

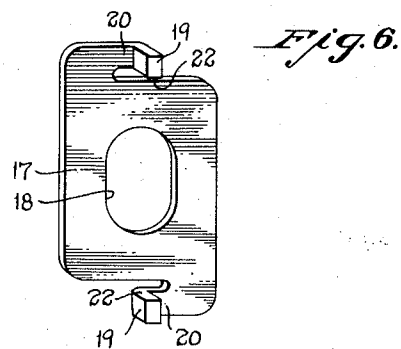
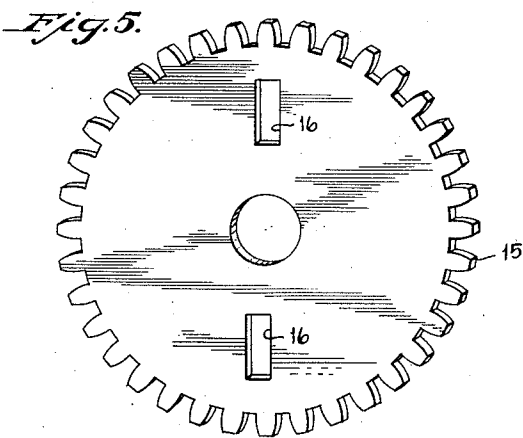
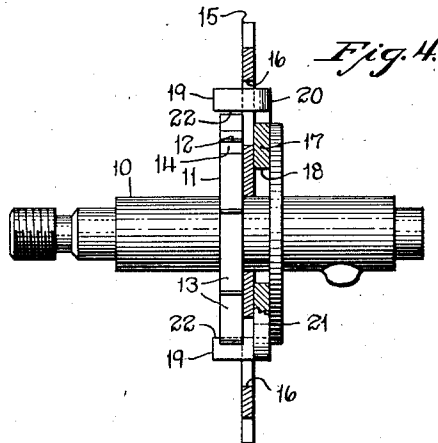
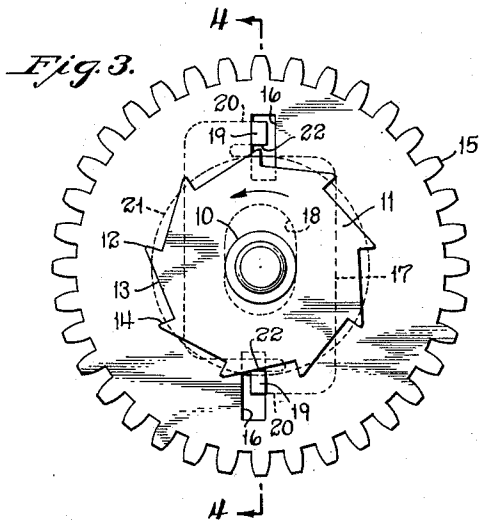
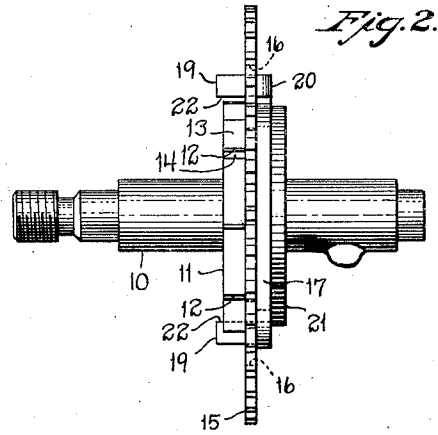
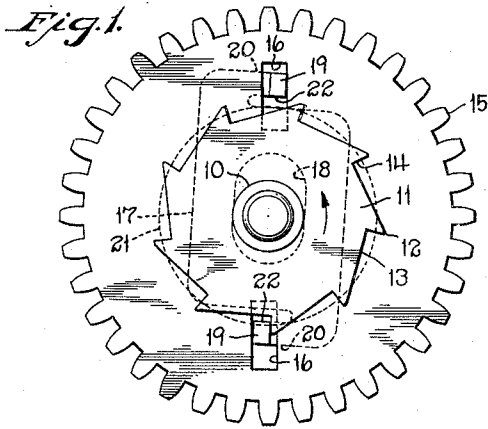
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2,482,435

RATCHET MECHANISM FOR TIMEPIECES

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RATCHET MECHANISM FOR TIMEPIECES

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10 Claims. (Cl. 58—46)

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The present invention relates in general to ratchet-mechanisms and more especially to an improved pawl for the ratchet-mechanism of a timepiece.

