

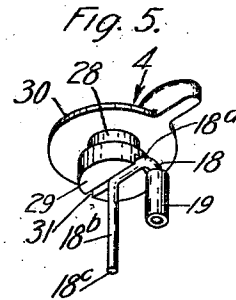
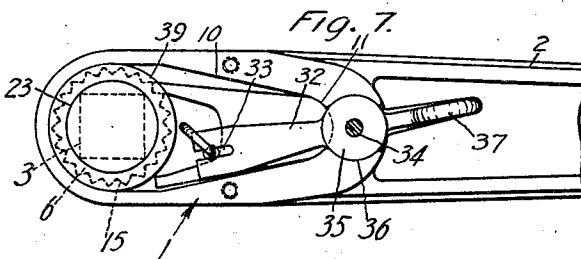
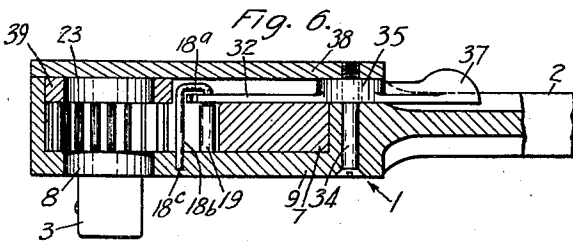
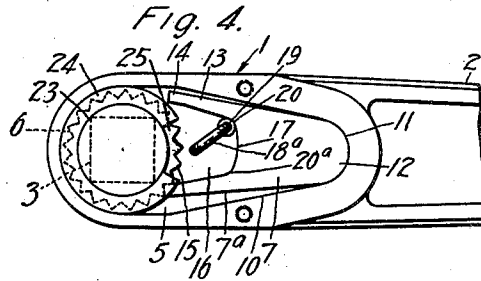
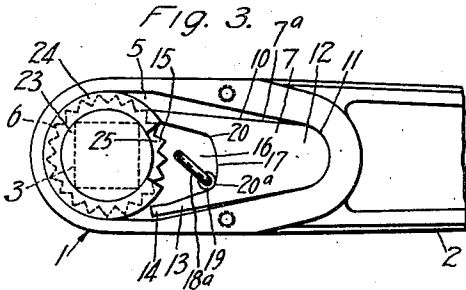
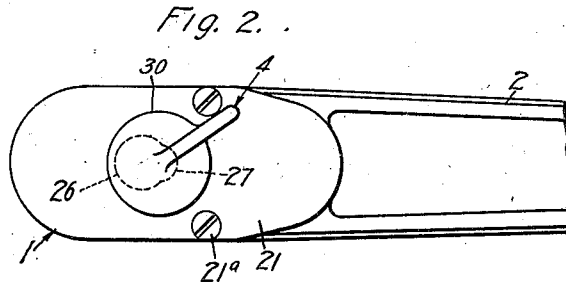
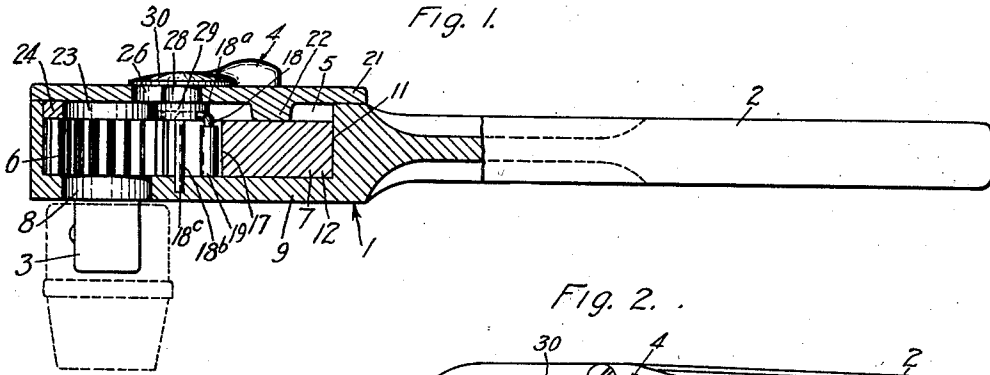
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F. P. WARD

2,138,331

RATCHET WRENCH

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RATCHET WRENCH

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27 Claims. (Cl. 192—43.1)

My invention relates to ratchet wrenches.

It has among its objects to provide an improved ratchet wrench, and, more particularly, such an improved wrench having extremely light
5 action while being positive and free from jamming. Further objects of my invention are to provide improved ratchet actuating means including improved cooperating spring and pawl means and to provide improved reversing and
10 controlling means associated with said spring and pawl means, all whereby, while obtaining the above advantages, the mechanism is adapted to be readily and conveniently operated and reversed at will without danger of being left in a neutral
15 position. Other objects include the provision of an improved structure having a small number of improved and simple parts which are adapted to be inexpensively manufactured and assembled and to operate over a long period with a minimum of wear. These and other objects and advantages of my improved construction will, however, hereinafter more fully appear.

In the accompanying drawing I have shown for purposes of illustration two embodiments
25 which my invention may assume in practice.

