No. 668,415.

Patented Feb. 19, 1901.

O. L. RAABE.

PRINTING PRESS.

(Application filed Oct. 30, 1897.)

(No Model.)

8 Sheets—Sheet 1.

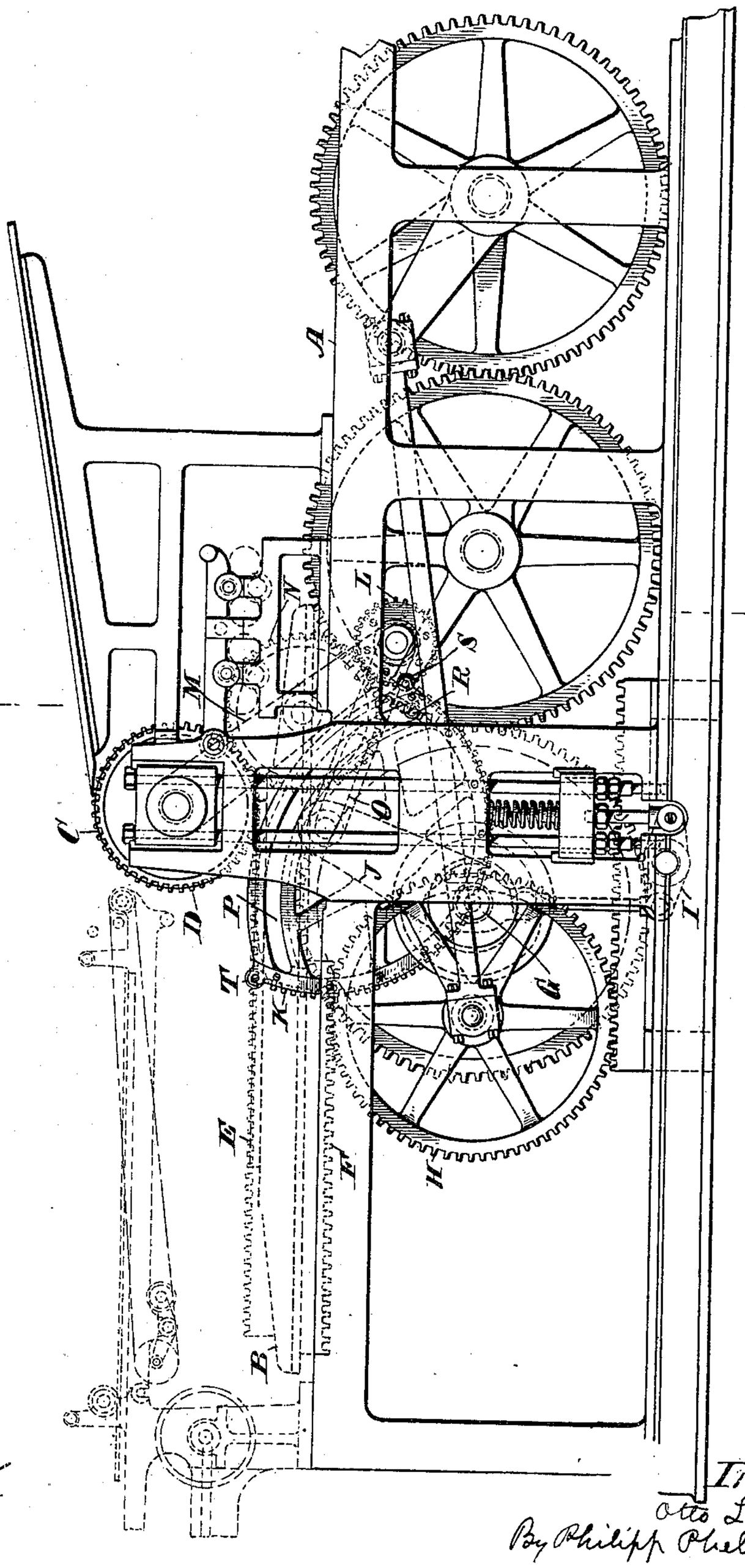

Fig. 1.

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8 Sheets—Sheet 2.

