(No Model.) 3 Sheets—Sheet 1.

A. B. WILLCOX.

MECHANICAL MOVEMENT.

No. 476,715. Patented June 7, 1892.

Fig. 2

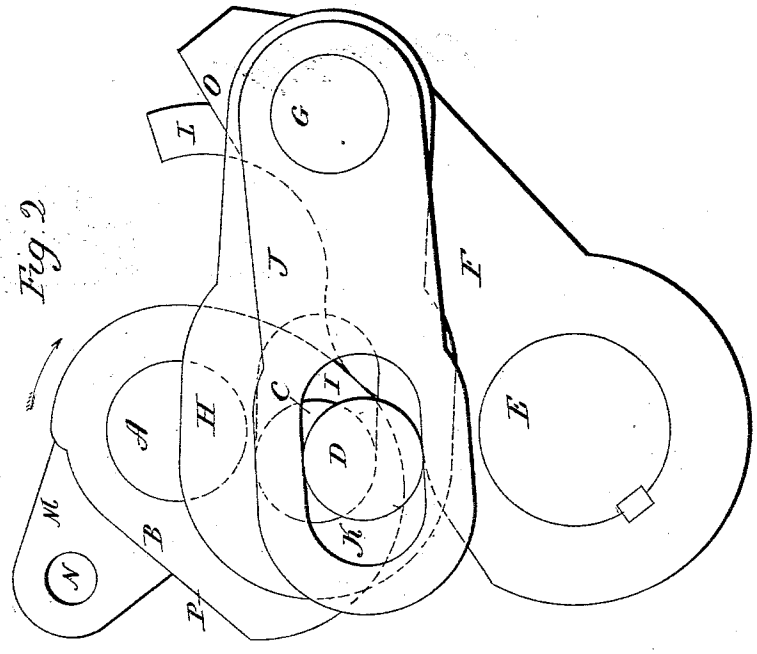

Fig 1

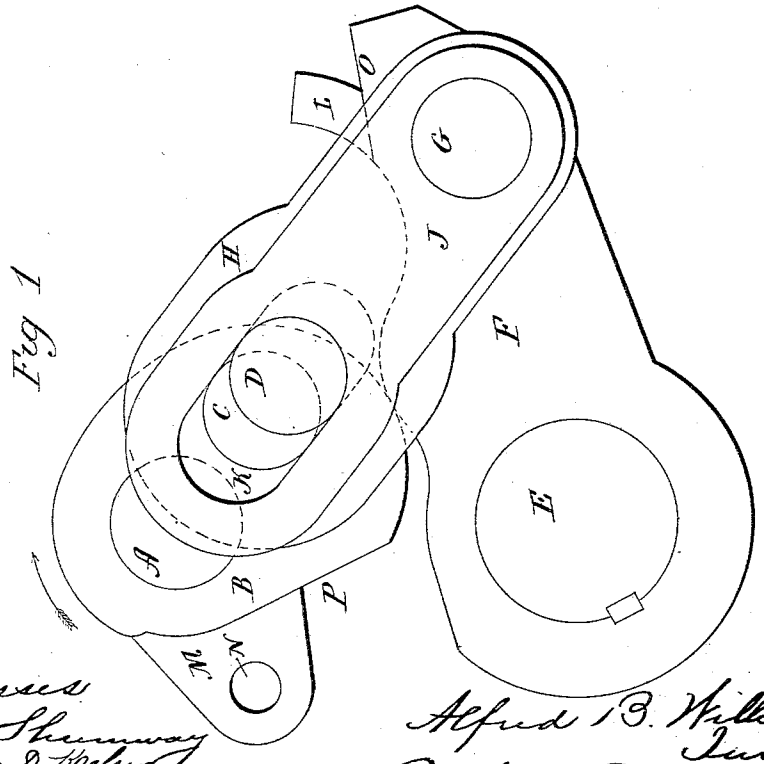

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Fig. 4

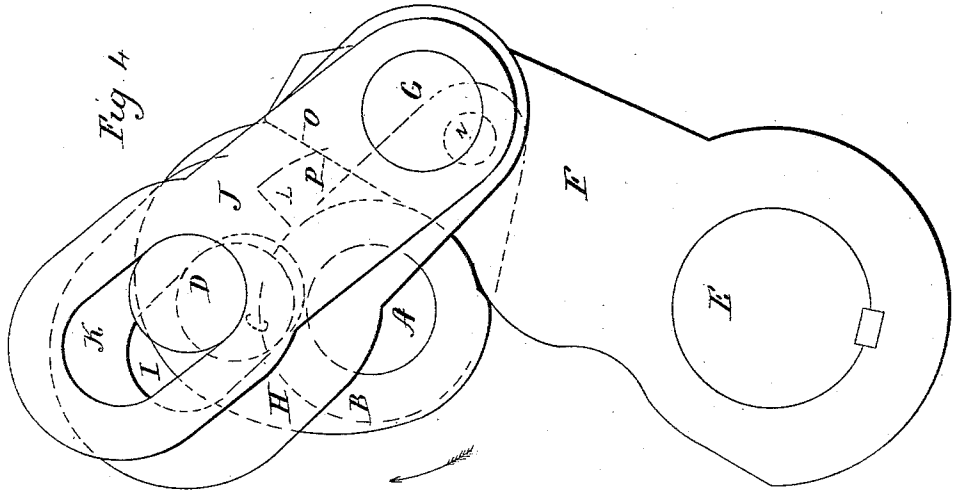

Fig. 3

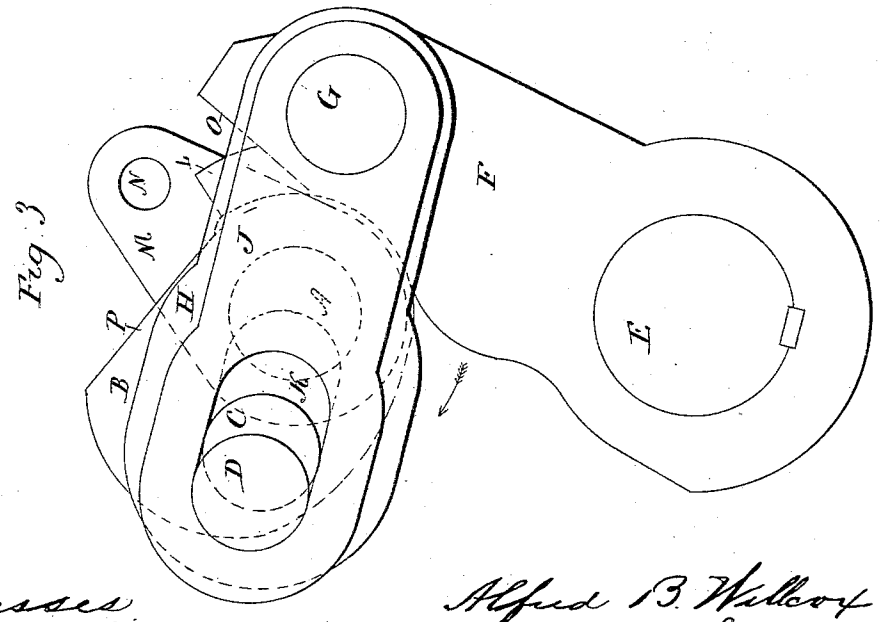

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Fig. 6

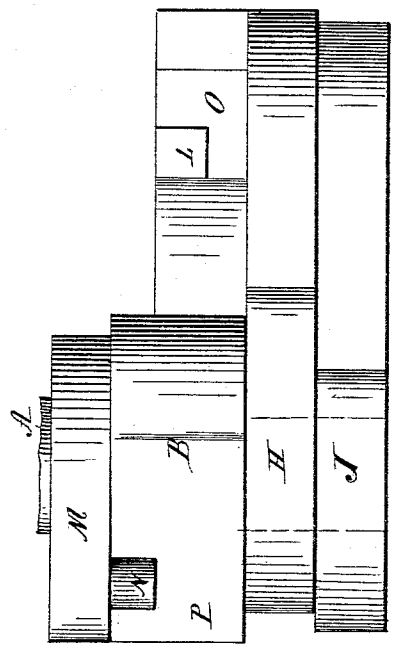
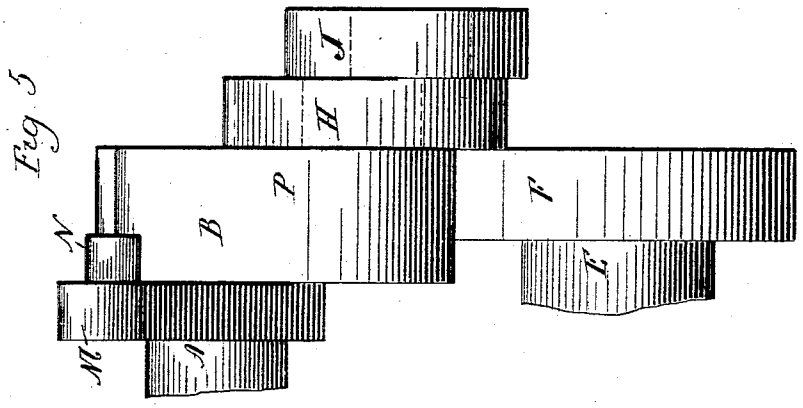


Fig. 5



Witnesses,
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UNITED STATES PATENT OFFICE.

ALFRED B. WILLCOX, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO E. L. WHITTEMORE, OF TOLEDO, OHIO.

MECHANICAL MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 476,715, dated June 7, 1892.

Application filed January 18, 1892. Serial No. 418,413. (No model.)

To all whom it may concern:

