No. 90,254. PATENTED MAY 18, 1869.

E. E. FURNEY.

MECHANICAL MOVEMENT.

Fig. 1.

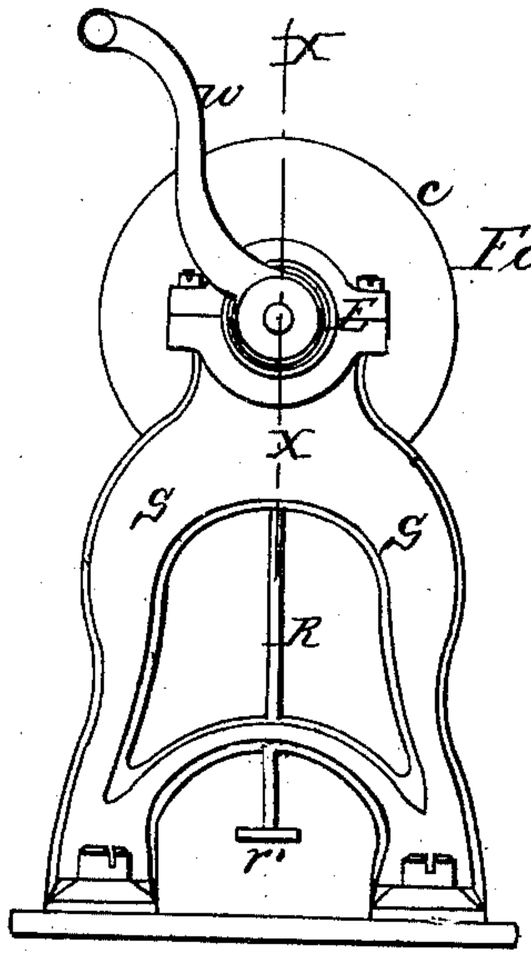


Fig. 2.

