3 Sheets—Sheet 1.

T. A. WESTON.

Ratchet Mechanism and Clutch for Machinery.

No. 212,336. **Patented Feb. 18, 1879.**

Fig 2.

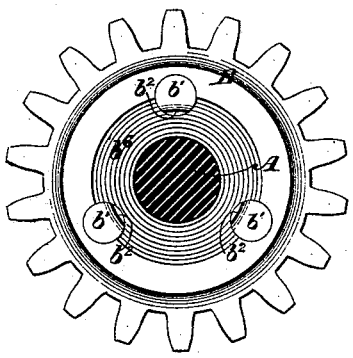


Fig 1.

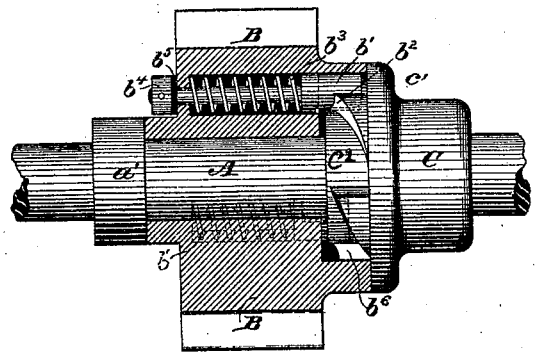


Fig 3.

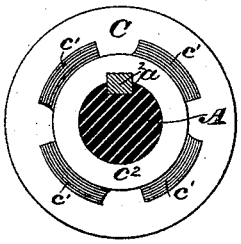
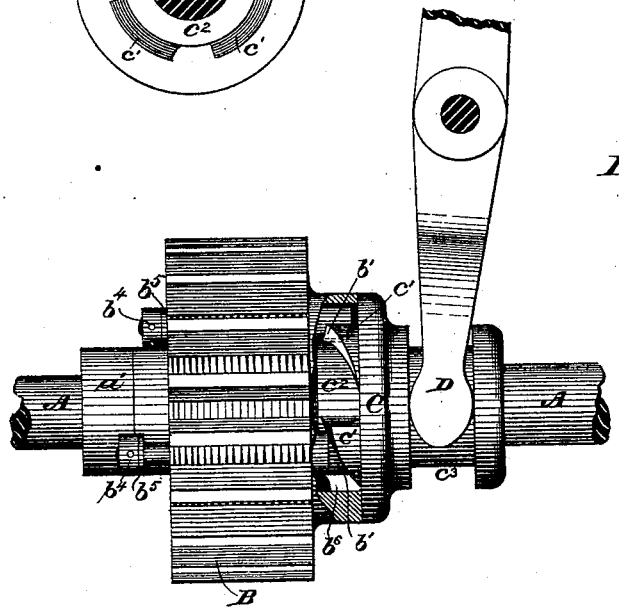


Fig 4.



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3 Sheets—Sheet 2.

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Fig 6.

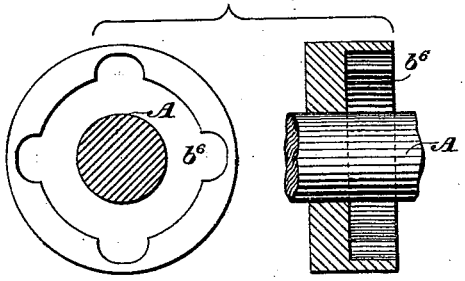
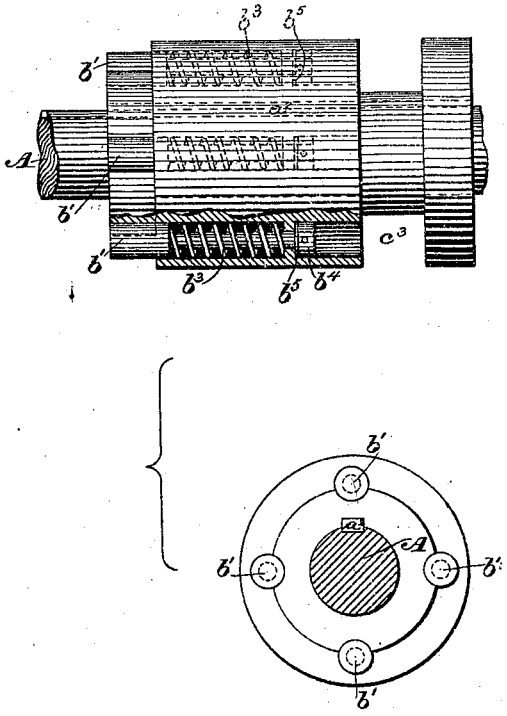