Be it known that I, ALFRED B. WILLCOX, of Chicago, in the county of Cook and State of Illinois, have invented a new Improvement in Mechanical Movements; and I do hereby declare the following, when taken in connection with accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a face view of the movement, showing the parts in what is termed the "down" position; Fig. 2, the same as Fig. 1, showing the parts in the position when the shaft is midway between its extreme movements; Fig. 3, the same as Fig. 1, representing the parts in the position as when the shaft is at its other extreme from Fig. 1; Fig. 4, the same as Fig. 1, representing the parts in the position as when the operating-shaft commences its return movement; Fig. 5, a side view of the apparatus, looking from the left of Fig. 2; Fig. 6, a top view of the same.

This invention relates to an improved device for mechanical movements adapted for use in various machines in which a reciprocating or rotative movement is required with a rest or dwell for a predetermined length of time at one point of the movement. Such requirements are found in power-presses, punching-machines, power-shears, and mechanical feeds for various purposes. The mention of these will be sufficient to illustrate the general application of the movement.

The present invention is an improvement on the device for which Letters Patent No. 458,347 were granted to this applicant, dated August 25, 1891; and it consists in the construction and combination of elements, as hereinafter described, and particularly recited in the claims.

As the present invention is an addition to the mechanism shown and described in the aforesaid patent, I will first describe the mechanism as it appears in the said patent and then point out the additions which have been made for the improvement of the same.

A represents the driving-shaft, to which a continuous rotation may be imparted in the direction indicated by the arrow. Made fast to the shaft, and so as to revolve with it, is a crank B, and on this crank two crank-pins C D are arranged, both being in the same radial line of the crank, but the pin D more distant from the center of revolution than the pin C, and as clearly seen in Fig. 1.

