F. H. AYER.

RATCHET MECHANISM.

APPLICATION FILED DEC. 23, 1915.

1,199,737.

Patented Sept. 26, 1916.

2 SHEETS—SHEET 1.

Fig. 1.

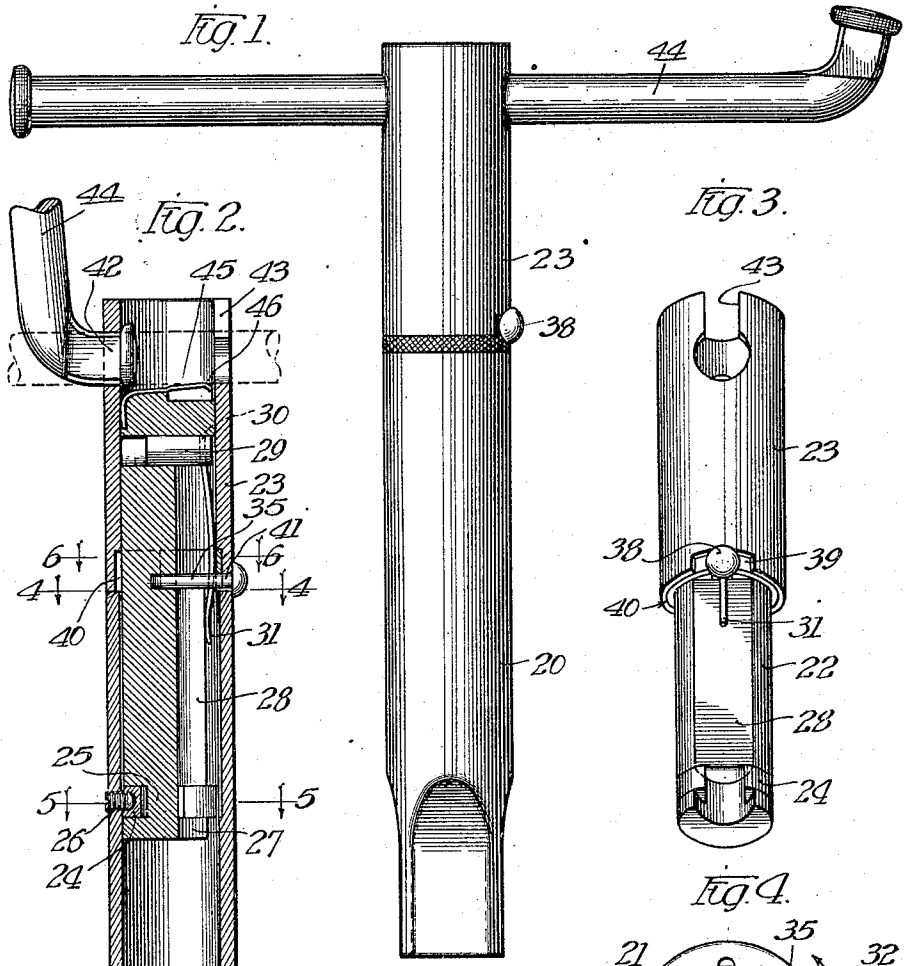


Fig. 2.

Fig. 3.

Fig. 4.

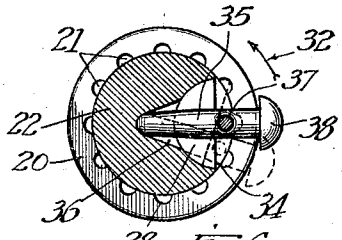


Fig. 5.

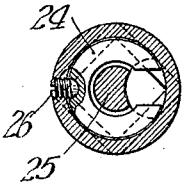
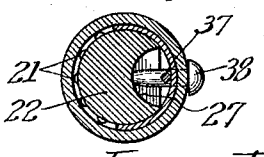


Fig. 6.



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2 SHEETS—SHEET 2.

Fig. 7.