An object of the invention is to provide a superior ratchet-mechanism which may be manufactured of parts which are easily fabricated and of dependable and durable construction.

A further object of the invention is to provide a superior ratchet-mechanism for timepieces wherein a double-ended pawl is provided which is positively actuated at all times by the teeth of a ratchet-wheel as the latter is rotated relative to a drive-wheel, thereby insuring immediate locking action between the drive-wheel and the ratchet-wheel when the latter is rotated in the direction of rotation of the drive-wheel.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Fig. 1 is a front elevation of a ratchet-mechanism constructed in accordance with the present invention with one pawl-finger against the perpendicular face of a tooth of the ratchet-wheel;

Fig. 2 is an edge view of the ratchet-mechanism of Fig. 1;

Fig. 3 is a front elevation similar to Fig. 1 but showing one pawl-finger in camming engagement with the sloping surface of one of the teeth of the ratchet-wheel;

Fig. 4 is an edge elevation in section on line 4—4 of Fig. 3;

Fig. 5 is a perspective view of the gear-wheel of the ratchet-mechanism; and

Fig. 6 is a perspective view of the pawl-plate of the ratchet-mechanism of this invention.

The ratchet-mechanism as illustrated in the drawings is an exemplary embodiment of the invention as applied to a timepiece and more especially to an arbor 10 of one of the drive-springs of a timepiece. A ratchet-wheel 11 is mounted on the arbor 10 substantially intermediate its opposite ends and is adapted to be fixedly secured thereon by any suitable fastening-means such as, for example, a force or drive fit, the ratchet-wheel comprising a set of peripheral teeth 12, each tooth having a tangential or sloping face 13 and a radial face 14, the latter being substantially perpendicular to the sloping face 13 of the next-successive tooth. Mounted freely on the arbor 55

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10 in juxtaposition to and preferably against one side of the ratchet-wheel 11 is a drive-wheel 15 constituting a drive-gear for transmitting the power of a wound spring (not shown) to the time-train or alarm-train of the timepiece, as the case may be. As shown especially well in Fig. 5, the drive-wheel 15 is provided with a pair of elongated substantially-rectangular clearance-apertures 16 in diametrically-opposed relationship, the longitudinal axes of the apertures being in alignment and extending radially from the center of the wheel. As related to the ratchet-wheel 11 and more particularly to the over-all diameter of its teeth 12, the loci of the outer ends of the teeth coincide with a circumferential line about the center of the drive-gear wheel and of a diameter to intersect each radial clearance-aperture 16 substantially intermediate its opposite ends.

The double-ended pawl of this invention is shown especially well in Fig. 6 and comprises a substantially-rectangular plate 17 having an elongated central aperture 18, the longitudinal axis of which coincides with the longitudinal axis of the plate 17. The transverse dimension of the aperture 18 is slightly greater than the diameter of the arbor 10, as shown especially well in Figs. 1 and 3, so that when the pawl-plate 17 is mounted thereon, the plate will have substantially no lateral movement relative to the arbor. The opposite ends of the elongated aperture 18 are rounded as shown, and the over-all length of the elongated aperture is considerably greater than the diameter of the arbor, whereby the pawl-plate may enjoy appreciable rectilinear movement in a plane parallel to the plane of the drive-wheel and in the direction of the common longitudinal axis of the said radial clearance-apertures 16.

For the purpose of brevity, this rectilinear movement of the pawl-plate is hereinafter referred to as its transverse movement relative to the drive-wheel 15.