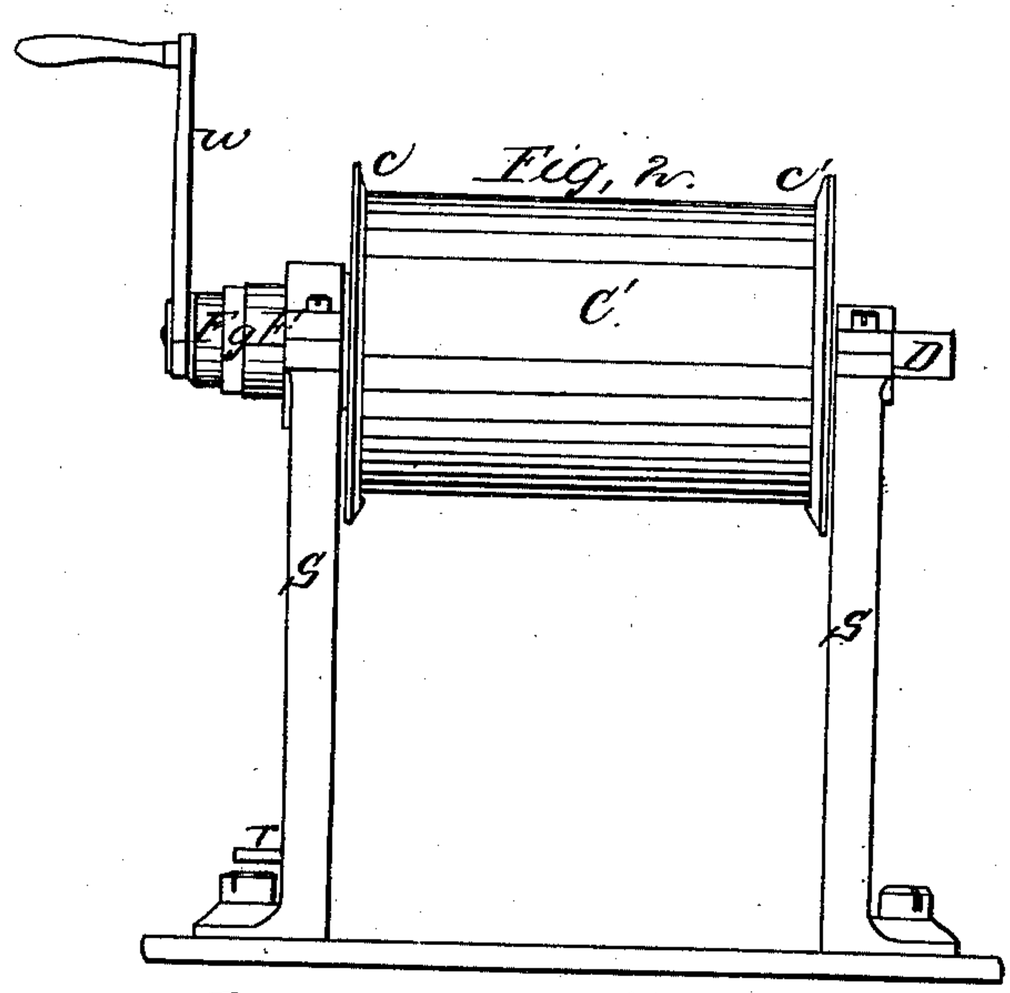


Fig. 8.

Fig. 9.

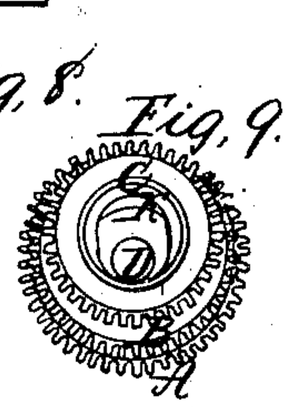


Fig. 3.

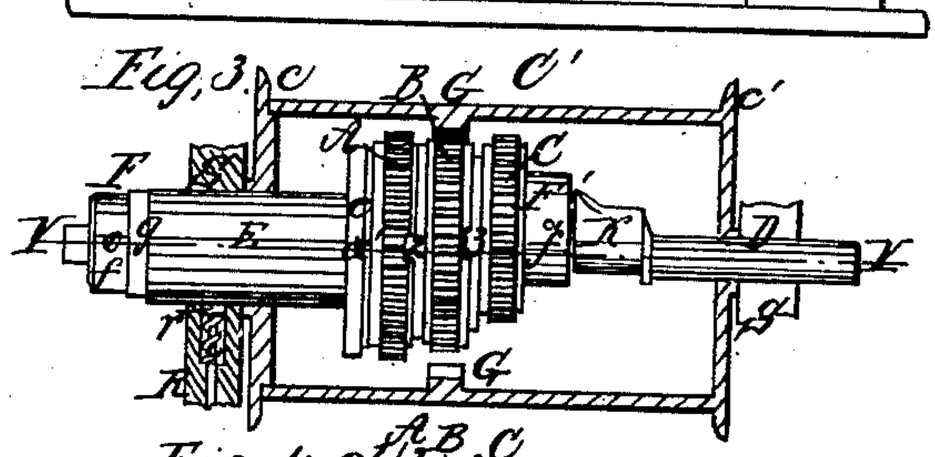


Fig. 7.

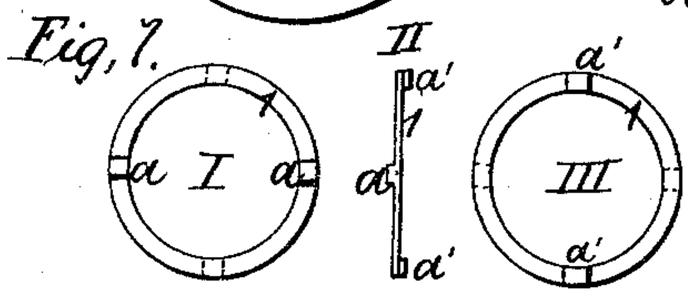


Fig. 4.

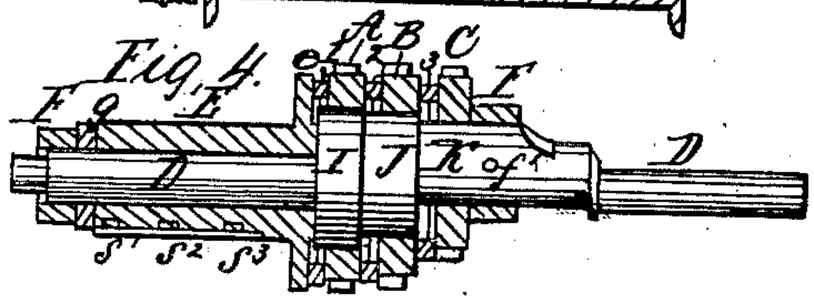


Fig. 6.