E represents a shaft to which an oscillating movement is given and from which the power to operate the mechanism is to be imparted. The axis of the shaft E is parallel with the axis of the shaft A, and from the shaft E an arm F projects in a plane parallel with the plane of the crank B, and as here represented the face of the arm F is in the same plane as the face of the crank B, as seen in Fig. 5. From the arm F a crank-pin G projects, the axis of which is parallel with the axis of the two pins C D and of a length substantially equal to the two pins C D. A connection is made between the pin C of the crank B with the pin G of the arm F by a connecting-rod H, the rod being provided with a predetermined extent of lost motion on one pin or the other, here represented as by a slot I on the pin C, the slot being of a width corresponding to the diameter of the pin C, but of a length greater than that of the diameter of the pin. A second connecting-rod J in like manner connects the crank-pin D with the pin G, the rod J being constructed with a slot K, in which the pin D works, and so that a predetermined extent of lost motion will be permitted between the crank-pin D and the pin G. The arm F is of somewhat greater length than the length of the crank B, and, owing to the lost motion occasioned by the slots I K in the respective connecting-rods, an oscillating movement only will be imparted to the arm F from the continuously-revolving crank B.

In Fig. 1 the arm F is represented as in its extreme down position. In this position the pins stand in a direct line between the center of the shaft A and the center of the crank-pin G. In this position the crank-pin D stands at the extreme lower end of the slot K, in which it works. At the same time the crank-pin C stands at the extreme upper end of the slot in which it works, so that in this position there is a positive engagement between the crank and the arm F in both direc-

tions, so that the arm F will be practically held firm—that is, will be forced to its down position by the pin D and prevented from passing beyond that position by the pin C. Starting from this point, Fig. 1, the shaft A, with its crank B, revolves in the direction indicated by the arrow. The crank-pin C, working against the end of its slot most distant from the pin G of the arm F, will draw the arm F with the crank, as indicated in Fig. 2. At the same time the pin D has moved from the end of the slot nearest the pin G and is approaching the other extreme of its slot K. The position Fig. 2 is substantially midway between the two extremes of movement of the arm F. The crank B continues its revolution, as indicated in Fig. 3, until the centers of the pin G, the shaft A, and of the crank-pins C D again come into line, but with the pins C D upon the opposite side of the shaft A, and, as seen in Fig. 3, at this point the pin D has reached the outward extreme of its slot, while the pin C still remains in the same position in relation to its slot in which it started, and this is the extreme up position of the arm F. As the shaft A and crank continue the revolution from the position seen in Fig. 3, if the arm F be held firm, the pins C D of the crank will carry the links over with them; but the pins C D approach the pin G and recede from the extreme outer end of their respective slots, and, as seen in Fig. 4, this movement of the pins C D continuing, the pin D first reaches the extreme inner end of its slot, and until that point is reached neither of the crank-pins C D has any effect upon the arm F; but after the pin D comes into engagement with the inner end of its slot, as seen in Fig. 4, then the power of the revolving crank will be communicated through its link J to the arm F to commence a return swinging movement of the said arm F.

To hold the arm F firmly during the time in which the crank-pins are passing from the extreme outer end of the slot, so as to obtain a bearing upon the inner end of one of the slots, a segment L is made fast to the arm F, the outer surface of which is concentric to the shaft A when the arm is in the up position, as seen in Fig. 3.

The crank B is constructed with a projection M, from which a pin or friction-roll N projects toward the links. The distance of the pin or roll N from the shaft A corresponds to the outer surface of the segments L when the arm is in the up position and as seen in Fig. 3, and the length of the segment L is such that as the arm reaches its extreme up position, as seen in Fig. 3, the pin N in the rotation of the shaft A will have just reached the upper end of the segment L, and then, continuing, will pass onto that segment until the point when the crank-pins again commence their action upon the arm F is reached, and, as seen in Fig. 4, at this point the pin N escapes from the segment L. As the surface of the segment corresponds to the path of the inner surface of the pin N, that pin takes a bearing upon the face of the segment and rides upon that surface, thus holding the arm F firmly in the up position from the time the pin passes onto the segment, as seen in Fig. 3, until it escapes therefrom, as seen in Fig. 4. The pin N having escaped from the segment, as seen in Fig. 4, the continued revolution of the shaft A through the pin D imparts the downward movement to the arm F until the extreme down position is reached, as seen in Fig. 4, at which time the outer end of the slot I of the connecting-rod H will have come into engagement with the pin C, and as seen in Fig. 1, and so that when that point is reached the upward movement of the arm F will immediately commence. The shaft A, making successive revolutions, will impart a corresponding vibratory movement to the arm F and consequent oscillatory movement to the shaft E; but because of the lost motion between the crank of the shaft A and the arm F, the arm F will remain inactive during a portion of the revolution of the shaft A corresponding to the extent of the said lost motion, thus making the oscillatory movement of the shaft E intermittent.