At each end of the pawl-plate 17 is a pawl-finger indicated generally at 19, each finger comprising the outer free end of a substantially-rectangular tang 20 cut from or otherwise formed at the corresponding end of the pawl-plate, the outer free end 19 of each tang being bent up at substantially right angles to the plane of the plate. Each pawl-finger 19 thus constitutes a substantially-rectangular block-like member, the width of which, as shown especially well in Fig. 3, is less than the transverse dimension of a radial clearance-aperture 16 of the drive-wheel, while the longitudinal dimension of each pawl-finger is considerably less than the longitudinal dimension

of a radial clearance-aperture 16. Consequently, when the pawl-fingers extend through their respective clearance-apertures 16 of the drive-wheel, as hereinafter described, the fingers 19 will engage freely therein and have appreciable longitudinal movement with respect thereto, that is to say, movement transversely of the drive-wheel.

As shown in Fig. 4, the pawl-plate 17 is adapted to be mounted freely on the arbor 10 in juxtaposition to and preferably against the adjacent side of the drive-wheel 15 opposite that side which is in juxtaposition to the ratchet-wheel, with the fingers 19 of the pawl-plate extending through the respective radial clearance-apertures 16 of the drive-wheel 15 into cooperative engagement with the teeth 12 of the ratchet-wheel, the pawl-plate 17 being effectively held from movement longitudinally on the arbor 10 away from the drive-wheel 15 by means of a retaining-collar 21 which is fixedly secured to the arbor 10 and engages against the outside face of the pawl-plate 17.

Referring especially to Figs. 1 and 3, it will be noted that the distance between the inner faces 22 of the respective pawl-fingers 19 measured on the longitudinal axis of the pawl-plate 17, is slightly less than the over-all diameter of the ratchet-wheel. In accordance with this construction, the inner faces 22 of the respective pawl-fingers 19 are adapted to be moved positively into operative engagement with each successive tooth 12 of the ratchet-wheel. Thus, when the inner face 22 of the upper pawl-finger 19 of Fig. 3 just clears the point of the upper tooth 12 of the ratchet-wheel, the inner face 22 of the lower pawl-finger 19 will be in camming engagement with the sloping face 13 of its respective tooth of the ratchet-wheel, and hence when the ratchet-wheel 11 is rotated counterclockwise, as indicated in Fig. 3, the lower pawl-finger will be cammed downwardly positively to a position such that its inner face 22 clears the point of its respective tooth 12 of the ratchet-wheel while the upper pawl-finger will have been drawn downwardly in rear of the perpendicular face of its respective tooth for subsequent engagement by the sloping surface of the next succeeding ratchet-tooth. Further rotation of the ratchet-wheel in a counterclockwise direction thereupon causes the upper pawl-finger 19 to be cammed upwardly transversely with respect to the drive-wheel 15 thereby simultaneously pulling the lower pawl-finger upwardly positively in rear of the substantially-perpendicular face of its respective ratchet-tooth. Since the perpendicular faces 14 of the respective ratchet-teeth 12 are moving away from the corresponding pawl-fingers 19 of the pawl-plate, the ratchet-wheel imparts substantially rectilinear movement only to the pawl-plate.

Specifically, when the arbor 10 is rotated counterclockwise as, for example, when winding a spring of the timepiece, the ratchet-wheel 11 rotates in the direction of the arrow in Figs. 1 and 3, and relative to the drive-wheel 15, the latter being disconnected therefrom by reason of the direction of rotation of the ratchet-wheel with respect thereto and the resulting rectilinear movement of the double-ended pawl-plate 17, as hereinabove described. Since the pawl-plate is operatively connected to the drive-wheel by engagement of its pawl-fingers 19—175 in the radial clearance-apertures 16—16 thereof, the pawl-plate is thereby restrained from rotating but, on the other hand, is free to enjoy rectilinear

movement transversely with respect to the drive-wheel because of the construction of the pawl-fingers which permits them to move transversely freely in the clearance-apertures 16 of the drive-wheel. Thus, as each pawl-finger 19 is successively engaged by the sloping faces of the succeeding teeth 12 of the ratchet-wheel, the pawl-plate 17 is reciprocated transversely of the drive-wheel with at least one finger of the pawl-plate being in engagement positively with a tooth of the ratchet-wheel throughout the rotation thereof.

