C. J. ROBERTSON.

MECHANICAL MOVEMENT.

APPLICATION FILED MAY 25, 1905. RENEWED AUG. 5, 1909.

1,019,188. **Patented Mar. 5, 1912.**

3 SHEETS—SHEET 1.

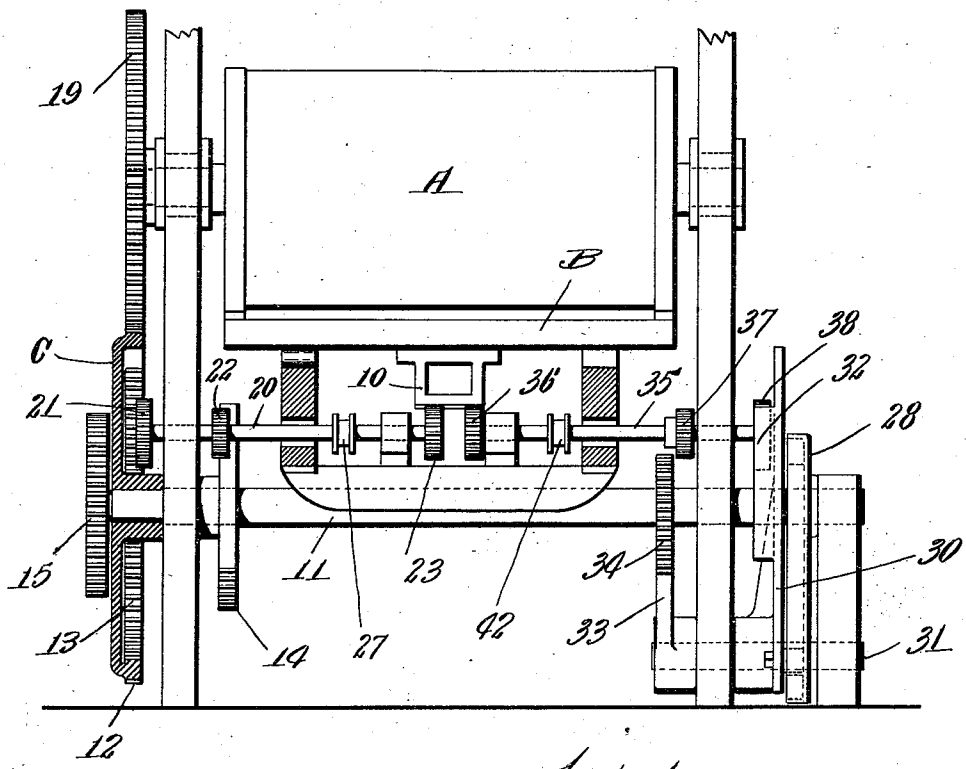

Fig. 1.