Fig 5.



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Ratchet Mechanism and Clutch for Machinery.

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Fig 8.

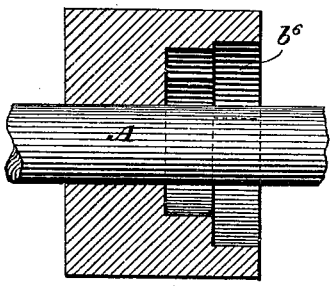


Fig 7.

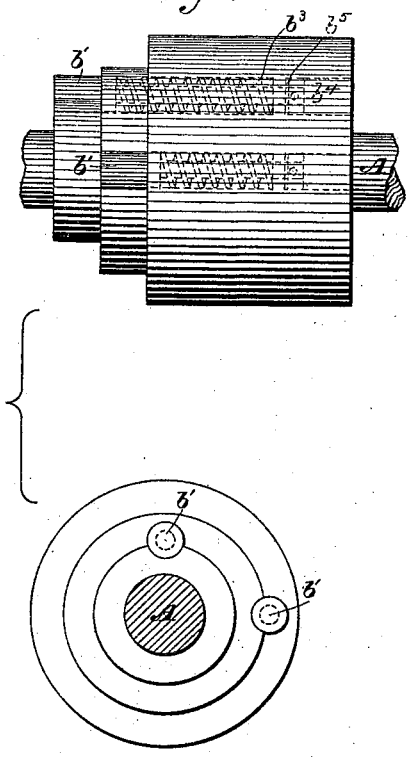


Fig 9.

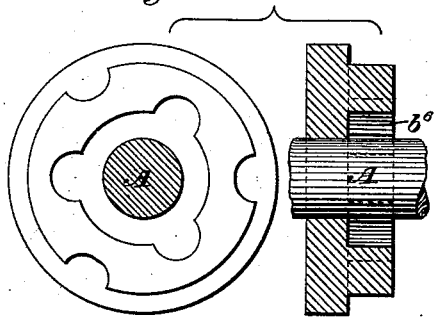
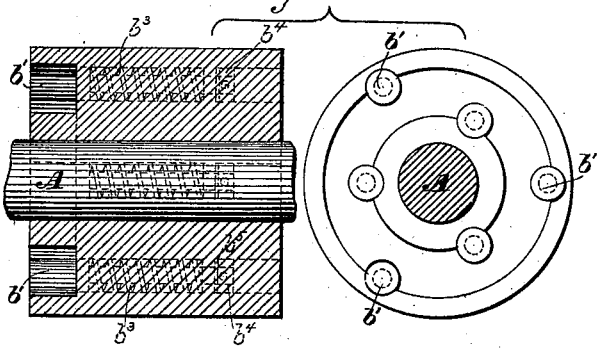


Fig 10.



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UNITED STATES PATENT OFFICE.

THOMAS A. WESTON, OF STAMFORD, CONNECTICUT.

IMPROVEMENT IN RATCHET MECHANISM AND CLUTCH FOR MACHINERY.

Specification forming part of Letters Patent No. **212,336**, dated February 18, 1879; application filed August 20, 1878; patented in England, September 22, 1877.

To all whom it may concern:

Be it known that I, THOMAS A. WESTON, of Stamford, in the county of Fairfield and State of Connecticut, have invented certain Improvements in Ratchet Mechanism and Clutches for Machinery, of which the following is a specification, and for which I received Letters Patent in England, No. 1,230 of 1877.