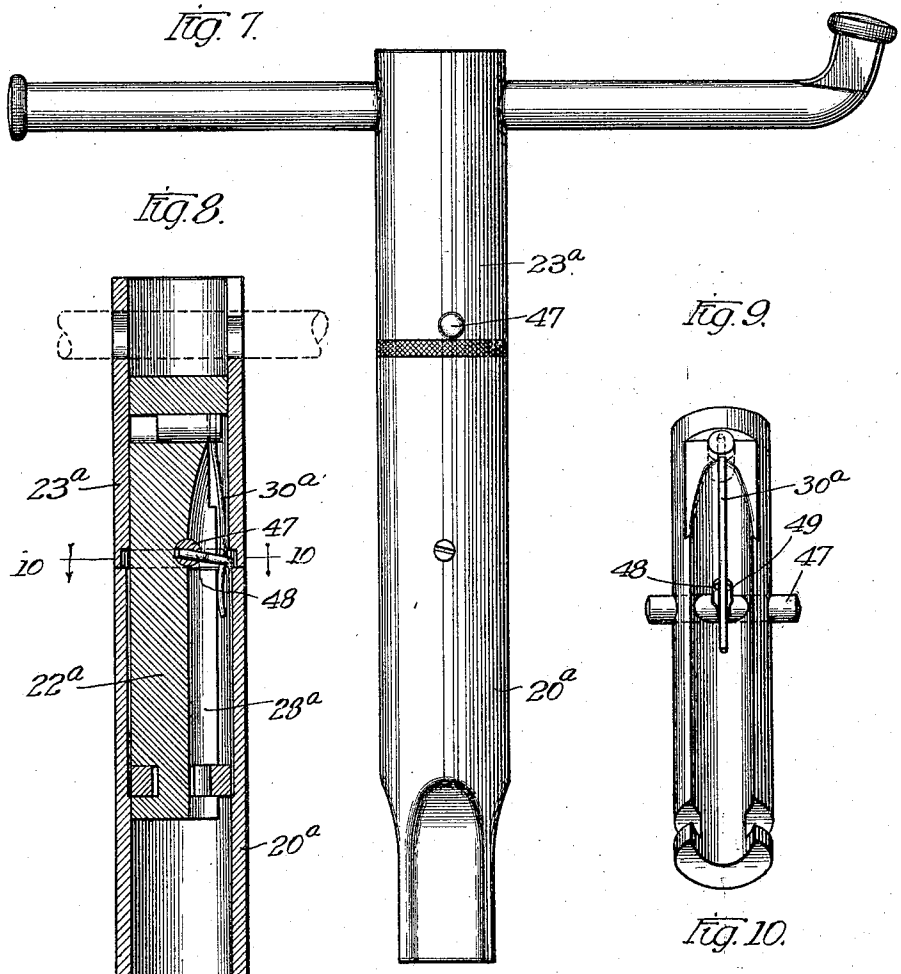
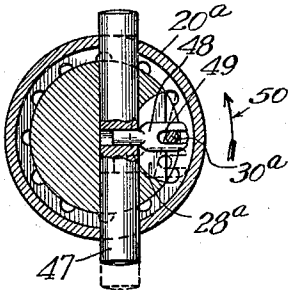


Fig. 8.

Fig. 9.

Fig. 10.



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RATCHET MECHANISM.

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To all whom it may concern:

Be it known that I, FREDERICK H. AYER, a citizen of the United States, residing at Chicago Heights, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Ratchet Mechanisms, of which the following is a specification.

The invention relates to improvements in ratchet mechanisms, and more particularly refers to a type of reversible ratchet mechanism so organized and constructed that it may readily be applied to ratchet wrenches, such as are used on or about automobiles.

Ratchet mechanisms have been used for some time in connection with automobile wrenches, and a number of constructions have been devised in the attempt to provide a satisfactory ratchet-driving mechanism for this purpose. Among other constructions might be mentioned that described in United States Letters Patent No. 1,072,807, issued to me on September 9, 1913. Although this previous construction of mine has been found to be quite practical and efficient, the construction to be described in this specification has a number of advantages not possessed by that of my previous patent.