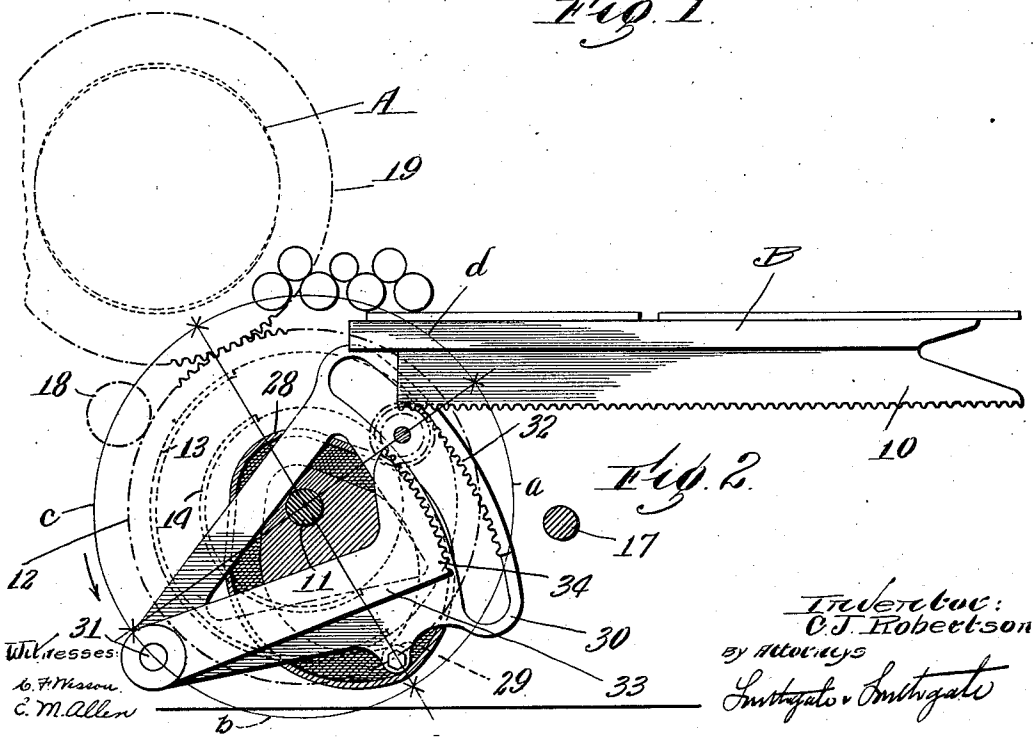

Fig. 2.

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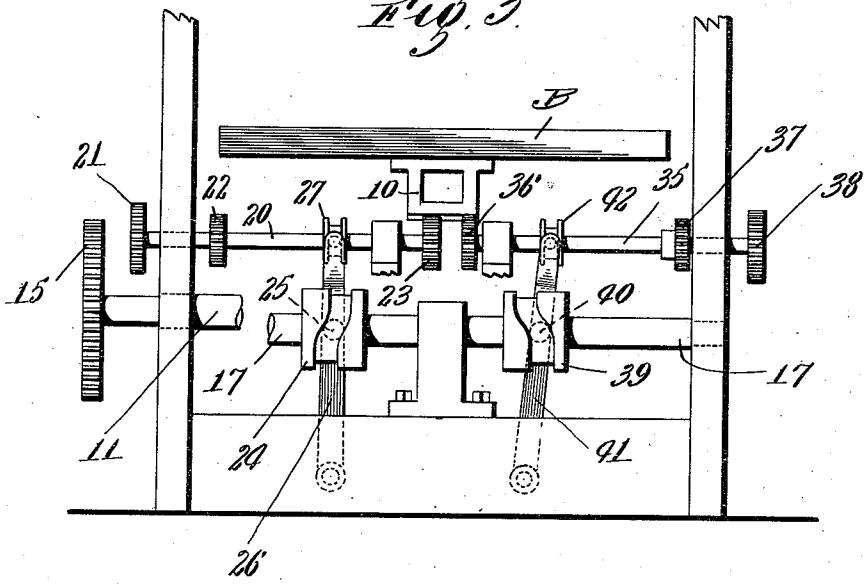
3 SHEETS—SHEET 2.

Fig. 3.



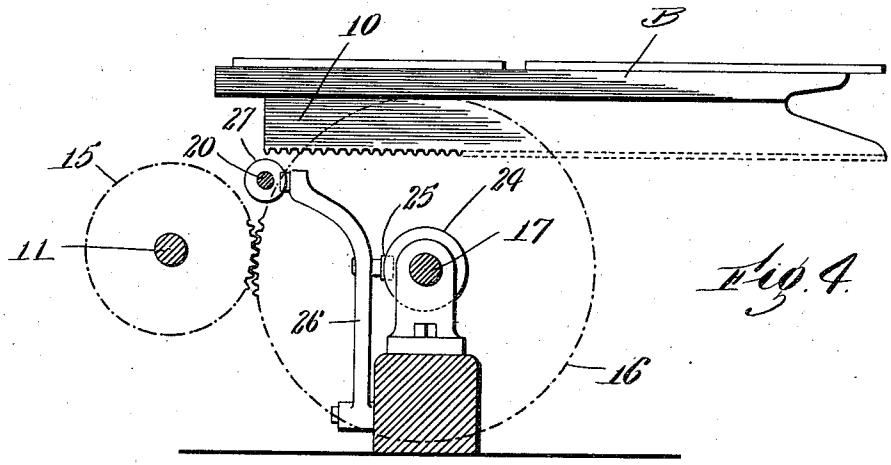


Fig. 4.