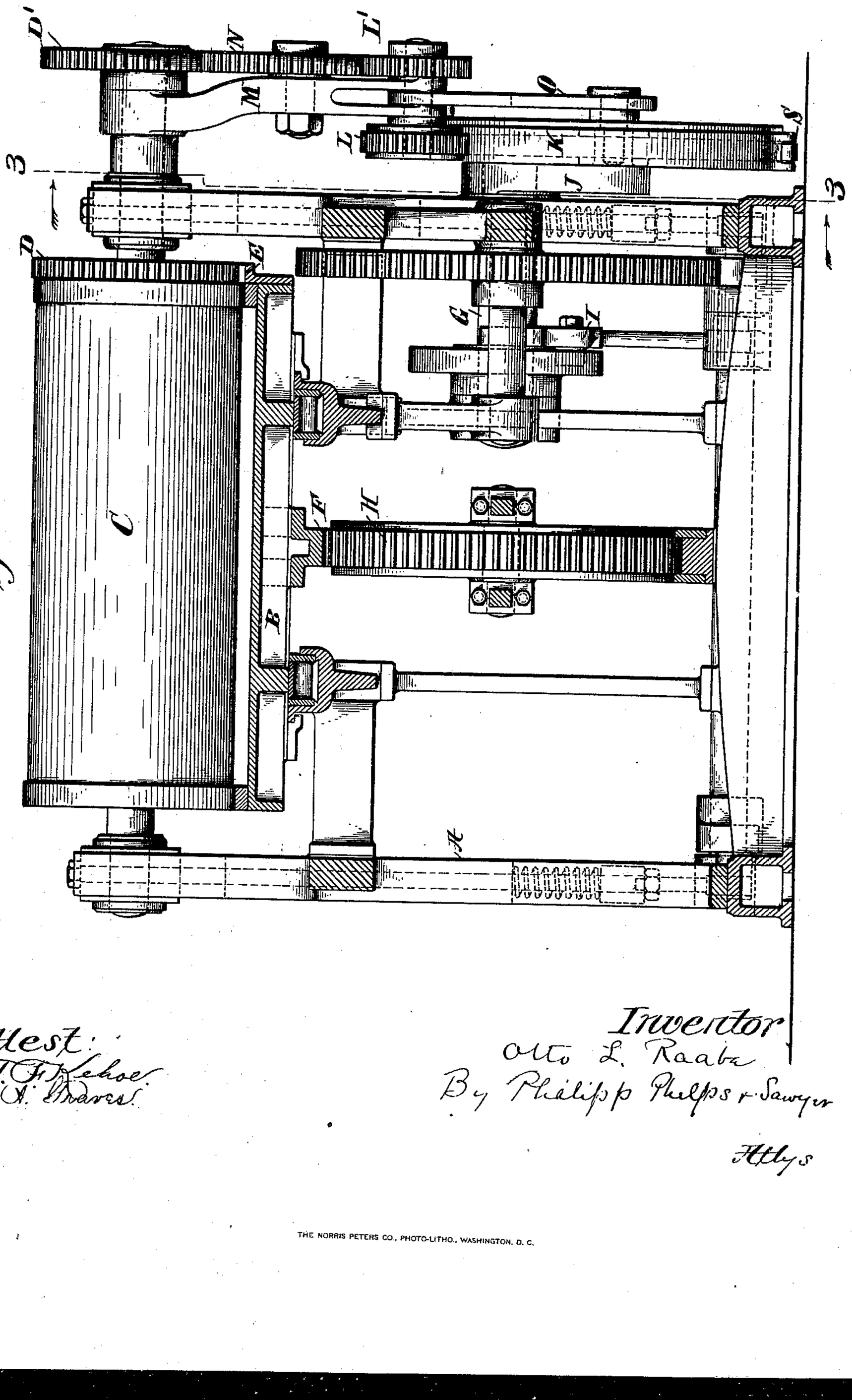

Fig. 2.

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(No Model.) 8 Sheets—Sheet 3.