However, when the arbor 10 is rotated in the opposite direction, or clockwise, as, for example, by the force of a wound spring, then the pawl-finger 19, which is in the path of an oncoming perpendicular face 14 of one of the teeth of the ratchet-wheel, will be engaged thereby and subjected to a shearing strain between the perpendicular face of that particular ratchet-tooth and the wall of the clearance-aperture 16 of the drive-wheel through which the finger projects, as a consequence of which the drive-wheel will be effectively locked to the ratchet-wheel and rotated thereby in a clockwise direction for driving the time-train or alarm-train of the time-piece, as the case may be.

From the foregoing it will be seen that the invention provides a superior pawl-mechanism embodying a single double-ended pawl-plate such that its fingers are positively engaged at all times with the teeth of the ratchet-wheel, the click action of the pawl-plate being positive and independent of a pawl-spring or other resilient member. Moreover, the pawl-plate and cooperating mechanism comprise durable elements which are easily fabricated and operable in a simple and efficacious manner.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. In a ratchet-mechanism, the combination with a ratchet-wheel and a coaxial drive-wheel mounted in juxtaposition thereto with capacity for relative rotary movement, the said drive-wheel having substantially diametrically-opposed radial clearance-apertures; of a pawl-plate located in juxtaposition to said drive-wheel on the side thereof opposite said ratchet-wheel, said pawl-plate being movable transversely with respect to said drive-wheel and having diametrically-opposed fingers movable in and arranged to project through the radial apertures respectively of said drive-wheel into engagement with the teeth of said ratchet-wheel, said fingers being adapted thus to lock said drive-wheel to said ratchet-wheel for rotating said drive-wheel in the direction of rotation of said ratchet-wheel and to be moved positively into and out of engagement with successive teeth of said ratchet-wheel when the latter is rotated relative to said drive-wheel.

2. In a ratchet-mechanism, the combination with a ratchet-wheel and a coaxial drive-wheel mounted in juxtaposition thereto with capacity for relative rotary movement, the said drive-wheel having substantially diametrically-opposed radial clearance-apertures; of a pawl-plate located in

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juxtaposition to said drive-wheel on the side thereof opposite said ratchet-wheel, said pawl-plate having an elongated axial aperture to enable said pawl-plate to move transversely with respect to said drive-wheel, and diametrically-opposed fingers movable in and arranged to project through the radial apertures respectively of said drive-wheel into engagement with the teeth of said ratchet-wheel, said fingers being adapted thus to lock said drive-wheel to said ratchet-wheel for rotating said drive-wheel in the direction of rotation of said ratchet-wheel and to be moved positively into and out of engagement with successive teeth of said ratchet-wheel when the latter is rotated relative to said drive-wheel.

3. In a ratchet-mechanism, the combination with a ratchet-wheel and a coaxial drive-wheel mounted in juxtaposition thereto with capacity for relative rotary movement, the said drive-wheel having substantially diametrically-opposed radial clearance-apertures; of a pawl-plate located in juxtaposition to said drive-wheel on the side thereof opposite said ratchet-wheel, said pawl-plate being movable transversely with respect to said drive-wheel and having diametrically-opposed fingers formed substantially perpendicular to the plane thereof and movable in and arranged to project through the radial apertures respectively of said drive-wheel into engagement with the teeth of said ratchet-wheel, said fingers being adapted thus to lock said drive-wheel to said ratchet-wheel for rotating said drive-wheel in the direction of rotation of said ratchet-wheel and to be moved positively into and out of engagement with successive teeth of said ratchet-wheel when the latter is rotated relative to said drive-wheel.