Among the salient objects of this invention are, to provide in a type of ratchet mechanism similar to that described in my previous Letters Patent referred to, an improved means for switching the movable dog member; to provide a construction of the class described in which the various subsidiary parts of the mechanism may be of extremely simple design and economical to manufacture; to provide a construction in which the handle of the wrench for operating the ratchet mechanism is so arranged that it will be retained in the position in which it is placed in the wrench, irrespective of the position or inclination of the handle; and, in general, to provide an improved wrench and ratchet-driving mechanism of the character referred to.

The invention in its construction and mode of application will be readily understood by reference to the following description in connection with the accompanying drawings, in which—

Figure 1 is an elevation of an automobile wrench in which my improved construction is embodied; Fig. 2 is a longitudinal section through the wrench, the handle being shown partially withdrawn; Fig. 3 is a perspective view of one of the principal parts of the ratchet mechanism; Fig. 4 is a section taken on the line 4—4 of Fig. 2; Fig. 5 is a section taken on the line 5—5 of Fig. 2; Fig. 6 is a section taken on the line 6—6 of Fig. 2; Fig. 7 is an elevation of a ratchet wrench embodying a slightly modified form of my improved construction; Fig. 8 is a longitudinal section through Fig. 7; Fig. 9 is a perspective view of one of the principal parts of the ratchet mechanism of the modification; and Fig. 10 is a section taken on the line 10—10 of Fig. 8.

Referring to the drawings, it will be observed that in the ratchet wrench which I have selected to illustrate the application of my invention, 20 is the tubular nose, the lower end of which is formed square in cross section, as indicated in dotted lines in Fig. 5, in order to receive the shanks of the various attachments to be operated by the wrench. As shown in Fig. 4, the upper part of said tube 20 is milled or grooved around its interior periphery with a series of longitudinally extending notches or channels 21, these being equally spaced around its periphery. The cylindrical member 22 is a piece of steel which is slightly less in diameter than the interior of the tube 20 and is secured at its upper end in a tubular head 23, which is substantially of the same diameter as the exterior of the tube 20. Said head 23 is a driving fit upon said part 22, to which it is securely driven or pinned. The lower edge of the part 23 and the upper edge of the shank 20 abut against each other and are held in position relatively to each other by means of a circular ring 24 which forms a journal and also a shoulder for the reduced neck 25 of the lower end of the part 22. Said neck is formed by turning in the end of the part 22 a circumferential groove, rectangular in section, to receive said part 24, which is maintained in position in the tube 20 by means of a set screw 26 threaded into the wall of the tube.

In order to establish a driving connection between the head 23 and the tool tube 20, I

mill in the part 22 a groove 27 which is approximately semi-circular in cross section and extends almost the entire length of the insert 22. Within said longitudinal groove 27 I seat a length of steel 28 which is made semi-circular in cross section to correspond with the curvature of the groove 27, and which lies between the upper edge of the ring 24 and the lower side of the switch member 35, to be described later. In the upper end of the part 22 is rotatably mounted a radial pin 29 having a small hole into which is driven a rod or stiff length of steel wire 30 which is suitably bent to constitute a spring, the lower end 31 of which tends to seek the center of the tube 20. Said lower end 31 rests upon the pawl 28 of which it makes in effect a dog or pawl engaging the longitudinal grooves 21 in the interior periphery of the top of the tube 20. When the head 23 is revolved, neither of the edges of the insert or dog 28 will engage the inner periphery of the upper part of the tube 20, the relation which exists in that case being shown in Fig. 6. If, however, the end 31 of the spring be moved over so that it rests upon the flat side of the dog 28 on one side of the center line, as shown in dotted lines in Fig. 4, the effect will be to rock said dog 28 in its semi-circular bearing in the piece 22, and the edge of said dog, which is thrown outwardly against the side of the tube, will engage one of the grooves 21 as soon as an attempt is made to move the head 23 in the direction of the arrow 32; a positive connection for driving the tube 20 in the direction of the arrow 32 will thus be established. If, however, the head 23 be rotated in the reverse direction, in a case where it is impossible to turn the handle of the wrench continuously in one direction, the outer edge of the dog 28 will slip past the edges of the grooves 21 and permit the head 23 to be revolved in the reverse direction. When it is desired to rotate the tool-shank 20 in the reverse direction, the end of the spring 31 is moved in a tangential direction across the surface of the dog 28 until it crosses the center line and rests upon the surface of the dog adjacent its other edge. When the end of said spring 31 crosses the center line of the insert or dog, the latter will rock and assume such position that the edge 34 will be thrown outwardly so as to engage the longitudinal grooves 21.