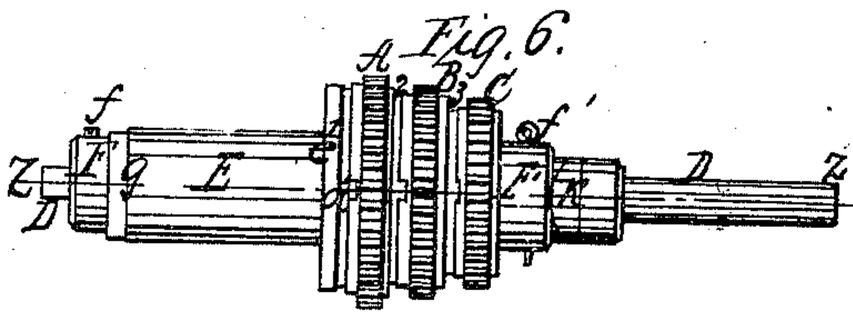
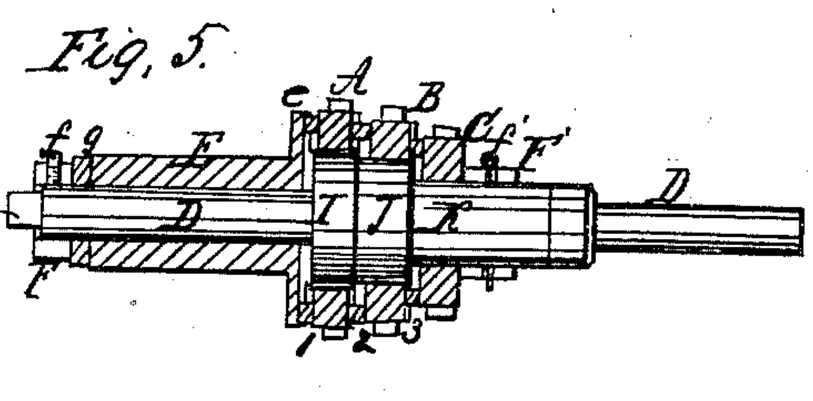


Fig. 5.



Witnesses,
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United States Patent Office.

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Letters Patent No. 90,254, *dated May* 18, 1869.

MECHANICAL MOVEMENT.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, E. E. FURNEY, of Chicopee, in the county of Hampden, and Commonwealth of Massachusetts, have invented a new and improved Mechanical Movement; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

My invention is herein shown and described as applied to a windlass, having a hollow cylinder, as a convenient and practical illustration of its operation in one of the numerous applications of which it is capable.

In the drawings—

Figure 1 is an end elevation of said windlass, having my application applied thereto;

Figure 2 is a side elevation of the same;

Figure 3 is a vertical and axial sectional view of the said cylinder, the contained shaft and its appurtenant parts being shown entire;

Figure 4 is a vertical axial section through said shaft and parts attached, as shown in fig. 3, or an axial sectional view, made by the horizontal plane *Z Z*, in fig. 6, the shaft being shown entire;

Figure 5 is a horizontal axial section of the parts carried upon the shaft, through the line Y Y, in fig. 3; and

Figure 6 is a plan view of the shaft and other parts, shown in the same relative position to the standards of the windlass which they occupy in fig. 3.

Figure 7. I, II, III, show, respectively, a front, side, and rear view of an annular disk, having projections on the opposite sides, and which may be denominated an annular key.

Figure 8 is an end view of said cylinder, the cap being shown as broken away, to display the concave gear attached to the interior of the cylinder, and the largest of the three gears upon the shaft.

Figure 9 is an end elevation of the shaft and the three gears which are carried upon it, the position of the shaft relatively to the standards being as shown in fig. 3.

The nature of my invention consists in the combination and arrangement of a sufficient number of such coacting parts, as are hereinafter described, to allow several different rates of transmitted motion to be produced in the same machine, or to allow the driving-shaft to revolve without communicating to the cylinder any motion whatever; and, further, relates to the means by which the co-operating parts are retained in one or another position of adjustment.