Thus far the mechanism is the same as that described in my previous patent.

The object of my present improvement is to hold the arm F more rigidly during its movement than can be done where dependence for such support is had upon the slotted rods which connect the crank with the arm. That side of the arm next the crank and the periphery of the crank itself, are made of cam shape corresponding to the line of contact between the crank and arm during the movement of the arm described. The curves of the crank and of the arm to produce this result are clearly shown in the several figures. Consequently the arm F bears against the crank throughout the entire revolution of the crank, or nearly so, and is therefore as firm as if the arm were operated by a single pitman and without the slotted connections described, and yet the desired dwell or rest of the arm F without the interruption of the crank is the same as without such contact and as in my previous patent.

As arranged in my previous patent the return movement of the arm after the dwell commences as the crank-pin strikes the end of the slot. Consequently there would be more or less of a blow imparted by this pin upon the end of the slot and the start of the crank on its return would be sudden. To avoid this blow and make the start of the crank easy, I construct the end of the arm as at O and construct the crank with a corresponding surface P, which, as the crank revolves, will come gradually onto the surface O slightly before the crank-pin reaches the end of the slot to start the arm. The result of this is that the crank gradually starts the arm, so

that the arm commences its movement before the crank-pin has reached the lower end of the slot and so that the crank-pin comes upon its end of the slot while the connecting-rod and arm are moving, and thereby avoids the blow or sudden start which would be the natural result of the start produced by the crank-pin, as before described.

The crank may be constructed with the cam-surface P and the arm with a corresponding bearing-surface O, and so as to produce the gradual start on the return of the arm as I have described without the continuous contact between the crank and arm described. The various purposes to which this mechanical movement is adapted are fully set forth in my previous patent, and it is therefore deemed unnecessary to further refer to such uses in this specification.

I claim—

1. The combination of a revolving shaft carrying a crank having two crank-pins in the same radial line, but one more distant from the center of motion than the other, an oscillating shaft, an arm projecting radially from said oscillating shaft and in substantially the same plane as the plane of the said crank, the said arm carrying a projecting crank-pin, and two connecting-rods arranged on the crank-pin of the said oscillating shaft, the said connecting-rods joined, respectively, to two crank-pins on the said revolving shaft, the said connecting-rods constructed for a predetermined length of lost motion between the crank-pin and the oscillating shaft and the two crank-pins of the revolving shaft, the periphery of the crank and the adjacent surface of the said arm curved corresponding to the points of contact between the said crank and arm in the revolution of the crank, substantially as and for the purpose described.

2. The combination of a revolving shaft carrying a crank having two crank-pins in the same radial line, but one more distant from the center of motion than the other, an oscillating shaft, an arm projecting radially from said oscillating shaft and carrying a projecting crank-pin, and two connecting-rods arranged on the crank-pin of the said oscillating shaft, the said connecting-rods joined, respectively, to the two crank-pins on the revolving shaft, the said connecting-rods constructed for a predetermined length of lost motion between the crank-pin of the oscillating shaft and the two crank-pins of the revolving shaft, the crank constructed with a cam-surface P and the arm with a corresponding bearing-surface O, the said surfaces adapted to come gradually together as the return movement of the arm commences, substantially as and for the purpose described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ALFRED B. WILLCOX.

Witnesses:

WALTER M. FITCH,

ARTHUR L. FANNING.