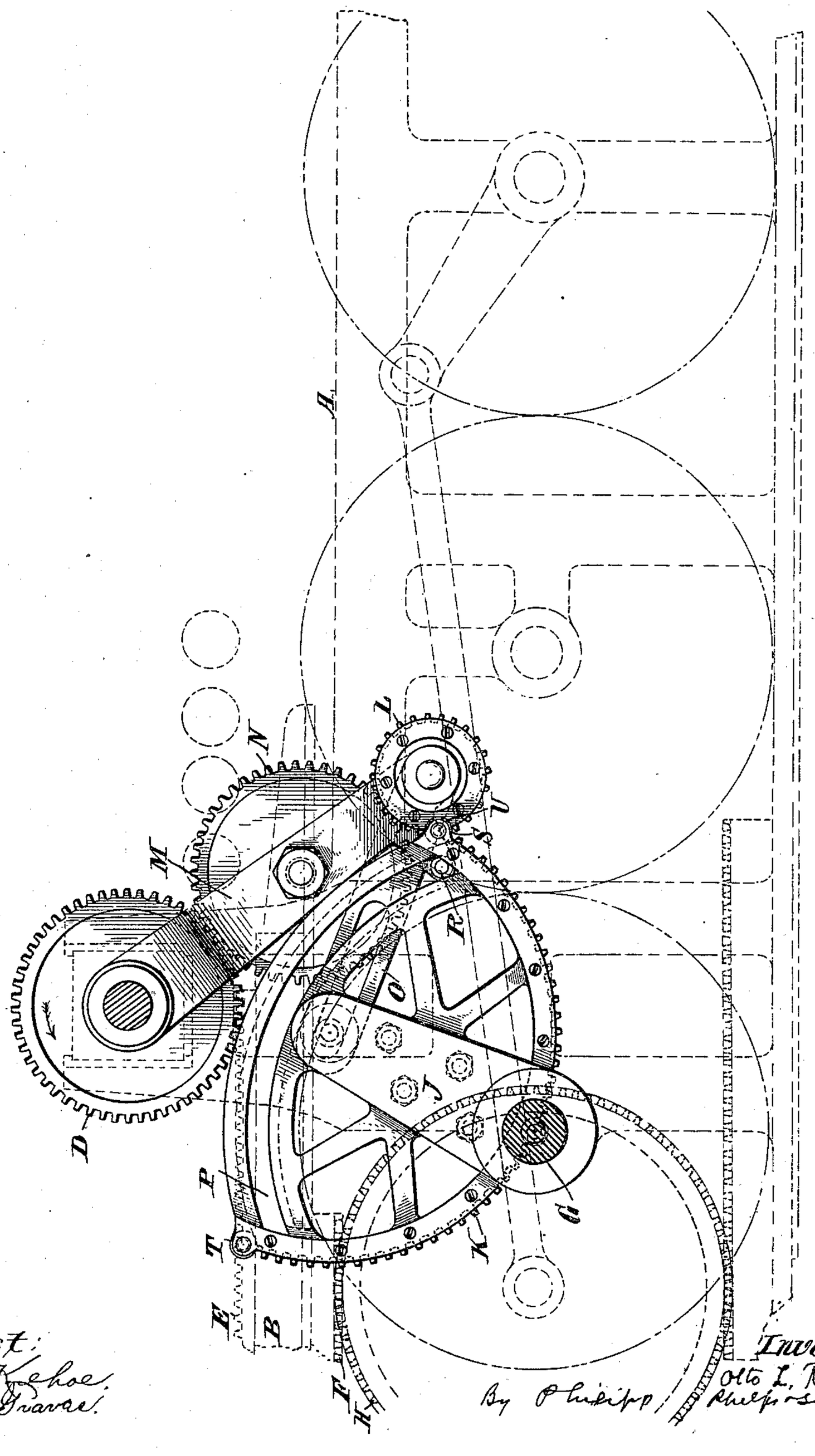

Fig. 3

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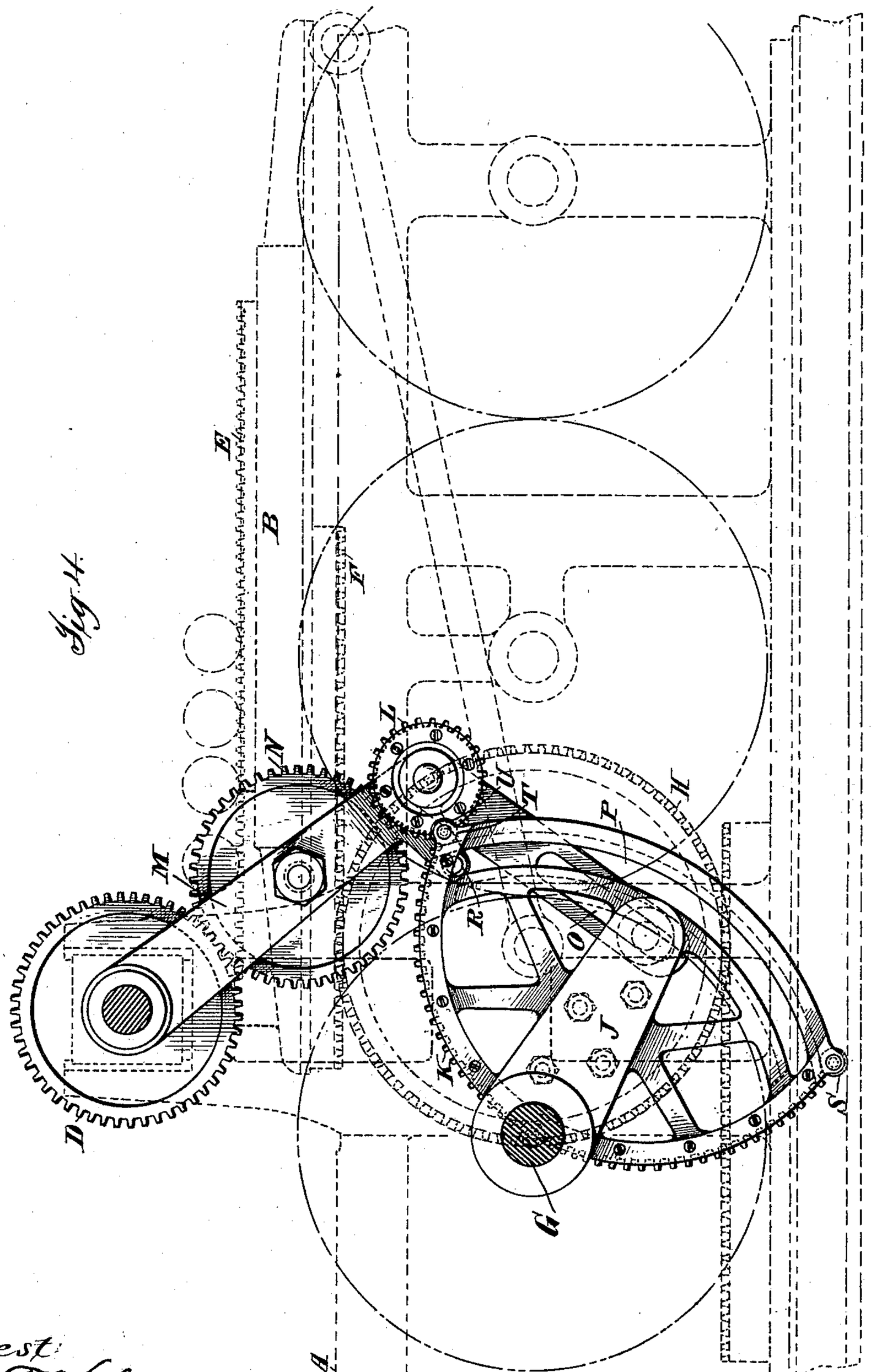
(No Model.)

8 Sheets—Sheet 4.

Fig. 4.



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No. 668,415.

Patented Feb. 19, 1901.

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(Application filed Oct. 30, 1897.)

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8 Sheets—Sheet 5.