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3 SHEETS—SHEET 3.

Fig. 5.

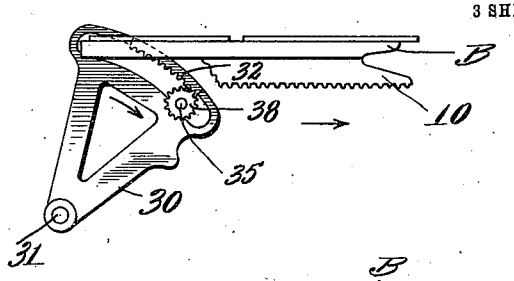


Fig. 6

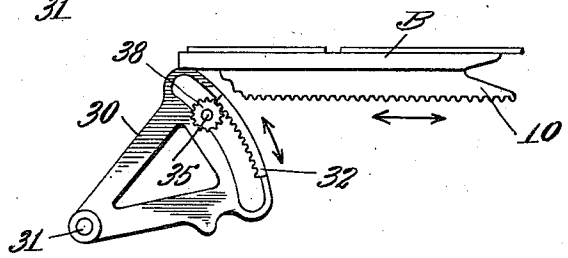
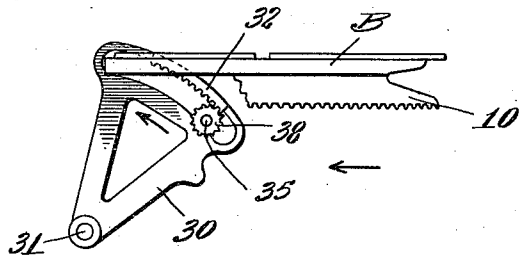


Fig. 7



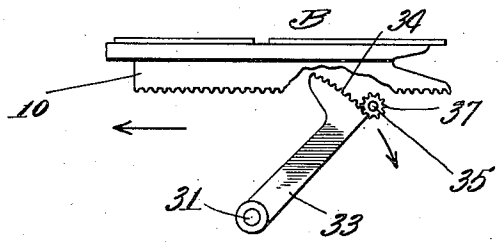


Fig. 8.

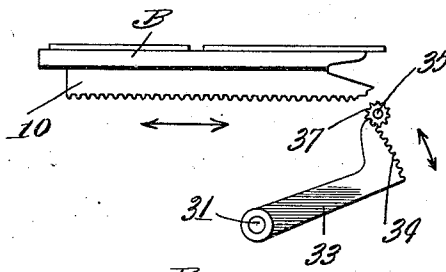


Fig. 9.

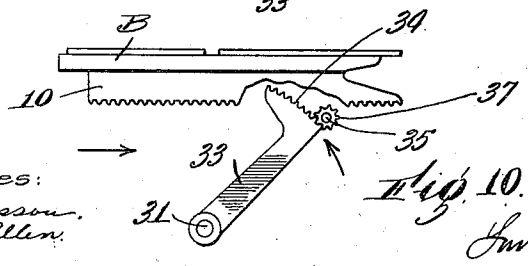


Fig. 10.

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UNITED STATES PATENT OFFICE.

CHARLES J. ROBERTSON, OF TAUNTON, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE AUTOPLATE COMPANY OF AMERICA, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

MECHANICAL MOVEMENT.

1,019,188. Specification of Letters Patent. Patented Mar. 5, 1912.

Application filed May 25, 1905, Serial No. 262,128. Renewed August 5, 1909. Serial No. 511,452.

To all whom it may concern:

Be it known that I, CHARLES J. ROBERTSON, a subject of the King of England, residing at Taunton, in the county of Bristol and State of Massachusetts, have invented a new and useful Mechanical Movement, of which the following is a specification.

The object of this invention is to provide a new and improved mechanical movement for converting rotary motion into reciprocating motion, especially adapted for actuating the beds of printing machines.

The invention comprises a main driving mechanism for imparting a to-and-fro movement to the bed or moving member at a uniform or constant speed and a cam actuated reversing mechanism for slowing down, stopping and starting the bed in the opposite direction, at each end of its travel, the time of each uniform speed movement or the time of operation being divided into four aliquot parts between the uniform speed movements and the reversing movements.