In the application of my invention to the windlass shown, one adjustment of the coacting parts requires twenty-five revolutions of the crank and main shaft to revolve the drum of the windlass once, thus increasing the transmitted power twenty-five times, less any loss by the friction of the co-operating parts.

In another adjustment, twelve and one-half revolutions of the main shaft produce a single rotation of the drum, the rate of increase of power being one-half of the preceding rate; while the third adjustment requires but about four and one-fourth revolutions of the shaft to revolve the drum once, being a smaller loss of speed, or "time," and also a less gain of power.

The construction may be varied, so as to allow a greater number of adjustments than above given, and any desired rate of increase of power, within practical limits, may be obtained

The construction of my invention is as follows:

The journals of the driven cylinder C are supported in bearings in the two standards S S.

The ends of the cylinder are closed by heads *c c*, which project beyond the cylinder, so as to form retaining-flanges at the ends, and the head *c* is removable, to allow access to the parts contained within the cylinders.

Central apertures, with proper bushings, are formed in the heads *c c*, through which the main shaft passes, these apertures being the bearings of the cylinder.

Rigidly attached to the inner face of the cylinder C is the toothed ring G, forming a concave, or internal gear, and having, in this case, fifty teeth. This ring is best located at a point near the middle of the length of the cylinder, to equalize the strain upon its end bearings.

The main shaft is continuous, and has at one end a rectangular head for receiving the eye of a crank, *w*, or a pulley may be keyed to it for receiving the driving-power.

Upon the shaft are formed the solid eccentric portions I J K, the thrust or eccentricity of I, relatively to the main shaft, being the least of the three, while that of K is the greatest.

A metallic ring, A, the cross-section of which is nearly rectangular, fits upon the eccentric I, so that the latter turns freely within the ring, and teeth similar to the teeth upon the concave gear G are formed upon its convex surface, being forty-eight in number.

A similar ring, B, of greater thickness, but of less diameter, and having forty-six teeth, is carried in like manner upon the eccentric J.

A third ring, C, of still greater thickness, and of a smaller diameter than B, and having thirty-eight teeth, is applied to the eccentric K.

The respective thickness of the three toothed rings, or gears A B C, is such that the thrust of their sev-

eral eccentrics, at each revolution of the main shaft, will cause either of the gears which is in line with the concave gear G, to mesh with it at one point in the revolution, as shown in fig. 3, where the gear B is represented as engaged with the concave gear G, and if the revolution of the main shaft be continued, one tooth after another of B will be thrown outward by the eccentric J, so as to mesh with the corresponding teeth of G.

It is necessary, that while the main shaft revolves, the gears A B C should not revolve relatively to the standards of the machine, but still should be left free to move in and out relatively to the axis of the main shaft, with the eccentrics which carry them.

I will, therefore, describe the means which I employ to prevent this revolution of the gears, and at the same time allow them freedom to follow the thrust of the eccentrics.

The sleeve E encloses the main shaft D, and has a collar, *e*, at its inner end, of a diameter a little less than the gear A.

Three circular recesses, s^1 s^2 s^3, are formed in the sleeve, and a rod, R, having a foot-plate, *r'*, is arranged to have a vertical movement in ways cut in the standard S.

A spiral spring, set in a recess in the standard, forces the enlarged end *r* of the rod upward, as a detent into one or the other of the recesses in the sleeve, thus preventing the latter from revolving with the main shaft.

A longitudinal channel extends along the line of s^1 s^2 s^3, so that the sleeve is still prevented from turning when moved longitudinally.

The three recesses are so located that when the detent is in the first recess s^1, the largest gear A will engage with the concave gear G, and when the sleeve is drawn out, so that the detent is in the second recess, the middle gear B will mesh with G, as is shown in fig. 3, while if *r* be entered in the third recess s^3, the smallest gear will be brought into action, and the other two will be disengaged, only one of the convex gears acting at a time.

To connect the gears with the sleeve, so that the two shall not revolve with the main shaft, I make use of three annular keys, 1, 2, 3, one for each gear.

The key 1 is shown in fig. 7, and has two equidistant projections, rectangular in form, *d d*, *d' d'*, on each face, the four being placed at the four quarters of the annular disk.