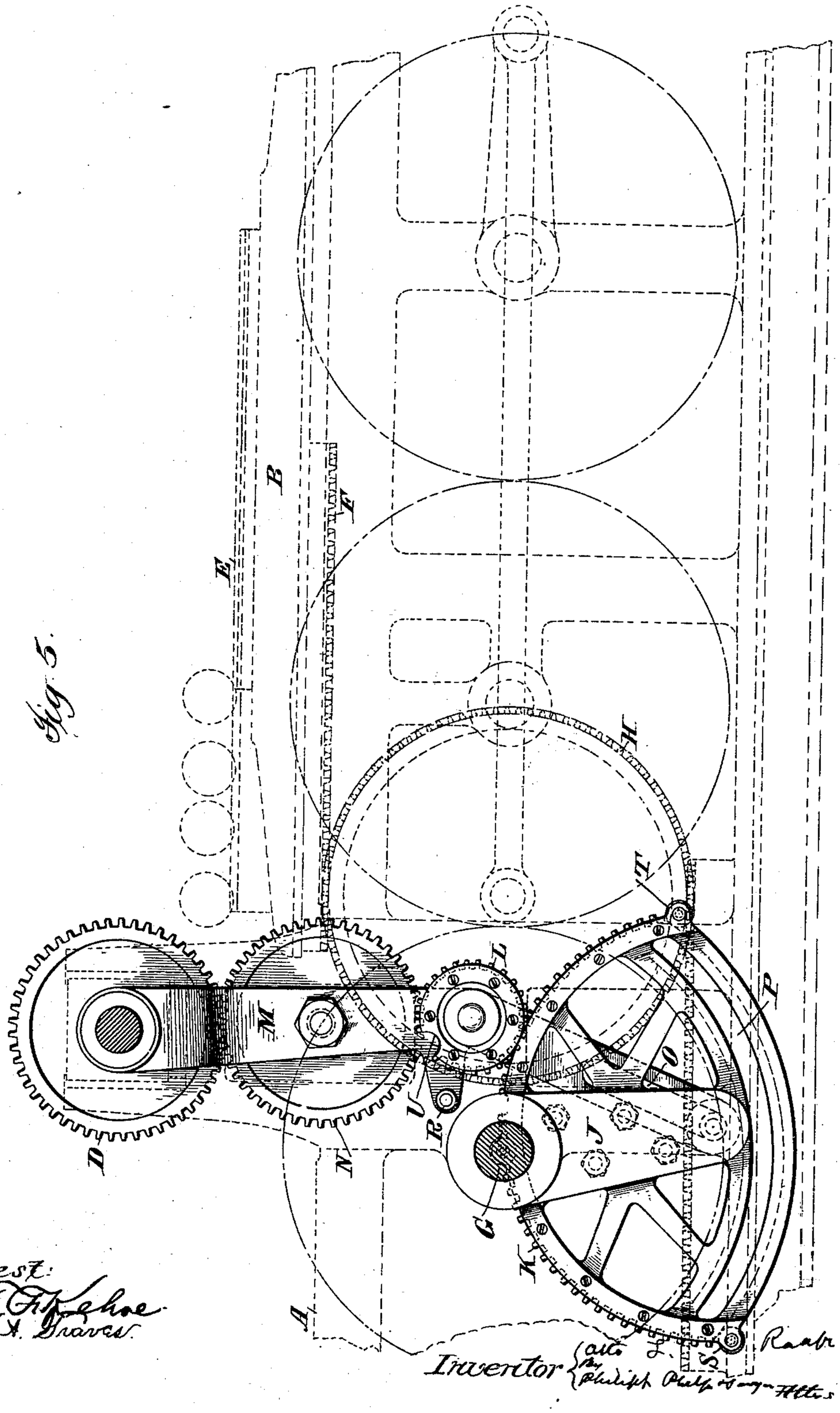

Fig. 5.

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No. 668,415.

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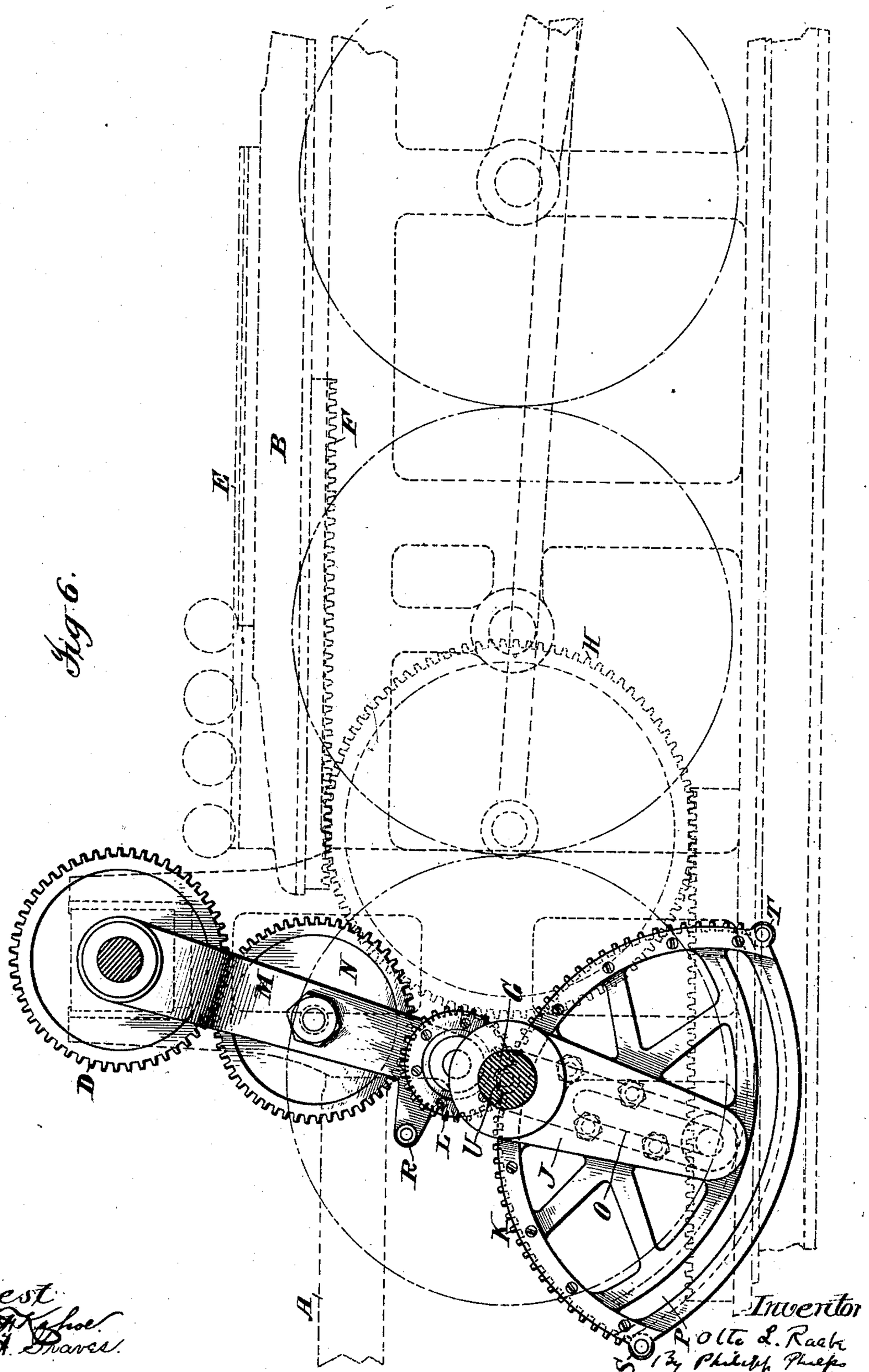
PRINTING PRESS.

(Application filed Oct. 30, 1897.)

(No Model.)

8 Sheets—Sheet 6.

Fig. 6.



Attest:
F. G. Kafoe
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Patented Feb. 19, 1901.