The invention further consists of improved points of construction hereinafter pointed out and described.

The invention is illustrated in the accompanying three sheets of drawings.

Referring to the same and in detail, Figure 1 is an end elevation partly in section, Fig. 2 is a sectional side elevation of the same, Fig. 3 is a front elevation illustrating the shifting mechanism for the gearing, Fig. 4 is a sectional side elevation illustrating a detail of the shifting mechanism and, Figs. 5 to 10 inclusive, are diagrams illustrating the action of the mechanism.

Referring to the drawings and in detail, A designates the impression cylinder and B the reciprocating bed, which parts are arranged in the usual way. The bed B carries a wide faced rack by which the movements are imparted to the bed.

11 designates the actuating shaft. On one end of the same is secured a gear C which has an outer spur gear 12 cut or secured thereon and a half internal gear 13 cut or secured inside of the same. Also arranged on the actuating shaft 11 is a half external or spur gear 14. Arranged on the end of the shaft 11 is a gear 15 which meshes with and drives a gear 16 on a cam shaft 17 journaled in the frame, the reduction between gears 15 and 16 being one to two so that the main shaft makes two revolutions for every single revolution of the cam shaft. Power is imparted to the machine by a driving pinion 18 meshing with the spur gear 12. The spur gear 12 meshes with and drives a gear 19 of the same size on the shaft of the impression cylinder, this arrangement being used when it is desired to adapt the mechanism to the ordinary two-revolution impression cylinder printing press.

The driving shaft 20 of the main driving mechanism is fitted so as to be capable of axial movement in its bearings. The same carries a pinion 21 which can engage the half internal gear 13 and a pinion 22 which can engage the half external or spur gear 14. On the end of the driving shaft 20 is arranged a rack pinion 23 which continuously engages the rack 10. The gear relation between the half internal gear 13 and pinion 21 and the half external gear 14 and the pinion 22 is the same so that the movements imparted to the driving shaft 20 through either system are the same speed but opposite in direction.

Arranged on the cam shaft 17 is a cam 24 engaging which is a roller 25 mounted on a pivoted lever 26 which engages a grooved wheel 27 secured on the driving shaft 20. These parts constitute the main driving mechanism. The operation thereof will be hereinafter described at length. Arranged on the other end of the main shaft 11 is a reversing cam 28. Engaging the groove of this cam is a roller 29 mounted on a rocking arm 30 secured on a shaft 31 journaled in one side frame and in a supplemental frame. This rocking arm 30 is provided with an internal segment 32. Secured on the inner end of the shaft 31 is a rocking arm 33 which has an external or spur gear segment 34 cut or formed thereon. A reversing shaft 35 is journaled in the frame of the machine in line with the driving shaft 20 and carries a reversing pinion 36 at its inner end, which pinion is in constant engagement with the rack 10.

Mounted on the shaft 35 is a pinion 37 of proper diameter to engage the segment 34 and a pinion 38 of proper diameter to engage the internal segment 32. The pinions 37 and 38 are so spaced on the shaft 35 that when one pinion is in engagement with its

segment, the other will be out of engagement and vice versa. The speed ratio between the internal segment 32 and the pinion 38 and the external segment 34 and the pinion 37 is the same whereby these two trains will impart the same movement to the reversing shaft 35 and pinion 36 but in opposite directions.

Mounted on the cam shaft 17 is a cam 39 engaging which is a roller 40 mounted on a pivoted lever 41 which engages a grooved wheel 42 secured on the reversing shaft 35. The parts last described, that is, numbered from 28 to 42 inclusive, make up the reversing mechanism; and thus a direct and change motion connection is provided from the cam; that is to say, when the cam is connected through one set of gearing to actuate the bed, the movement imparted will be in a direction as if the bed were connected directly to the slot of the cam; while, when the cam is connected to the bed through the other set of connections, a reverse or change movement will be obtained. It will be seen that as the reversing cam 28 is rotated, the internal segment 32 and external segment 34 will be oscillated in unison. It will be seen that the reversing cam 28 has a very small throw for about 180 degrees and that its principal operative section is on the other 180 degrees. For the convenience of description, the cam groove will be divided into 90 degree sections and lettered *a*, *b*, *c* and *d*, see Fig. 2. These parts operate to reverse the bed as hereinafter described.