Projections are formed on the other keys in the same manner, and the three keys correspond nearly in diameter to the three gears A B C.

A rectangular channel is cut diametrically in the collar *e*, to receive the projections *d d* on one side of the ring 1, and a corresponding channel at a right angle to the former, in the gear A, in which the projections *d' d'*, on the other side of the ring 1, will slide.

In like manner, the annular key 2 is placed between the gears A and B, channels at a right angle to one another being formed in the adjacent faces of the two gears, to receive the projections on the opposite sides of the key 2.

In the same way, the key 3 is adjusted between the gears B and C.

To retain these several parts in place upon the main shaft, the collar F is pinned to the shaft at the crank-end, and the collar F' is also secured to the shaft beyond the third gear C.

The operation of the annular keys, in allowing the gears freedom of motion relative to the eccentrics, while preventing their revolution with the main shaft, can best be seen by removing the cylinder, and then replacing the main shaft in its bearings upon the standards.

It will then be readily observed that the described arrangement of the annular keys and channels permits the eccentrics to operate their respective gears freely, while the latter are still coupled by the sliding keys to the stationary sleeve, and therefore do not revolve.

It will also be evident that the end of each tooth of the gears A B C describes, during one revolution of the main shaft, a perfect circle, the radius of which will be equal to the eccentricity of that part of the shaft which carries the gear.

It is this constant evolution of circles by the several teeth which successively engage with the teeth of the concave gear G, which causes the revolution of the cylinder C', each successive tooth adding an increment of motion to the cylinder.

The progress of the surface of the cylinder at each revolution of the main shaft will, therefore, be equal to the diameter of one of the equal circles, which are formed, as aforesaid, by the ends of the teeth of that gear, A, or B, or C, which is at the time engaged with the gear G on the inside of the cylinder.

The operation of shifting the rate of speed is performed by simply sliding the main shaft in or out of the cylinder, until the detent *r* enters the proper recess in the sleeve.

In large machines, this sliding of the main shaft would require the use of levers, or other common mechanical devices, and the rod R, worked by foot-power, may be dispensed with, and a small lever, to be worked by hand, be substituted therefor.

As it is sometimes desirable, with a light load, to use the full rate of speed which is applied to the machine, I propose to attach a clutch to the main shaft, whereby the cylinder C' may be driven directly by the shaft, without allowing the gears A, B, C, and G, to mesh together.

It will be seen that the space between the teeth of any two adjacent gears is sufficient to allow the teeth of G to enter this space, and there remain without engaging with either A, B, or C.

In this position of the parts, the main shaft can be revolved without moving the cylinder, and the main shaft would necessarily be brought to this position, if it were to be coupled directly to the cylinder by a clutch or any similar device.

The use of any pawls upon the main shaft, in the windlass shown, for the purpose of preventing any backward movement, if the crank should be released, is unnecessary, inasmuch as the relation of the coacting parts is such, that while the cylinder is revolved by turning the main shaft, the latter cannot be revolved by turning the cylinder, which result is, in many applications of this mechanical movement, of great value, in simplifying the construction, and in preventing accidents to the machinery itself and to those operating it.

The same mechanism herein described may be applied to many machines in which a complicated system of gearing, or pulleys and belts, is now necessary to obtain different rates of motion in the same machine, and may be used with a vertical main shaft, as well as the horizontal one shown.

Having described my invention,

What I claim as new therein, and desire to secure by Letters Patent, is—

1. The combination of the cylinder, having a concave gear, G, applied thereto, main shaft D, having one or more eccentric portions I J K, and a gear, A, B, or C, for each of such eccentrics, when such gears are left free to follow the thrust of their respective eccentrics, but are prevented from revolving with the main shaft by means of the sleeve and

annular keys, substantially as and for the purposes specified.

2. The construction of the annular keys 1, 2, 3, in combination with the channelled rings A, B, or C, carried upon eccentrics, and with the stationary channelled disk, or collar *e*, substantially as and for the purposes set forth.

In witness whereof, I have hereunto set my hand, this 17th day of August, A. D. 1868.

E. E. FURNEY.

Witnesses:

J. P. BUCKLAND,
E. J. SOMMER.