My improvements constituting my present invention are applicable, first, to the ratchet mechanism for which I obtained Letters Patent of the United States, March 3, 1868, Nos. 75,090 and 75,091; and, secondly, as an improvement upon and substitute for the ordinary claw-clutches and forked clutches used in machinery.

My invention is further applicable to many of the uses of ordinary ratchet-wheels and pawls, the object of my invention, wherever applied, being to give to this class of devices greater strength, durability, convenience of manipulation, certainty of action, and economy in first cost and in maintenance.

In the accompanying drawings, Figures 1 to 3 represent my invention as applied to a spur-pinion and shaft.

A is the shaft, having a fixed collar, a^1. B is a pinion, capable of turning freely upon the shaft, and containing three sliding bolts or pawls, b^1. C is a crown ratchet-wheel, having four teeth, c^1, projected from the boss c^2.

The subdivision of the circle into three parts by the three pawls, and into four parts by the four teeth, constitutes a differential or "vernier" arrangement of the pawls and teeth, whereby twelve coincidences or engagements between them are provided for. This construction affords a multiplicity of stops, (twelve in number,) or the effect of a twelve-toothed ratchet-wheel and one pawl, with the advantage of the greater strength due to dividing the wheel into four teeth only. The said differential action and the general character of the aforesaid pawls and teeth are similar to those of the devices of my United States Patents of March 3, 1868, Nos. 75,090 and 75,091.

The ratchet-wheel C is keyed to the shaft by a key, a^2. The teeth c^1 are sloped on one side, so as to force back the pawls and slip over them one way, while they are capable of driving the pinion, or being driven by it, in the other direction by the abutting of the vertical faces or sides of the teeth against the pawl ends. The pawls are impelled constantly toward the teeth c^1 by springs b^3, and the extreme end or tail of each pawl carries a nut or collar, b^4, and an elastic washer or buffer, b^5, to deaden the noise of percussion occurring when the pawl shoots into the spaces between the teeth c^1 of the ratchet-wheel. The acting or driving end of the pawl has a small concave, b^2, upon it, cut to the curve of the boss c^2 of the ratchet-wheel over which it slides, whereby the pawl is kept from turning upon its axis, and its easy sliding motion is thus better secured.

In the devices of my aforesaid United States patents it will be seen that the pawls at their acting ends project unsupported from the pawl barrel or hub containing them, so that they are exposed to be bent or broken off should sufficient force be applied; whereas, in this, my present invention, the pawls are shrouded or embraced by the solid metal of the hub or pinion up to their extreme points, of which a segment only is exposed to the action thereon of the teeth, the strain being a combined shearing and crushing strain. This result is secured by my improved construction in the following manner: The circle of ratchet-teeth c^1 has an exterior diameter adapted to fill and turn easily within the recess b^6 in the pinion. Into the recess b^6 the pawl ends project to about one-half their diameter only, the other half or back being embedded in the solid metal of the pinion or hub. The strain upon the exposed portion of the pawls, due to the action thereon of the teeth, is therefore transmitted directly to the shrouding portion of the surrounding hub in which the pawls slide, and the pawls therefore cannot be bent, but are exposed to a simple crushing-strain.

I am thus enabled to use pawls of reduced diameter, but increased strength, made from common round rods of steel or other metal, with an economy of space, materials, and workmanship.

The device thus represented in Figs. 1 to 3 is applicable to the transmission of continuous or intermittent rotary motion, either from

the shaft to the pinion or hub, or vice versa, and independent motion or slipping is possible in one direction only. To employ the said device as a driving-clutch capable of entire disconnection, the ratchet-wheel C may be fitted to slide upon its key a^2 by means of a forked lever, D, Fig. 4, the forks of which engage with the groove c^3. By the said lever, or any equivalent means, this, my improved ratchet or claw-clutch, may be at any instant, by a single positive movement, forced into engagement with the pinion B, the pawls sliding backward upon their springs and adapting their position to that of the ratchet-teeth or claws, whatever it may chance to be. The differential arrangement of the pawls and teeth yielding the effect of numerous small teeth by means of a few large ones, reduces backlash or lost motion to a minimum.