The end 31 of the spring is switched across from one side of the dog 28 to the other by means of a switch member 35 mounted in a slot or aperture 36 in the groove 27 of the stem 22 in such manner that it may be rotated in a plane substantially at right angles to the axis of the device. Said switch member 35 is drilled out as at 37, so as to admit the spring 30, and the outer end of said switch member is furnished with a small knob or button 38 projecting from a slot 39 in the thimble member or head 23. In order to prevent dust or other foreign matter from entering through said slot 39, I counterbore the lower end of the head 23 in order to receive a dust ring 40 which fits rather closely around the neck 41 of the switch member 35 and moves loosely with the switch member when the latter is rocked. It should be understood that when the position of the spring 30 is changed by means of the switch member 35, the pin 29 rotates slightly in the stem 22 and the end 31 of the spring slides over the upper portion of the smooth flat surface of the dog 28. Owing to the fact that the end 31 of the spring tends to seek the center of the stem 22, the dog 28 is rocked in its seat, thus causing such an inclination of the flat outer surface of the dog 28 that the spring retains its position on whichever side of the dog 28 it may be placed and therefore does not tend to drift over to the center of the dog.

In Fig. 2 I have shown a construction which is a great improvement over any of the ratchet wrenches of this general type which have heretofore been brought to my attention. In the upper end of the tubular head 23 are made a hole 42 on one side, and directly opposite thereto a key-hole slot 43 in order to receive the swinging handle pin 44. At the upper end of the stem piece 22 there is inserted a flat steel spring 45, one end of which is bent down at right-angles so as to secure it in position. The other end of the spring is bent upward slightly and engages the handle 44, as shown at 46. It will be readily understood that the pressure of the spring 45 upon the part 44 is sufficient to prevent improper sliding movements of the handle piece in the apertures 42 and 43, but at the same time is light enough to permit the handle to be pushed manually from one side of the head 23 to the other. This construction will be found to be a great convenience in the practical manipulation of a ratchet wrench of this character, for the reason that there is no possibility of the handle piece improperly sliding from one side of the wrench to the other, or of becoming unbalanced whenever it is desired to turn the tool rapidly; as, for instance, in taking up the slack of a bolt or screw.

In Figs. 7, 8, 9, and 10 I have illustrated a modification of the construction previously described, the difference consisting in the slightly different construction used for sliding the end 31 of the spring 30 across the flat surface of the dog 28. In this modified construction I drill a transverse hole through the parts 22^a and 23^a and substantially parallel with the direction of movement of the end of the spring when it is being switched from one position into the

other. Within said transverse aperture I slidably mount a switch pin or push button piece 47, which is somewhat longer than the external end of the thimble piece 23, so that if one end of the switch pin be pressed inwardly until it is flush with the surface of the part 23^a, the opposite end of the pin will be projected outwardly a substantial distance. Movement of the switch pin 47 is communicated to the spring 30^a by means of a connecting pin 48 inserted transversely in the center of the pin 47 and having its outer end slotted, as shown at 49 in order loosely to receive the spring 30^a.