O. L. RAABE.

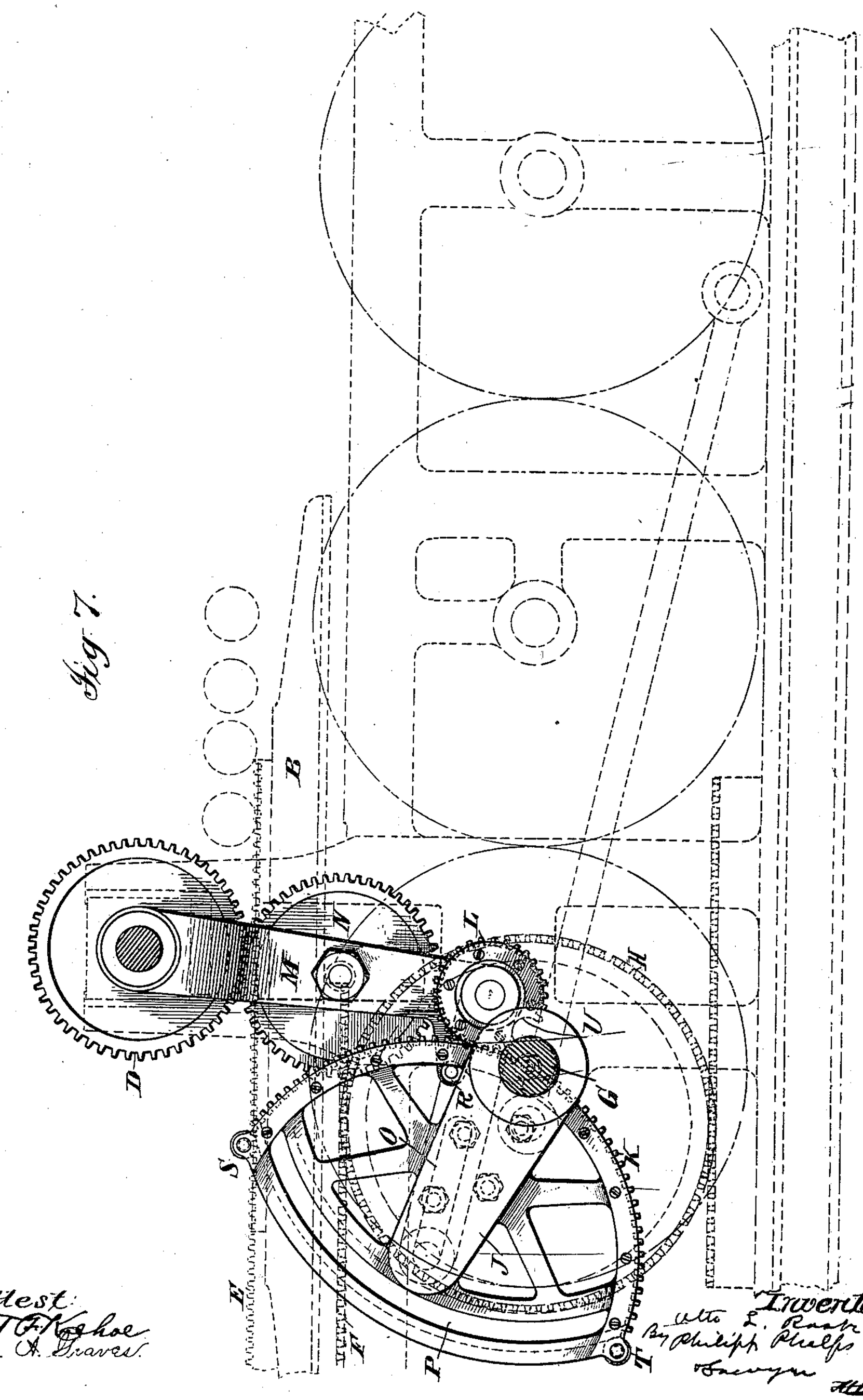
PRINTING PRESS.

(Application filed Oct. 30, 1897.)

(No Model.)

8 Sheets—Sheet 7.

Fig. 7.



Attest:
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 668,415.

Patented Feb. 19, 1901.

O. L. RAABE.

PRINTING PRESS.

(Application filed Oct. 30, 1897.)

(No Model.)

8 Sheets—Sheet 8.

Fig. 10.

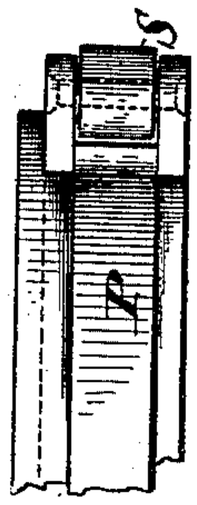
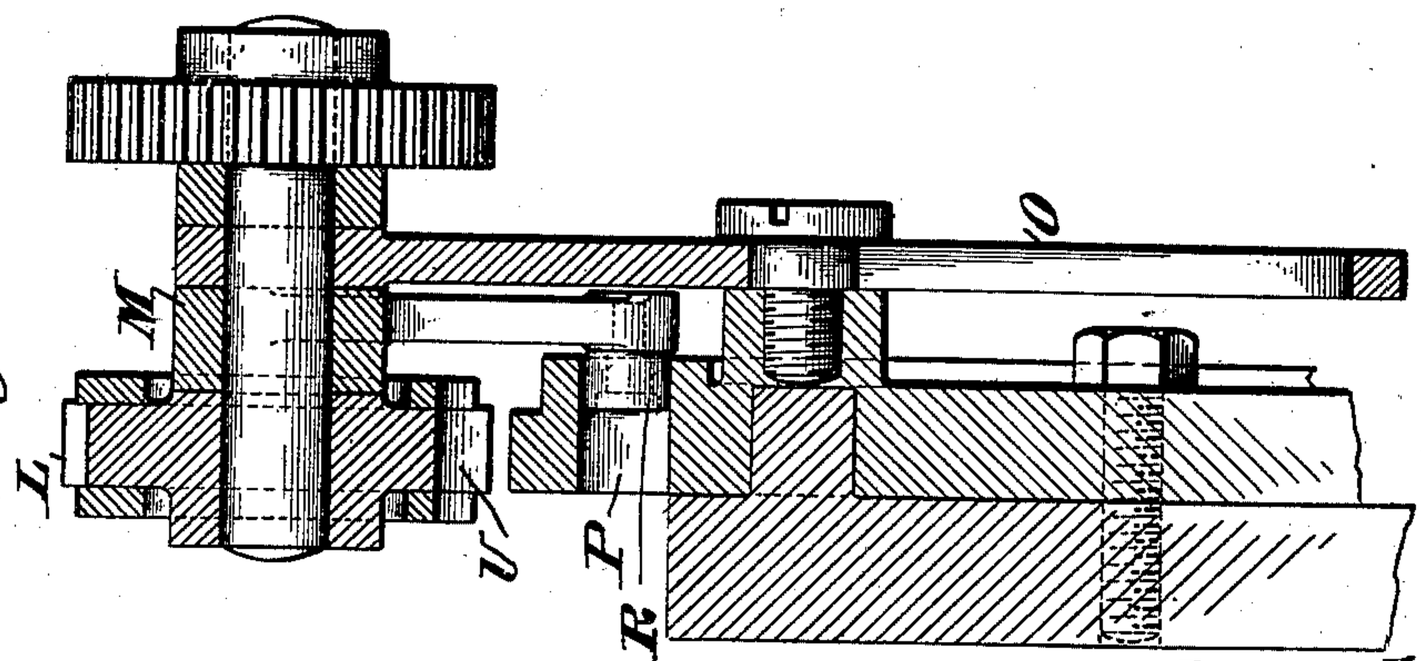


Fig. 8.