The operation of the movement as a whole will now be described. Suppose the bed to be just completing its return stroke away from the cylinder or to the right, as shown in Fig. 5. This constant speed return stroke is accomplished by the engagement between the half external gear 14 and the pinion 22. Just as this movement ceases, the internal reversing segment 32 engages the pinion 38 at the proper speed and takes control of the bed, the half external gear 14 of the main driving mechanism running out of its pinion 22. As this engagement takes place, the roller 29 is practically at the point between sections *d* and *a* of the cam groove. Now during the next quarter revolution of the main shaft 11, the segments will be oscillated from the position shown in Fig. 5 down to their lowest position by the reversing cam. The cam groove is proportioned so that this oscillating movement will be a gradually diminishing movement substantially equivalent to the retardation of the well-known crank reverse. This quarter rotation of the reversing cam will thus bring the bed to a state of rest at its right hand extreme, as shown in Fig. 6 and Fig. 2, the operation taking the section *a* of the cam groove. Now during the next quarter revolution of the main shaft, the reversing cam will oscillate the reversing segments from their lowest position up to the position shown in Fig. 7, by section *b* thereof, at a speed which will impart a movement to the bed commencing at zero and gradually increasing up to full speed, substantially equivalent to the accelerating movement of the crank reverse. This will start the bed on its forward or left hand movement at full speed. During the last half revolution of the main shaft, the driving shaft 20 will be shifted to the left so that the pinion 21 will come in position to engage the half internal gear 13. This engagement takes place just as the bed acquires its full speed movement on its forward or left-hand stroke. Now during the next half revolution of the main shaft 11, the bed will be given its constant speed forward stroke by the mesh between the internal gear 13 and the pinion 21. During this last half revolution of the main shaft the sections *c* and *d* of the cam come into operation. These sections are so shaped as to bring the segments easily to rest at their highest position and then to start them on their downward movement to acquire the proper speed for the left-hand reverse. This movement is thus practically a dwell with a slight starting and stopping movement of the reversing segments above their pinions.

During the last half revolution of the main shaft, while the bed is on its constant speed or forward movement to the left, the reversing shaft 35 will be shifted to the left, from the position shown in Figs. 1 and 3 so that as this constant speed movement is completed, the external segment 34 will come in position to engage the pinion 37, as shown in Fig. 8. Now during the next quarter revolution of the main shaft, the section *a* of the cam will operate through the external segment 34 and its pinion 37. This will retard and stop the movement of the bed as previously described, and as the motion is changed, compared with the previously described reversing movement, the stopping or retarding movement will be in the opposite direction. This will bring the parts to the position shown in Fig. 9. Now during the next quarter revolution of the main shaft, the section *b* of the cam will operate and will start the bed from zero at a gradually increasing speed on its return movement to the right the same as previously described in connection with the other reverse but in the opposite direction owing to the changed motion connection. This last described half revolution of the main shaft will give the left-hand reversing movement to the bed. During this last half revolution of the main shaft, the driving shaft 20 will have been shifted to the right

so that as the bed acquires its full speed on its return movement, the half external gear 14 will engage the pinion 22. Now during the next half revolution of the main shaft, the bed will be given its constant speed return stroke, completing the cycle. During this half revolution of the main shaft, sections *c* and *d* of the cam come into operation and the reversing segments reverse their movement clear of the reversing pinions, as previously described. Thus a movement is provided in which an easy reverse is accomplished which is well adapted to the two-revolution principle wherein the time of reverse is equal to the time of constant speed. The movement described also has the advantage that the various mechanisms come into and out of operation by running into and out of gear, and that the parts are properly moving so that the gears come into and run out of mesh without slip or loss of motion.

While the proportions described, that is the proportions wherein the constant speed movements are equal in time to the reverse movements are preferred, it is within the scope of the invention to vary these proportions which can be done by making the internal and external gears 13 and 14 more or less than 180 degrees in circumference by correspondingly increasing or diminishing the radial length of the operative sections *a* and *b* of the reversing cam.