In this drawing,—

Figure 1 is a side elevation partially in longitudinal section, of a wrench constructed in accordance with my improvements;

30 Fig. 2 is a top plan view of the same, the wrench handle being broken away;

Fig. 3 is a view similar to Figure 2 with the cover plate removed to facilitate illustration, the parts being disposed for rotation of the ratchet
35 in one direction;

Fig. 4 is a like view showing the parts disposed for rotation in the opposite direction;

40 Fig. 5 is a perspective view showing the connection of the reversing means to the spring member some of the parts being omitted to facilitate illustrations;

Fig. 6 is a view similar to Fig. 1 showing a portion of a modified construction, and

45 Fig. 7 is a plan view of the construction shown in Figure 6, the cover being removed to facilitate illustration.

In the illustrative construction shown in Figures 1 to 5, I have shown a wrench body, generally indicated at 1 and having a handle 2, and carrying a rotatable member 3 adapted to engage with a wrench socket or suitable work piece indicated in dotted lines in Fig. 1, and to be rotated in opposite directions, depending upon the position of adjustment of a swinging controlling
50 member 4 carried on the top of the wrench body,

the mechanism between the controlling member 4 and the operating member 3 being of an improved construction hereinafter more fully described.

Referring more particularly to this mechanism,
5 it will be noted that the body 1 is provided with a chamber 5 adapted to receive in one end a ratchet member 6 and in the other end to receive a cooperating oscillating pawl 7. Herein, the end of the chamber 5 over the member 3 is of
10 maximum diameter and rounded and the ratchet 6, which is located in this end, has a reduced bearing portion 8 underneath the ratchet teeth and rotatably mounted in the bottom portion 9 of the chamber. Also, the chamber 5 is provided with
15 converging side walls 10 leading from the portion of the same in which the ratchet 6 is located, toward the opposite end of the chamber and terminating in a semi-round portion 11 forming a bearing for a like rounded end 12 on the extremity of the pawl 7 remote from the ratchet 6.
20 As shown, the pawl 7 is also provided with converging side walls 7a and is slightly smaller than the portion of the chamber 10 in which the same is disposed. Thus, in either position of the pawl
25 7, it is free to be moved from adjacency to one wall 10 through a limited distance about its end 12 before it approaches the other wall 10, while the pawl 7 is also capable of being adjusted for reverse operation in either the position shown in
30 Figure 3 or the position shown in Figure 4, wherein its opposite sides 7a approach opposite converging walls of the chamber 10. Herein also it will be noted that the pawl 7 is provided with a pair of spaced diverging arms 13 on its extremity
35 toward the ratchet 6 and that each arm 13 is provided with a squared end 14 so that these arms may selectively engage and cooperate with the teeth 15 of the ratchet 6 during ratcheting in opposite directions, as illustrated in Figures 3
40 and 4.

Cooperating with the pawl 7 is improved spring means. As shown, the pawl is herein provided with an opening 16 between its arms 13 and this opening has an end wall 17 forming a cam face,
45 herein arcuate, in the end of the opening adjacent the end 12 of the pawl, while the inner sides of the arms 13 diverge away from the ends of this cam face 17. Also a substantially vertical spring end 18, preferably carrying a roller 19, is
50 adapted to cooperate with this cam face 17 and normally be disposed either in the corner 20 formed between one of the arms 13 and the face 17, or in the other corner, herein indicated at
55 20a, between the other arm and this face 17.

Further, it will be observed that the substantially vertical spring portion 18 is connected by a curved transverse upper portion 18a with another longer vertical portion 18b which is journaled at 18c in the bottom 9 of the body 1 on an axis disposed between the teeth 15 of the ratchet 6 and the arcuate surface 17 and in alignment with the axis of the ratchet 6 and the center of the pawl bearing 11. Thus, it being understood that it is normally under compression, the spring end 18, while located in either the corner 20 or 20a, will yield to permit ratcheting in the selected direction and the direction of operation of the ratchet may be reversed at will by merely swinging the spring portion 18 and roller 19 about its axis 18c from one corner to the other as desired.

Cooperating with the mechanism described is also improved means for swinging the spring end 18 to effect reversal when desired. Herein, these means are carried by a cover plate 21 overlying the chamber 5 and suitably connected to the body 1, as, for example, by screws 21a. As shown, the plate 21 also has a depending portion 22 engaging and positioning the pawl 7 against vertical displacement while permitting oscillation thereof about its end 12. Also, this cover plate herein engages and positions an upper end or bearing portion 23 on the ratchet 6, similar to the portion 8, as well as a bearing washer 24 engaging this portion 23 and provided with an opening 25 in the area above the teeth extending into the opening 16 between the arms 13. Here it will also be noted that the cover 21 is provided with an enlarged rounded opening 26 communicating with an eccentrically disposed smaller rounded opening 27 coaxial with the spring axis 18a, while the adjusting member 4, herein in the form of a thumb latch, is provided with a neck portion 28 and a lower portion 29 of larger diameter coaxial with said neck portion. The construction is thus such that the portion 29 may be inserted through the large opening 26 and then moved longitudinally until the neck 28 is disposed in the small opening 27. In this position, the cover lies between the portion 29 and a portion of the member 4, herein a disc-like portion 30, and the periphery of the member 29 engages the portion 23 on the ratchet 6 within the limits of the opening 25 in the washer 24, the parts thereby being effectively maintained in the desired relation while permitting rotation of the portion 29 whenever the member 4 is moved in either direction about the axis of the members 28 and 29. Attention is further directed to the fact that a groove 31 is provided in the under face of the portion 29 so that it may receive the portion 18a between the vertical spring portions 18b and 18 and thus enable the spring and roller 19 to be moved about the axis 18a in either direction by merely throwing the controlling member 4 reversely.