Fig. 9.



Witnesses:
J. F. Kehoe
J. A. Graves

Inventor
atty O. L. Raabe
By Philipp Philipp & Sawyer

Attys

UNITED STATES PATENT OFFICE.

OTTO L. RAABE, OF NEW YORK, N. Y., ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO ROBERT HOE AND CHARLES W. CARPENTER, OF SAME PLACE.

PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 668,415, dated February 19, 1901.

Application filed October 30, 1897. Serial No. 656,882. (No model.)

To all whom it may concern:

Be it known that I, OTTO L. RAABE, a citizen of the United States, residing at New York, county of New York, and State of New York, have invented certain new and useful Improvements in Printing-Presses, fully described and represented in the following specification and the acccompanying drawings, forming a part of the same.

This invention relates to certain improvements in cylinder-driving mechanism, and is more particularly intended for use with printing-machines in which a reciprocating bed cooperates with a rotating cylinder. In bed-and-cylinder machines as heretofore constructed the rotating cylinder has been arranged to make one, two, three, or four revolutions during each reciprocation of the bed or to stop after the first revolution and during the return of the bed. For good printing it is necessary that the impressions on the two sides of a sheet of paper should, if they be of equal size, be exactly superimposed, giving what is known as "good register," or if two or more impressions are made on one side of a sheet in two or more colors the different impressions should fit together exactly. All of the constructions above referred to, excepting the one in which the cylinder stops, are subject to the disadvantage that the sheets had to be fed to the cylinder while the cylinder was in motion, thus entailing a considerable amount of inaccuracy in the register. In proportion to the distance which the bed travels the cylinders making one revolution for each reciprocation of the bed were larger than those making two revolutions and those making two revolutions were larger than those making three or four revolutions; but the speed of the presses was in inverse ratio to the size of the cylinders. The speed of the presses in which the cylinders make three or four revolutions was so great that accurate feeding could not be done, and this class of presses was used only for ordinary newspaper-printing. In the presses in which the cylinder makes two revolutions the slower speed enabled more nearly accurate feeding, and as the speed was greater than in the presses in which the cylinder makes one revolution the former class of presses has come into more general use than the latter. The construction in which the cylinder stops after the first revolution and during the return of the bed was subject to the disadvantage of loss of speed due to the operation of the stop mechanism, but possessed the advantage that the sheets were fed to the cylinder while the cylinder was at rest, enabling accurate register. This construction was also subject to the disadvantage that the front delivery with the side of the sheet last printed uppermost was not available, since the cylinder came to a stop directly after the printing of the sheet. Therefore on these presses it has been usual to employ a delivery-cylinder, which is liable to smut the sheet. Still further, stop-cylinder presses were subject to the disadvantage that the stop mechanism was complicated and difficult to construct.

One object of this invention is to produce a new and improved printing-press in which the cylinder shall make two or more revolutions for each reciprocation of the bed, the cylinder during its revolutions being brought to an easy and gradual stop, so that the sheets may be fed thereto while the cylinder is at rest and then receive a gradually-accelerated motion, whereby it is brought up to the speed of the bed, thus attaining all the advantages of both the two-revolution and the stop-cylinder press and that without sacrificing the speed at which the press is run.

A further object of the invention is to produce a new and improved gear mechanism which is adapted to give to a cylinder the stopping and starting movements before referred to. This gear mechanism is applicable not only to printing-machines, but to other machines employing cylinders to which it is desirable to give such movements.

With these and other objects in view the invention consists in certain constructions and in certain parts, improvements, and combinations, as will be hereinafter more fully described and then particularly pointed out in the claims hereunto appended.

In the drawings annexed, Figure 1 is a side elevation of a press embodying my improvements. Fig. 2 is a sectional elevation of the

same, on a larger scale, taken from the point indicated by the line 2 2 of Fig. 1. Figs. 3, 4, 5, 6, and 7 are sectional elevations on the line 3 3 of Fig. 2, respectively, for different positions of the bed, the line of sight being in the direction of the arrows in Fig. 2. Fig. 8 is a view of a detail on a still larger scale. Fig. 9 is a section on the line 9 9 of Fig. 8; and Fig. 10 is a top view of a portion of the mechanism shown in Fig. 8, the line of sight being in the direction of the arrow in Fig. 8.

In the drawings, A is the frame of the press; B, the bed; C, the impression-cylinder; D, the gear by which it is driven; E, the cylinder-rack, and F the bed-rack. The bed is reciprocated by a crank mechanism of ordinary description and a railroad gear or bed wheel H. The crank connections being of ordinary well-known character do not need further description. The cylinder-gear D meshes with the cylinder-rack E during part of the forward stroke of the bed. During the backward stroke it is raised out of mesh in the usual manner by the cam-operated lever I, which lifts slides in the standards which carry the journal-boxes of the cylinder.

Fixed upon an arm J, keyed to the main shaft, is a toothed segment K, of which the pitch-line at its center corresponds with or is near to the center of the main shaft. Adapted to mesh with this segment is a gear L, keyed to a short shaft, journaled in an arm M, pivoted upon the shaft of cylinder C, which said short shaft has keyed upon its outer end a gear-wheel L′, connected in turn by intermediate N with gear D′ on the cylinder-shaft. The shaft of gear L is also connected by a slotted link O with a pivot at the center of curvature of the segment K. The two ends of the segment K are connected by a web having a slot P, in which rides a guide-roller R, fixed to a projection from the arm M.

