stationary frame or guide C^3 on the front side of the perforating mechanism, thence downward over said last-mentioned roller, thence around the uppermost guide-roller D^8 of the vibrating frame on the front side of the perforating mechanism, thence upward and over another of the rollers C^2 of the stationary frame or guide, thence around the guide-roller E on the portion A^2 of the frame, thence around a winding-roller E', and thence to the mandrel or core E^2, upon which the paper is finally wound. The web from the second or next to the top roll passes downward and over one of the guide-rollers C of the stationary frame or guide C', thence around the two rollers of the vibrating frame D, which are next below the top roller of said vibrating frame, thence upward and over another of the guide-rollers of the stationary frame or guide, thence through the perforating mechanism to the front side of the latter, thence downward over one of the rollers of the stationary frame or guide at said front side, thence downward and around the pair of guide-rollers in the forward vibrating frame, which are next to the top roller of said frame, thence upward over another of the guide-rollers of the stationary frame or guide, and thence over a guide-roller, feed-roller, and upon the second mandrel or core on the portion A^2 of the main frame. The webs from all the other rolls of unperforated paper are conducted in like manner over and around the remaining guide-rollers of the stationary frames C and of the vibrating frames D and to their respective winding-rollers and cores or mandrels upon the portion A^2 of the main frame, as will be readily understood by an inspection of Fig. 4 of the drawings, the rolls or guides of each of the movable series being arranged in different horizontal planes, thus separating the webs. From this it will be seen that in the machine illustrated, which is designed to deal with six rolls simultaneously, six superposed webs of unperforated paper will extend through the perforating mechanism at once, in position to be simultaneously perforated thereby, and that after being so perforated said webs will be wound upon their respective mandrels or cores, thus affording six separate rolls of perforated paper. Of course it would be impracticable to perforate these superposed webs while they are in motion, and it is because of this fact that the frames D are given alternately up-and-down motions, such up-and-down motions having the effect of causing the portions of the web which extend through the perforating mechanism to be intermittingly arrested or delayed a sufficient length of time to enable the perforators to act. This will be more clearly comprehended by an inspection of Fig. 4. Now assuming all the webs to be in motion through the machine, the upward motion of the vibrating frame D in front of the perforating mechanism and the simultaneous downward motion of the vibrating frame D on the rear side of the perforating mechanism will cause an arrest in the progress of the portions of the web which extend through the perforating mechanism, an arrest which will be but momentary yet of sufficient duration to enable the perforating devices to act, and as soon as said perforating devices have acted the reverse motions of the two frames D will permit the webs to be again fed forward the required distance before the perforators again go into action. The feeding and winding rolls rotate uninterruptedly while the perforating operations take place.

The perforating mechanism is of very simple character and a brief description will suffice to enable it to be perfectly understood. It consists, essentially, of a series of punches or perforators F, extending transversely over the webs and connected to the common head or carrier F', a guide-plate F^2, through which the punches extend and by which they are guided, and a perforated bed-plate F^3, over which the webs pass and through the perforations in which the ends of the punches pass when driven down through the webs. The head or carrier F, to which the punches are connected, is held normally elevated by means of springs F^4, interposed between its ends and the frame of the machine, as shown in Fig. 3, and said head or carrier is intermittingly depressed by the reciprocation of a follower F^5, that is guided in the upper part A' of the frame of the machine and receives motion through cams or eccentrics F^6, mounted on the main driving-shaft through eccentric-rods F^7, as shown in Figs. 1 and 3. Each time the eccentric D^6 on the main driving-shaft D^7 operates to vibrate the frames D, so as to cause a temporary arrest in the progress of the superposed webs of paper, as before described, the eccentrics F^6 operate, through the eccentric-rods F^7, to depress the follower F^5 and bring down the punches through said arrested webs of paper, and thus effect the perforation of the latter. In order that the vibrating frames D may be moved with greater steadiness and precision, one or both of said frames, and if

one only, preferably the forward one, is or are provided with depending arms D^9, and the lower ends of these arms are fitted so as to move up and down in guides D^{10} on the main frame, as shown in Fig. 4, while one of the arms D^3 on the rear side of the perforating mechanism is provided with an extension, to which a rod D^{11}, working in a guide D^{12} on the frame, as shown in Fig. 4, is connected, a strong spring D^{13}, surrounding said rod D^{11} and extending between a shoulder D^{14} on said rod and the guide D^{12}, operating to keep the friction-roller D^5 at all times in close contact with the cam or eccentric D^6, as shown in Fig. 4.

What are termed the "winding-rollers" E′ receive their motion from the main driving-shaft D^7 in the following manner: Upon the main driving-shaft is mounted a gear-wheel G, from which motion is communicated through a series of gear-wheels G′ G^2 G^3 to the shaft of the next to the lowest feeding-roller, as shown in Fig. 4. Upon the shaft of the last-mentioned feeding-roller is secured a beveled pinion G^5, which meshes with a corresponding beveled pinion G^6 on the vertical shaft G^7, extending from the top to the bottom of the series of rollers on the front part A^2 of the main frame. All the other feeding-rollers of the series receive their motion from this shaft G^7 by means of pinions corresponding to the pinions G^5 and G^6, as will be readily understood by reference to Fig. 2.