The manner of operation of the modified construction just described is self evident. If the push pin 47 be placed with its ends projecting an equal distance on either side of the head 23^a (as shown in full lines in Fig. 10), the end of the spring 30^a will be maintained in the center of the flat face of the dog 28^a, the edges of which will hence be out of engagement with the inner periphery of the shank 20^a which is free to revolve in either direction around the part 22^a. If, however, the push pin 47 be pushed to the dotted line position, as shown in Fig. 10, the spring and dog will assume the positions indicated in dotted lines in Fig. 10. The parts 23^a and 20^a will consequently be locked together when the head 23^a is revolved in the direction of the arrow 50. It is manifest that the head and shank may readily be locked together to rotate in a direction contrary to the arrow 50 by simply sliding the pin 47 in the opposite direction.

Although I have described constructions which may be considered as approved embodiments of my invention, the details may be varied somewhat without sacrificing any of the benefits or advantages derived from the invention; hence, it should be remembered that the invention in its broader aspects is not limited by the specifically described construction, except as specified in the appended claims.

I claim:

1. In a reversible ratchet driving mechanism, the combination of a tube, a male member drivingly related to said tube and having a longitudinal extension rotatably contained within said tube, said extension being provided with an opening in its outer surface, a dog rotatably seated within said opening and having a pair of opposite spaced apart outer edges adapted alternately to engage the internal periphery of said tube to drive it in alternate directions, a longitudinal spring member extending along and supported at one end by said male member, its other end engaging said dog, and means for shifting said latter end across said dog and adjacent to either edge thereof at will.

2. In a reversible ratchet driving mechanism, the combination of a tubular shank, a male member drivingly related to said shank and having a longitudinal substantially cylindrical extension rotatably contained within the tube, said extension being provided with an arcuate longitudinal groove in its outer surface, a dog loosely fitting and rotatably seated within said groove and having a pair of longitudinal, opposite, spaced apart outer edges adapted alternately to engage the internal periphery of said tube whereby the latter may be driven in alternate directions, a longitudinal spring member extending along and supported at one end by said drivingly related member, its other end engaging said dog, and means for shifting said latter end across said dog and adjacent to either edge thereof at will.

3. In a reversible ratchet driving mechanism, the combination of a tubular shank, a male member drivingly related to said shank and having a longitudinal cylindrical extension rotatably contained within said tube, said extension being provided with an arcuate longitudinal groove in its outer surface, a longitudinal arcuate dog loosely fitting and rotatably seated within said groove and having a pair of longitudinal, spaced apart, parallel, opposite outer edges adapted alternately to engage the internal periphery of said tube whereby it may be driven alternately in either direction, an attenuated longitudinal spring member extending along and having one of its ends rotatably supported by said drivingly related member whereby the other end of said spring may be swung in a direction substantially at right angles to the direction of flexure of said spring, said other end of said spring engaging said dog and tending to move in a substantially radial direction, and means for shifting said latter end of said spring from the vicinity of one edge of said dog to the vicinity of the other edge.

4. In a reversible ratchet driving mechanism, the combination of a tubular shank provided with a series of internal longitudinal ratchet grooves, a head drivingly related to said tube and having a longitudinal cylindrical extension rotatably contained within said tube, said extension being provided with an arcuate longitudinal groove in its outer surface, a longitudinal arcuate dog loosely fitting and rotatably seated within said groove and having a pair of parallel opposite spaced apart outer edges adapted alternately to engage the ratchet grooves in said tube, a transverse pin rotatably mounted in said head, a longitudinal attenuated spring member extending along said head and having one of its ends supported in said pin, the other end of said spring engaging the outer surface of said dog, and means

for shifting said latter end across said dog from the vicinity of one edge to the vicinity of the other edge.

5. In a reversible ratchet driving mechanism, the combination of a tubular shank provided with a series of internal longitudinal rachet grooves, a head drivingly related to said tube and having a longitudinal cylindrical extension rotatably contained within said tube, said extension being provided with an arcuate longitudinal groove in its outer surface, a longitudinal arcuate dog loosely fitting and rotatably seated within said groove and having a pair of parallel opposite spaced apart outer edges adapted alternately to engage the ratchet grooves in said tube, a transverse pin rotatably mounted in said head, a longitudinal attenuated spring member extending along said head and having one of its ends supported in said pin, the other end of said spring engaging the outer surface of said dog, and means for sliding said latter end across said dog from the vicinity of one edge to the vicinity of the other edge, the portion of the surface of said dog engaged by said spring being suitably arranged to permit transverse sliding movement of the end of said spring.