Instead of arranging the pawls around an interior recess in the hub or pinion, as in Figs. 1 to 4, they may be arranged around an exterior rim, as in Fig. 5, where the inner side of the pawls is shrouded, and the outer side exposed to act upon an annular clutch-wheel, Fig. 6, having four recesses with vertical sides, capable of driving the pawl-hub, or of being thereby driven in either direction in the manner of an old-style forked clutch, except that, as before explained, the hub and clutch-wheel may at one movement be placed instantaneously in position for driving. In this last example the hub is shown as having a groove around it, for engagement with an operating-lever similar to D, Fig. 4.

With a number of teeth or recesses in the clutch-wheel, Fig. 6, equal to the number of pawls, no differential or vernier action occurs; but, the pawls all acting together, their united strength is utilized for driving, and by giving an excess of strength to the clutch-wheel any unavoidable breakage from overstrain will fall upon the cheap movable pawls. These being easily replaced, an economical safety arrangement is obtained for use in place of the breaking-spindle used in rolling-mills and other kindred devices.

If desired, the annular projections of the clutch-wheel, Fig. 6, can be sloped on one side in like manner to the teeth of Figs. 1 to 4, and made of unequal number to the pawls. The action and functions would then be similar. Also, if desired, an internal pawl-hub, like Fig. 1, could be employed clutch-fashion to drive an external pawl-hub, such as Fig. 5, provided the recess b^6, Fig. 6, were of right internal diameter to receive the pawl-rim of Fig. 5 in like manner as it receives the ratchet-wheel C. The two sets of pawls, then, if unequal in number, would give the vernier or differential effect of numerous engagements and small backlash, and be capable of driving both ways, but not of slipping until wholly separated and uncoupled.

My improved sliding pawls may be arranged in concentric circles, as in Fig. 7, where one pawl only is shown in each rim or circle. The number of pawls, however, in each circle, as also the aggregate number, may be varied as required, and they may be arranged differentially throughout in regard to the ratchet-teeth—that is, each rim or circle be differential as to its own set or circle of teeth, and also the separate rims and sets be differential as to the other sets. The last-named arrangement would yield the maximum of minute subdivision in a revolution, and enable me to obtain the very numerous stops due to a large circle of differential teeth and pawls within the compass of a small circle, thus securing compactness, convenience, and economy of manufacture.

Fig. 8 represents, in section, a ratchet or clutch wheel for the pawl-hub, Fig. 7. Fig. 9 shows an end elevation and a longitudinal sectional view of a clutch-wheel. Fig. 10 shows a concentric arrangement of pawls placed alternately upon convex and concave rims.

My invention is applicable whether the pawls slide in lines parallel with the shaft or hub, as shown in the accompanying drawings, or whether they are at right angles with or tangential to the shaft, as in the device of my United States Patent No. 75,089, March 3, 1868. My invention is also generally applicable to the common uses of ordinary ratchet-wheels and pawls, and of ordinary claw-clutches and forked clutches, as hereinbefore fully set forth.

I claim as of my invention—

1. In ratchet and clutch mechanism, the combination of a ratchet and clutch wheel, a revolving pawl-hub, and a supporting device or shrouding, whereby the acting or driving end of each sliding pawl is supported, substantially as described.

2. In ratchet and clutch mechanism, a driving-clutch, consisting of a pawl-hub with shrouded sliding pawls, a ratchet or clutch wheel, and a device for shipping into and out of engagement, substantially as described.

3. In ratchet and clutch mechanism, a driving-clutch having its sliding pawls arranged in concentric sets or circles, substantially as described, for the purpose of securing the maximum of differential subdivision within the minimum diameter.

In testimony whereof I have hereunto subscribed my name.

THOS. A. WESTON.

Witnesses:

MARCUS S. HOPKINS,

BALTIS DE LONG.