The details and arrangements herein described may be greatly varied by a skilled mechanic without departing from the scope of my invention as expressed in the claims.

Having thus fully described my invention, what I claim and desire to secure by Letters-Patent of the United States is:—

1. In a mechanical movement, the combination of a reciprocating member, a main driving mechanism for imparting the movement thereto at a uniform speed, a revolving cam, and connections actuated therefrom so that the cam will slow down, stop and start the member in the opposite direction at both ends of its travel, the time of the uniform speed movements being equal to the time of the slowing down, stopping and starting movements imparted from the cam.

2. In a mechanical movement, the combination of a reciprocating member, a shaft making two revolutions for each complete reciprocation thereof, a main driving mechanism for imparting motion to the member at a uniform speed, and a cam actuated reversing mechanism, the main driving mechanism acting alternately with the reversing mechanism and each action taking a half revolution of said shaft.

3. In a mechanical movement, the combination of a reciprocating member, a partial internal gear and a partial external gear, a shaft carrying pinions for engagement therewith and geared to the member, and means for shifting said shaft axially to make up a main driving mechanism.

4. In a mechanical movement, the combination of a reciprocating member, means for giving the same its constant speed movements, and a reversing mechanism comprising a cam, a direct and change motion connection therefrom whereby the same part of the cam can act to reverse the bed at each end of its travel.

5. In a mechanical movement, the combination of a reciprocating member, a main driving mechanism therefor, and a reversing mechanism comprising rocking segments, means for using one segment to reverse the bed at one end of its travel, and means for using the other segment to reverse the bed at the other end of its travel, the said two means being oppositely arranged relatively to the segments so that the same relative movement of the segments will be used for both reversing movements of the bed.

6. In a mechanical movement, the combination of a reciprocating member, a main driving mechanism therefor, and a reversing mechanism comprising a cam, an internal and an external segment operated from the cam, a shaft carrying pinions for engaging said segments and connected to the bed, and means for causing the pinions to engage with the segments alternately.

7. In a mechanical movement, the combination of a reciprocating member, a main driving mechanism therefor, and a reversing mechanism comprising an internal and an external segment vibrated therefrom, a shaft carrying pinions for engaging said segments, a pinion meshing with a rack carried by the bed, and means for shifting said shaft axially to engage the pinions with the segments alternately.

8. In a mechanical movement, the combination of a reciprocating member, a main driving mechanism therefor, and a reversing mechanism comprising a cam, segments vibrated from the cam, a shaft carrying pinions for engaging said segments, a pinion meshing with a rack carried by the bed, and a cam for shifting said shaft to cause the pinions to engage the segments alternately.

9. In a mechanical movement, the combination of a reciprocating member, a main driving mechanism therefor, and a reversing mechanism comprising a rotating cam, segments oscillated thereby, pinions for transmitting the reversing movements to the bed, means for causing the pinions to engage the segments alternately, and means for rotating said cam twice for each cycle whereby the same part of the cam will reverse the bed at the ends of its travel.

10. In a mechanical movement, the combination of a reciprocating member, a main driving mechanism therefor, and a reversing mechanism comprising a revolving cam making two revolutions for each cycle, segments oscillated by said cam, pinions for transmitting the motion of said segments to the bed to reverse the movements of the same, and means for causing the pinions to engage the segments alternately whereby the same portion of the cam will reverse the bed at the ends of its travel, the cam being also shaped to hold the segments out of engagement with the pinions during the constant speed movements.

11. In a mechanical movement, the combination of a reciprocating member, a main driving shaft making two revolutions for each reciprocation, a partial internal and a partial external gear mounted on said shaft, a driving shaft having pinions for engagement for said gears and geared to the bed, means for shifting the driving shaft to make up a main driving mechanism, a cam mounted on said main shaft, an internal and an external segment vibrated by said cam, a reversing shaft geared to said bed and having pinions for engagement with said segments, and means for causing the pinions to engage the segments alternately to make up a reversing mechanism.

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

C. J. ROBERTSON.

Witnesses:
ROBERT T. JOHNSTON,
M. J. MORRISON.