The operation is as follows: At this time the parts are in the position shown in Fig. 3, the cylinder is being rotated from the rack on the bed, and during this time the pinion L is being idly driven from the gear D′ and the intermediate N. Since, however, the bed is driven by a crank movement, the speed of the gears will vary somewhat. At the time, however, when the parts reach the position shown in Fig. 4 the movement of the pinion L is precisely equal to the movement which the segment K, which, as has been before stated, is carried by the arm J, has, and the pinion and segment run easily into mesh, being assisted in this operation by the engagement of the roller T with the recess U in the gear. At the moment when the pinion L and segment K run into mesh or immediately thereafter the cylinder is lifted and its gear D passes out of mesh with the rack E. The cylinder is now driven from the segment K through the train of gears L′, L, N, and D′. As the segment rotates to the right of the observer the link O draws the lever M to the left, and consequently causes the pinion L, which is of course being rotated by the segment, to move toward the center, around which the segment rotates, at which point the segment exercises no rotative effect on the pinion L. In other words, the segment exercises its greatest rotative effect on the pinion L when the pinion is at the end of the segment. As the pinion moves toward the center of rotation of the segment this rotative effect continues to grow less, and when the pinion reaches that center its rotating movement ceases. This decreasing rotating movement of the pinion L is transmitted to the intermediate N, which, it will be remembered, is carried on the lever M. Furthermore, as the lever M swings to the left the intermediate N is moving in a direction which is opposite to the direction of rotation of the gear D′, and consequently does not impart to the said gear its full movement of rotation. Inasmuch, therefore, as the pinion L, as it is passing from the position shown in Fig. 4 to the position shown in Fig. 6, is gradually approaching the center of rotation of the segment, the speed at which the segment rotates the pinion will be constantly decreasing, and inasmuch as at the same time the intermediate N is moving in a direction opposite to the rotation of the cylinder, and therefore does not exercise its full rotative effect thereon, the speed of the cylinder will be constantly decreasing. When the parts reach the position shown in Fig. 6, the pinion will be at the center of rotation of the segment, and consequently will not be rotated by the segment and the cylinder will be stationary. This condition of affairs continues substantially while the parts are moving from the position shown in Fig. 6 to that shown in Fig. 7, and during this time the cylinder receives practically no movement from the train of gearing. As, however, the parts pass from the position shown in Fig. 7 to the position shown in Fig. 3 the pinion begins to be driven by the segment, and since the pinion is passing from the center of rotation of the segment toward the circumference of rotation this movement is a constantly-accelerated one. Furthermore, the movement of the lever M, by which the intermediate N is carried, is now reversed and the intermediate moves in the direction of rotation of the cylinder, which also tends to increase the rotating movement of the cylinder. The movement of the cylinder therefore is accelerated not only by reason of the fact that the pinion L is receiving a constantly-accelerated movement, but also because the intermediate is reciving a swinging movement in the direction of rotation of the cylinder. At the time when the parts reach the position shown in Fig. 3 the cylinder is running at the same rate of speed as the bed. Shortly before this, however, the raising and lowering mechanism operates to drop the cylinder into its impression position, and as thereafter the speed of the cylinder becomes equal to the speed of the bed the two

easily intermesh, the pinion L and the segment at the same time running out of mesh. While the segment is passing from the position shown in Fig. 4 to that shown in Fig. 5 the cylinder is under the control of the bed and the printing is accomplished.

As an illustration of the relative motions of the bed and cylinder the cylinder-gear may have forty-four teeth of one-inch pitch, making its circumference on the pitch-line forty-four inches. The cylinder-rack may have the same number of teeth, while the travel of the bed is sixty inches. Before entering the gear on its forward stroke the rack may then travel six inches. After leaving the gear it travels ten inches farther. This difference in distance traveled before and after intermeshing with the gear D is determined by the position of the bed-driving crank at the points where the motion is transferred from one driving mechanism to the other. Therefore after the rack and gear go out of mesh on the forward stroke the bed travels ten inches forward and ten inches backward before the last tooth of the rack again comes directly under the cylinder-gear, and this twenty inches of motion takes place while the speed of the bed is gradually slowing down and starting up, giving ample time to raise the cylinder out of gear. At the other end of the stroke the bed travels backward six inches and forward six inches, (twelve inches of very slow motion of the bed,) in which time the cylinder can be gradually brought down into position.

The rollers S and T at the angles of the segment are provided to smooth and facilitate the passage of the gear L to and from the segment, a recess U being let into the gear for engagement therewith. A roller V is placed at the center of the segment for engagement with this recess.

The gear L and the segment are provided with the shoulders usually employed in such constructions for limiting the depth of engagement of the teeth.

The gear mechanism shown herein may also be used for transmitting motion to the impression-cylinder of a rotary cylinder-press, and I contemplate such an application thereof.

What I claim is—

1. The combination with a reciprocating bed and a multirevolution cylinder, of means whereby the cylinder is driven from the bed during a part of a complete reciprocation, a gear on the cylinder-shaft, a swinging gear from which said gear on the cylinder-shaft is driven, and means independent of the bed for driving said gear at different speeds, substantially as described.

2. The combination with a reciprocating bed and a multirevolution cylinder, of means whereby the cylinder is driven from the bed during a part of a complete reciprocation, a gear on the cylinder-shaft, a swinging gear from which the gear on the cylinder-shaft is driven, means for giving said gear a swinging movement around the cylinder-shaft as a center, and means for driving the swinging gear at different speeds, substantially as described.

3. The combination with a reciprocating bed and a multirevolution cylinder, of means whereby the cylinder is driven from the bed during a part of a complete reciprocation, a gear on the cylinder-shaft, a swinging gear from which said gear is driven, and a rotating segment for driving said gear, said segment having its pitch-line at one point coincident with its center of rotation, substantially as described.

4. The combination with a reciprocating bed and a multirevolution cylinder, of means whereby the cylinder is driven from the bed during a part of a complete reciprocation, a gear on the cylinder-shaft, a second gear from which said gear is driven, a rotating segment having its pitch-line at one point coincident with its center of rotation, and means controlled by the segment for imparting a swinging movement to the second gear, substantially as described.

5. The combination with a shaft, of a gear supported thereon, a second gear from which the first gear is at times driven, means for imparting a variable movement to the second gear, means for swinging the second gear about the shaft as a center and means for driving the shaft when it is not driven from the second gear, substantially as described.

6. The combination with a shaft, of a gear thereon, a second gear from which the gear on the shaft is at times driven, a curved rotating segment having its center of rotation eccentric to its center of curvature, means for swinging the second gear about the shaft as a center and means for driving the shaft when it is not driven from the second gear, substantially as described.