4. In a ratchet-mechanism, the combination with a ratchet-wheel and a coaxial drive-wheel mounted in juxtaposition thereto with capacity for relative rotary movement, the said drive-wheel having substantially diametrically-opposed radial clearance-apertures; of a pawl-plate located in juxtaposition to said drive-wheel on the side thereof opposite said ratchet-wheel, said pawl-plate having an elongated axial aperture to enable said pawl-plate to move transversely with respect to said drive-wheel and a pair of diametrically-opposed fingers in alignment with the longitudinal axis of said elongated aperture, said fingers being formed substantially perpendicular to the plane of said pawl-plate and movable in and arranged to project through the radial apertures respectively of said drive-wheel into engagement with the teeth of said ratchet-wheel, said fingers being adapted thus to lock said drive-wheel to said ratchet-wheel for rotating said drive-wheel in the direction of rotation of said ratchet-wheel and to be moved positively into and out of engagement with successive teeth of said ratchet-wheel when the latter is rotated relative to said drive-wheel.

5. In a ratchet-mechanism, the combination with a ratchet-wheel and a coaxial drive-wheel mounted in juxtaposition thereto with capacity for relative rotary movement, the said drive-wheel having substantially diametrically-opposed radial clearance-apertures; of a pawl-plate located in juxtaposition to said drive-wheel on the side thereof opposite said ratchet-wheel, said pawl-plate being movable transversely with respect to said drive-wheel and having a pair of diametrically-opposed fingers movable in and arranged to project through the radial apertures respectively of said drive-wheel into engagement with

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the teeth of said ratchet-wheel, said fingers being spaced apart diametrically a distance slightly less than the over-all diameter of said ratchet-wheel such that when said ratchet-wheel is rotated relative to said drive-wheel, each finger of said pawl-plate will be successively moved positively into engagement with the perpendicular face of one tooth of said ratchet-wheel by the camming action of the oppositely-disposed finger with the sloping face of a second tooth of said ratchet-wheel, the finger on engagement with the perpendicular face of the said one ratchet-tooth being subjected to shearing strain between the said perpendicular face of said one tooth and the wall of its radial clearance-aperture in said drive-wheel when said ratchet-wheel is rotated in the direction of rotation of said drive-wheel to effectively lock said wheels together.

6. In a ratchet-mechanism, the combination with a ratchet-wheel and a coaxial drive-wheel mounted in juxtaposition thereto with capacity for relative rotary movement, the said drive-wheel having substantially diametrically-opposed radial clearance-apertures; of a pawl-plate located in juxtaposition to said drive-wheel on the side thereof opposite said ratchet-wheel, said pawl-plate having an elongated axial aperture to enable said pawl-plate to move transversely with respect to said drive-wheel and having a pair of diametrically-opposed fingers movable in and arranged to project through the radial apertures respectively of said drive-wheel into engagement with the teeth of said ratchet-wheel, said fingers being spaced apart diametrically a distance slightly less than the over-all diameter of said ratchet-wheel such that when said ratchet-wheel is rotated relative to said drive-wheel, each finger of said pawl-plate will be successively moved positively into engagement with the perpendicular face of one tooth of said ratchet-wheel by the camming action of the oppositely-disposed finger with the sloping face of a second tooth of said ratchet-wheel, the finger in engagement with the perpendicular face of the said one ratchet-tooth being subjected to shearing strain between the said perpendicular face of said one tooth and the wall of its radial clearance-aperture in said drive-wheel when said ratchet-wheel is rotated in the direction of rotation of said drive-wheel to effectively lock said wheels together.

7. In a ratchet-mechanism, the combination with a ratchet-wheel and a coaxial drive-wheel mounted in juxtaposition thereto with capacity for relative rotary movement, the said drive-wheel having substantially diametrically-opposed radial clearance-apertures; of a pawl-plate located in juxtaposition to said drive-wheel on the side thereof opposite said ratchet-wheel, said pawl-plate being movable transversely with respect to said drive-wheel and having a pair of diametrically-opposed fingers formed substantially perpendicular to the plane thereof and movable in and arranged to project through the radial apertures respectively of said drive-wheel into engagement with the teeth of said ratchet-wheel, said fingers being spaced apart diametrically a distance slightly less than the over-all diameter of said ratchet-wheel such that when said ratchet-wheel is rotated relative to said drive-wheel, each finger of said pawl-plate will be selectively moved positively into engagement with the perpendicular face of one tooth of said ratchet-wheel by the camming action of the oppositely-disposed finger with the sloping face of a second tooth of said ratchet-wheel, the finger in engagement with the

perpendicular face of the said one ratchet-tooth being subjected to shearing strain between the said perpendicular face of said one tooth and the wall of its radial clearance-aperture in said drive-wheel when said ratchet-wheel is rotated in the direction of rotation of said drive-wheel to effectively lock said wheels together.