As the operation of winding up each of the webs after perforation is the same, the description of only one set of the winding devices will be necessary.

Each web as it passes from its appropriate guide-roller on the stationary frame C′ travels over the stationary guide-roller E on the portion A^2 of the frame, and thence downward and around the winding-roller E′. This winding-roller, driven as before described, has its surface roughened in any suitable manner in order to increase its tractive action upon the paper. Upon it rests the mandrel or core E^2, upon which the web of paper is to be wound, the ends of said mandrel or core being guided by suitable guide-slots E^4, formed in the portion A^2 of the frame, as shown in Fig. 1. Before starting the machine the end of the web is brought around the winding-roller E′ and secured in any suitable way to the mandrel or core E^2, and when the machine is set in motion the feeding-roller acts not only to draw the paper, but also to rotate by frictional contact the mandrel or core, and thus cause the paper to be wound up on the latter. To secure the proper intimacy of contact between the winding-roller E′ and the mandrel or core E^2, the pressure-roller E^3, Fig. 1, is provided. This pressure-roller is placed upon the mandrel or core E^2, and as the forming-roll increases in size said pressure-roll rises with it.

The main driving-shaft is provided with a fly-wheel H, Fig. 3, a tight pulley H′, and a loose pulley H^2. A shipping-rod H^3, operated by a shipping-lever H^4, is provided for shifting the belt from the loose to the tight pulley, and a locking device H^5 H^6 is provided for holding the lever in the position which it occupies when the belt is on the tight pulley. When the locking device H^5 H^6 is disengaged from the shipping-lever H^4, a spring H^7 on the shipping-rod H^3 causes the latter to be moved outward until a brake-shoe or friction-surface H^8 on its outer end, Fig. 3, is brought against the coöperating friction-surface H^9 on the balance-wheel and the belt is shifted from the tight to the loose pulley, thus stopping the machine.

It is desirable that each of the rolls produced by the machine should contain a uniform quantity, and in order that this result may be accomplished a counting or measuring device is applied to the shaft of one of the feeding-rollers. One form of such device is illustrated in the drawings, particularly in Figs. 1, 2, and 5, and consists of a crank I, secured to the projecting end of one of the winding-rollers, and having its wrist-pin I′, Fig. 5, arranged to operate in a slot in the lower end of the bar I^2, which is hung so as to freely oscillate upon a shaft I^3. The upper end of this bar I^2 bears a pawl I^4, which is adapted to engage, as the bar is oscillated by the action of the wrist-pin I′, with the teeth of a ratchet-wheel I^5, mounted upon the aforesaid shaft I^3. Secured to the ratchet-wheel I^5 is a pinion I^6, which in turn meshes with a gear-wheel I^7, having projecting from its side a pin I^8. This pin I^8 as the gear-wheel I^7 is rotated is adapted to strike a spring-pressed latch I^9, to the longer arm of which is connected a chain I^{10}, which in turn is connected to one member H^6 of the locking device of the hand-lever H^4. This locking device, as shown in Figs. 2 and 8, consists of two bars H^5 H^6, pivoted together at H^{10}, the inner bar H^5 being pivoted to an arm H^{11}, secured to the main frame. When the bars H^5 H^6 are brought into alinement, as shown in Fig. 8, the inner end of the arm H^6 strikes against a pin H^{12} on the bar H^5 and is prevented from moving farther, and while the two bars are thus in alinement the hand-lever H^4 may be brought into engagement with a shoulder H^{13} on the outer end of the bar H^6, and thus lock the shipping-lever in the position that it occupies when the machine is in motion; but as soon as the pin I^8 on the wheel I^7 strikes the latch I^9 and raises the chain I^{10} the bars H^6 H^5 will be drawn out of alinement, as shown in Fig. 2, and the hand-lever will be released, thus shifting the belt onto the loose pulley, applying the brake, and stopping the machine. The frequency with which the pin I^8 operates upon the latch I^9 is of course regulated by the speed with which the ratchet-wheel I^5 is advanced under the influence of the pawl I^4, bar I^2, and wrist-pin I^5. By varying the speed of said ratchet-wheel the machine can be automatically

stopped upon the formation of a roll containing any predetermined length of paper.

It is obvious that where but a single web of paper is to be perforated a single stationary guide for the paper may be used, and this single guide may form a part of the punching or perforating mechanism, all as shown in the diagram Fig. 9.