7. The combination with a shaft, of a gear thereon, a swinging lever supported on the shaft, a gear supported on the swinging lever and operating at times to drive the gear on the shaft, a curved rotating segment having its center of rotation eccentric to its center of curvature, and connections between the segment and the swinging lever whereby the movement of the lever is controlled from the segment and means for driving the gear on the shaft when it is not driven from the segment, substantially as described.

8. The combination with a shaft, of a gear thereon, a swinging lever supported on the shaft, a gear supported on the lever and operating to drive the gear on the shaft, a curved rotating segment having its center of rotation located on its pitch-line, and connections between the segment and the swinging lever, substantially as described.

9. In a printing-machine, the combination with a reciprocating bed and a multirevolution cylinder, of means whereby the cylinder is driven from the bed during a part of a complete reciprocation, mechanism for driving

the cylinder when it is not driven by the bed, said mechanism consisting of rotating gears and a rotating segment, and means whereby said gears and segment are caused to take the cylinder from the bed, bring it to a gradual stop, and then speed it up to the speed of the bed, substantially as described.

10. In a printing-machine, the combination with a reciprocating bed and a multirevolution cylinder, of means whereby the cylinder is driven from the bed during a part of a complete reciprocation, a rotating segment, and means whereby said segment is caused to drive the cylinder when it is not driven by the bed, said means and the segment operating to bring the cylinder to a gradual stop and then speed it up again to the speed of the bed, substantially as described.

11. As a means for transmitting variable movement, the combination with a driving-shaft, of a rotating toothed segment fixed thereto with its pitch-line coincident with the center of the shaft, a driven gear-wheel meshing with the segment, and means for moving the gear-wheel toward and away from the center of rotation of the segment, substantially as described.

12. The combination with a curved rotating segment having its center of rotation eccentric to its center of curvature, of a gear-wheel driven from the segment, means for moving the gear-wheel toward and away from the center of rotation of the segment and means for driving the gear-wheel when it is not driven from the segment, substantially as described.

13. The combination with a shaft, of a gear thereon, a lever supported on said shaft, a gear mounted on said lever from which the first gear is driven, a curved rotating segment having its center of rotation eccentric to its center of curvature, and a slotted link connecting the segment and the lever, substantially as described.

14. As a means for transmitting variable motion, the combination of a pivoted toothed segment, a gear-wheel adapted to intermesh therewith and mounted so as to be capable of movement to and from the center of rotation of the segment, means for holding the gear-wheel in mesh with the segment during a portion of the rotation thereof, and means for transmitting motion from the driven gear to the mechanism to be operated, substantially as shown and described.

15. As a means for transmitting variable and intermittent motion, the combination of a pivoted segment-shaped frame having its curved face provided with gear-teeth, means for rotating the segment, a gear-wheel, mounted so as to be capable of motion toward and from the center of rotation of the segment, means for holding the gear-wheel into mesh with the segment during the portion of its revolution corresponding to its toothed face, means for holding the gear-wheel in position but disconnected from driving engagement with the segment during the remainder of the revolution of the segment, and means for transmitting motion from the gear-wheel to the mechanism to be operated, substantially as shown and described.

16. As a means for transmitting variable motion a toothed segment caused to revolve about a point in its pitch-line as a center, a driven gear-wheel held in gear with the segment by a link pivoted at the center of curvature of the segment, a swinging arm upon which said gear-wheel is mounted and gearing also mounted on said swinging arm for conveying motion therefrom to the driven mechanism, substantially as shown and described.

17. The combination with a reciprocating bed carrying a rack, of a cylinder having means by which it is driven from the rack, a gear on the cylinder-shaft, a lever supported on the cylinder-shaft, a gear supported on the lever, a curved rotating segment having its center of rotation eccentric to its center of curvature, and connections between the lever and the segment, substantially as described.

18. The combination with a reciprocating bed carrying a rack, of a cylinder having means by which it is driven from the rack, a gear on the cylinder-shaft, a lever supported on the cylinder-shaft, a gear supported on the lever, a curved rotating segment having its center of rotation eccentric to its center of curvature, and a slotted link between the lever and the segment, substantially as described.

19. The combination with a reciprocating bed carrying a rack, of a cylinder having means by which it is driven from the rack, a gear on the cylinder-shaft, a lever supported on the cylinder-shaft, a gear supported on the lever, a curved rotating segment having its center of rotation eccentric to its center of curvature and means for swinging the lever about the shaft as a center, substantially as described.

20. The combination with a reciprocating bed carrying a rack, of a cylinder having means by which it is driven from the rack, a gear on the cylinder-shaft, a lever supported on the cylinder-shaft, a gear supported on the lever, a curved rotating segment having its center of rotation eccentric to its center of curvature, connections between the lever and the segment, and raising and lowering devices for the cylinder, substantially as described.

21. The combination with a reciprocating bed carrying a rack, of a cylinder having means by which it is driven from the rack, a gear on the cylinder-shaft, a lever supported on the cylinder-shaft, a gear supported on the lever, a curved rotating segment having its center of rotation eccentric to its center of curvature, a slotted link between the lever and the segment, and raising and lowering devices for the cylinder, substantially as described.

22. The combination with a reciprocating bed carrying a rack, of a cylinder having

means by which it is driven from the rack, a gear on the cylinder-shaft, a lever supported on the cylinder-shaft, a gear supported on the lever, a curved rotating segment having its center of rotation eccentric to its center of curvature, means for swinging the lever about the shaft as a center, and raising and lowering devices for the cylinder, substantially as described.

23. The combination with a reciprocating bed, of a multirevolution cylinder, means whereby the cylinder is driven by the bed during part of one reciprocation, a set of rotating regular gears for driving the cylinder when it is not driven by the bed and operating to bring the cylinder to a stop and then starting it again to bring it up to the speed of the bed, substantially as described.

24. The combination with the impression-cylinder, reciprocating bed and gearing for driving the bed and for connecting the bed and the impression-cylinder, of a gear between the crank-shaft gear and the impression-cylinder gear, a stud for such gear and means for moving the stud and gear laterally for giving to the impression-cylinder and its gear the same surface speed as the bed at the time the gears engage each other and separate, substantially as set forth.

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

OTTO L. RAABE.

Witnesses:
GEO. H. BOTTS,
A. L. KENT.