8. In a ratchet-mechanism, the combination with a ratchet-wheel and a coaxial drive-wheel mounted in juxtaposition thereto with capacity for relative rotary movement, the said drive-wheel having substantially diametrically-opposed radial clearance-apertures; of a pawl-plate located in juxtaposition to said drive-wheel on the side thereof opposite said ratchet-wheel, said pawl-plate having an elongated axial aperture to enable said pawl-plate to move transversely with respect to said drive-wheel and a pair of diametrically-opposed fingers formed substantially perpendicular to the plane of said pawl-plate and in alignment with the longitudinal axis of said elongated aperture said fingers being movable in and arranged to project through the radial apertures respectively of said drive-wheel into engagement with the teeth of said ratchet-wheel, said fingers being spaced apart diametrically a distance slightly less than the over-all diameter of said ratchet-wheel such that when said ratchet-wheel is rotated relative to said drive-wheel, each finger of said pawl-plate will be selectively moved positively into engagement with the perpendicular face of one tooth of said ratchet-wheel by the camming action of the oppositely-disposed finger with the sloping face of a second tooth of said ratchet-wheel, the finger in engagement with the perpendicular face of the said one ratchet-tooth being subjected to shearing strain between the said perpendicular face of said one tooth and the wall of its radial clearance-aperture in said drive-wheel when said ratchet-wheel is rotated in the direction of rotation of said drive-wheel to effectively lock said wheels together.

9. In a ratchet-mechanism, the combination with an arbor; of a ratchet-wheel fixedly mounted on said arbor, a drive-wheel freely mounted on said arbor in juxtaposition to said ratchet-wheel, said drive-wheel having substantially diametrically-opposite radial clearance-apertures; and a pawl-plate mounted freely on said arbor in juxtaposition to said drive-wheel on

the side thereof opposite said ratchet-wheel, said pawl-plate being movable transversely with respect to said drive-wheel and having a pair of diametrically-opposed fingers movable in and arranged to project through the radial apertures respectively of said drive-wheel into engagement with the teeth of said ratchet-wheel, each of said pawl-fingers being subjected successively to shearing strain between the perpendicular face of the corresponding ratchet-tooth of said ratchet-wheel and the wall of its corresponding radial clearance-aperture in said drive-wheel when said ratchet-wheel is rotated in the direction of rotation of said drive-wheel to effectively lock said wheels together.

10. In a ratchet-mechanism, the combination with an arbor; of a ratchet-wheel fixedly mounted on said arbor, a drive-wheel freely mounted on said arbor in juxtaposition to said ratchet-wheel, said drive-wheel having substantially diametrically-opposite radial clearance-apertures and a pawl-plate mounted freely on said arbor in juxtaposition to said drive-wheel on the side thereof opposite said ratchet-wheel, said pawl-plate being movable transversely with respect to said drive-wheel and having a pair of diametrically-opposed fingers movable in and arranged to project through the radial apertures respectively of said drive-wheel into engagement with the teeth of said ratchet-wheel, said fingers being spaced apart diametrically a distance slightly less than the over-all diameter of said ratchet-wheel such that when said ratchet-wheel is rotated relative to said drive-wheel, each finger of said pawl-plate will be successively moved positively into engagement with the perpendicular face of one tooth of said ratchet-wheel by the camming action of the oppositely-disposed finger with the sloping face of a second tooth of said ratchet-wheel, the finger in engagement with the perpendicular face of the said one ratchet-tooth being subjected to shearing strain between the said perpendicular face of said one tooth and the wall of its radial clearance-aperture in said drive-wheel when said ratchet-wheel is rotated in the direction of rotation of said drive-wheel to effectively lock said wheels together.

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