Having thus described my invention, what I claim as new is—

1. In a machine for perforating webs of paper, the combination with a continuously-operating paper-feeding mechanism and a relatively-fixed intermittingly-operating perforating mechanism, of two reciprocating paper-web guides for coöperating with the web of paper on opposite sides of the perforating mechanism, a drive-shaft, mechanism intermediate said shaft and guides for reciprocating them to alternately take up the web of paper on opposite sides of the perforating mechanism whereby the web is alternately moved and held stationary between said guides and mechanism intermediate said drive-shaft and perforating mechanism for operating the latter while the guides are moving in a direction to hold the paper web stationary; substantially as described.

2. In a machine, such as described, the combination with means for drawing a series of webs of paper through the machine, two series of stationary guides, two series of movable guides and means for vibrating the two series of guides simultaneously in opposite directions; substantially as described.

3. In a machine, such as described, the combination with a series of feeding-rolls for supplying a series of webs of paper, a series of winding-rollers, two series of stationary guides for the webs and two series of movable guides for the same and means for vibrating the latter simultaneously in opposite directions; substantially as described.

4. In a machine, such as described, the combination with means for drawing the paper through the machine, of a stationary guide for the paper, two movable guides for the same, means for positively vibrating said movable guides in opposite directions, whereby to periodically arrest the movement of the paper over the stationary guide and perforating mechanism for perforating a portion of the paper arrested while the same is stationary; substantially as described.

5. In a machine, such as described, the combination with means for drawing the paper through the machine, two stationary guides for the paper, two movable guides for the same, means for positively vibrating said movable guides simultaneously in opposite directions and perforating mechanism operating upon the arrested portion of the paper intermediate the stationary guides; substantially as described.

6. In a machine, such as described, the combination with means for drawing a series of webs of paper through the machine, two series of stationary guides, two series of movable guides, means for vibrating the two series of movable guides in opposite directions, a perforating mechanism located intermediate the two series of stationary guides and operating to perforate simultaneously the whole series of webs when arrested; substantially as described.

7. In a machine, such as described, the combination with a series of feeding-rolls for supplying a series of webs of paper, a series of winding-rolls, two series of stationary guides for the webs, two series of movable guides for the same, means for vibrating the movable guides simultaneously in opposite directions, and perforating mechanism located intermediate the two series of stationary guides and operating to perforate the superposed webs of paper in the manner described.

8. In a machine, such as described, the two series of stationary guides for the paper having the guides of each series located in different horizontal planes and having the corresponding guides of the two series in substantially the same horizontal plane in combination with a perforating mechanism intermediate said two series of guides whereby the proper superposition of the series of webs of paper and the presentation of the same to the perforating mechanism are insured; substantially as described.

9. In a perforating-machine, such as described, the combination with the punches mounted in stationary bearings, of the two series of movable guides one on each side of said punches and with the guides of each series arranged in different horizontal planes, and mechanism for moving said guides alternately, substantially as described.

10. In a machine, such as described, the combination with the series of stationary guides arranged as described of the two series of movable guides having the guides of each series arranged in different horizontal planes; substantially as described.

11. In the herein-described machine, the combination with the stationary guide-frames, of the independent movable guide-frames, the links, arms and rock-shaft by which said movable frames are connected and the cam and spring for imparting motion to the rock-shaft; substantially as described.

12. In the herein-described machine, the combination of the stationary guide-frames and their guides, the movable guide-frames and their guides, the links, arms and rock-shaft by which the movable guide-frames are connected, the main driving-shaft, the cam and spring for oscillating the rock-shaft and the perforating mechanism operated from the said main driving-shaft; substantially as described.

13. In the herein-described machine, the combination with the stationary guide-frames C′, C^3, and their guides, the movable guide-frames D, D, and their guides, the links D^2, arms D^3, rock-shaft D^4, cam D^6, on the main

driving-shaft, rod D^{11}, and spring D^{13} all operating substantially as described.

14. In the herein-described machine, the combination of the punch-carrier, the guide-plate, the perforated bed-plate, the follower for depressing the punch-carrier operated from the main drive-shaft with the stationary guide-frames and their guides, the movable guide-frames and their guides and mechanism intermediate the driving-shaft and the movable guide-frames by which the latter are positively and simultaneously reciprocated in opposite directions, substantially as described and for the purpose specified.

15. In the herein-described machine, the combination with the vibratory bar, I^2, the crank on the shaft of one of the winding-rollers, for oscillating said bar; the gear provided with the projecting pin operated from said vibratory bar through the instrumentality of the pawl-ratchet and pinion, the spring-pressed latch with which the pin on the gear engages, the shipping-lever, its locking device and the connection between said locking device and spring-pressed latch, whereby the shipping-lever is released when the winding-rollers have made a predetermined number of revolutions or when the rolls of perforated paper have attained a predetermined size; substantially as described.

16. In the herein-described machine, the combination with the shipping-lever, of the locking device consisting of the bars H^5, H^6, pivoted together and to the frame of the machine, as described, the said bar H^6 being provided with a shoulder H^{13} for engaging the shipping-lever and the bar H^5 being provided with a pin H^{12} against which the inner arm of a bar H^6 rests when the two bars are in alinement; substantially as described.

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