6. In a reversible ratchet driving mechanism, the combination of a tube, a male member drivingly related to said tube and having a longitudinal extension rotatably contained within said tube, said extension being provided with an opening in its outer surface, a dog rotatably seated within said opening and having a pair of opposite spaced apart outer edges adapted alternately to engage the internal periphery of said tube to drive it in alternate directions, a longitudinal spring member extending along and supported at one end by said male member, its other end engaging said dog, and means for shifting said latter end across said dog and adjacent to either edge thereof at will, said means comprising a manually-shiftable member extending beyond the outer surface of the male member and engaging an intermediate point in the length of said spring.

7. In a reversible ratchet driving mechanism, the combination of a tubular shank, a male member drivingly related to said shank and having a longitudinal substantially cylindrical extension rotatably contained within said tube, said extension being provided with an arcuate longitudinal groove in its outer surface, a dog loosely fitting and rotatably seated within said groove and having a pair of longitudinal, opposite, spaced apart outer edges adapted alternately to engage the internal periphery of said tube whereby the latter may be driven in alternate directions, a longitudinal spring member extending along and supported at one end by said drivingly related member, its outer end engaging said dog, and means for shifting said latter end across said dog and adjacent to either edge thereof at will, said means comprising a manually-shiftable member rotatably mounted on said male member to move in a transverse plane and adapted to engage a point on said spring intermediate the ends of the latter.

8. In a reversible ratchet driving mechanism, the combination of a tubular shank provided with a series of internal longitudinal ratchet grooves, a head drivingly related to said tube and having a longitudinal cylindrical extension rotatably contained within said tube, said extension being provided with an arcuate longitudinal groove in its outer surface, a longitudinal arcuate dog loosely fitting and rotatably seated within said groove and having a pair of parallel opposite spaced apart outer edges adapted alternately to engage the ratchet grooves in said tube, a transverse pin rotatably mounted in said head, a longitudinal attenuated spring member extending along said head and having one of its ends supported in said pin, the other end of said spring engaging the outer surface of said dog, and means for sliding said latter end across said dog from the vicinity of one edge to the vicinity of the other edge, the portion of the surface of said dog engaged by said spring being suitably arranged to permit transverse sliding movement of the end of said spring, said means comprising a manually-shiftable member rotatably mounted on said male member to move in a transverse plane and adapted to engage a point on said spring intermediate the ends of the latter.

9. In a reversible ratchet driving mechanism, the combination of a tubular shank provided with a series of internal longitudinal ratchet grooves, a cylindrical head for rotating said shank and having a longitudinal substantially cylindrical extension rotatably contained within said shank, said extension having an arcuate longitudinal groove in its outer surface, a longitudinal arcuate reversible pawl loosely fitting and rotatably seated within said arcuate groove and having a pair of parallel, opposite, spaced apart outer edges adapted alternately to engage the ratchet grooves in said shank, a longitudinal spring rod extending along said head and having one of its ends supported thereby, the other end of said spring resting upon the outer surface of said pawl, said spring tending to seek the axis of the shank, and means for sliding the latter end of said spring across the outer surface of said pawl from the vicinity of one edge to the vicinity of the other edge, the portion of the surface of said pawl en-

gaged by said spring being suitably arranged to permit transverse sliding movement of the end of said spring.

10. In a reversible ratchet mechanism, a tube, a male member drivingly related to said tube, a longitudinal extension within said tube provided with an opening in its outer surface, a dog within said opening having a pair of edges adapted to alternately engage the inner surface of said tube, a spring member supported at one end of the male member and engaging the dog, and means for moving said spring.

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