In the operation of my improved construction, it will be evident that, with the controlling member 4 in either position thereof, the wrench will be free to ratchet in one direction. For example, considering Fig. 3, just as soon as the pawl end 14 clears the end of the next tooth 15, as a result of the movement of the wrench body, and while the other pawl end 14 moves toward the tooth 15 but before it can engage therewith, the spring portion 18 and roller 19 will snap the first pawl end 14 back into engagement with the next tooth. Also, it will be noted that the construction is such that the parts are returned automatically so as to be ready for further operation. Further, when the controlling member is moved into its other

position, the direction will be reversed. More particularly, the roller 19 will then be moved from its position shown in Figure 3 to its position shown in Figure 4 and held in that position where it will be understood that the parts will be operative in the manner above described during ratcheting.

In Figures 6 and 7 I have shown a modified construction which may be used if desired. In this construction, it will be noted that the spring portion 18a is raised slightly higher than in my previously described construction and that a pivoted horizontally swinging shifter finger 32, disposed longitudinally between the pawl and cover, is provided with a longitudinal slot 33 in which the portion 18 of the spring just above the roller 19 is received. In this construction, the finger 32 is pivoted on a vertical pivot 34 in the body in rear of the pawl pivot and the finger is also provided with an enlarged hub 35 disposed around this pivot and movable in a suitable countersink 36 in the body 1, while a protruding upstanding operating portion 37 is also provided in rear of this hub whereby the finger may be moved from the exterior of the casing in either direction to swing the spring 13 and thus reverse the wrench. Here also it will be noted that while held in position by screws as heretofore described, the cover 38 in this form of my invention is in the form of a flat plate and that the pivot screw 34 for the finger is also threaded into this plate at one end. Here also, instead of using a bearing washer having an opening therein, a solid bearing washer 39 is used and this washer is also held in position by the cover plate. Obviously this construction will function essentially similarly to that previously described as regards the movements of the spring during ratcheting, and the spring may be reversed whenever desired by swinging the protruding end 37 of the finger from the position shown in Figure 7 to a reverse position or vice versa, as desired.

As a result of my improved construction, it will be evident that the ratcheting action will be very light yet extremely positive, the pawl ends 14, due to the action of the spring, cooperating with the teeth 15 of the ratchet 6 in a very effective manner and continuing to operate equally effectively, irrespective of the position of the spring or controlling member. Further, the structure is such as to eliminate danger of the parts being disposed in a neutral position, the spring snapping from one corner 20, 20a to the other and having no tendency to remain in any other position. Attention is also directed to the fact that my improved construction so disposes the forces acting during operation as to produce a very strong and powerful wrench despite the use of a light spring. It will also be observed that it is made possible to eliminate all necessity for a plurality of springs and to use, instead, a single spring which is of such an improved construction and so operatively connected and disposed as to be adapted to long wear in service without breakage, while giving the desired light yet positive action and being both readily and conveniently reversed or replaced whenever desired. Further, attention is directed to the small number of parts and to the inexpensive nature of the same, as well as to the effective positioning of the parts one relative to another in any position, and to the fact that the parts may be assembled or disassembled with facility. These and other advantages of my improved construction will, how-

ever, be clearly apparent to those skilled in the art.

While I have in this application specifically described two forms which my invention may assume in practice, it will be understood that my invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a ratchet wrench, a rotatable ratchet, a pawl for rotating the same, a spring having a depending portion engaging said pawl to hold the same in ratchet engaging position, and means providing a pivot for said spring disposed between the axes of said ratchet and pawl.

2. In a ratchet wrench, a rotatable ratchet, a cooperating pawl having ratchet engaging arms, and a spring pivoted between the arms and selectively engaging the same yieldingly to hold the pawl in selected position with one of said arms in ratchet engaging position.

3. In a ratchet wrench, a rotatable ratchet, a cooperating pawl having spaced ratchet engaging arms and cam means having portions adjacent to different arms, and a pawl controlling spring mounted between said arms independently of said pawl and having a portion movable bodily across and cooperating with different portions of said cam means.

4. In a ratchet wrench, a rotatable ratchet, a pivoted pawl having spaced ratchet engaging arms and a cam face between the free ends thereof and the pawl pivot and having portions adjacent to said arms, and a pawl controlling spring pivoted between said arms independently of said pawl and having a portion bodily movable across and cooperating with said face.

5. In a ratchet wrench, a rotatable ratchet, a pivoted pawl having spaced ratchet engaging arms and a cam face between the free ends thereof and the pawl pivot, said cam faces having portions adjacent to said arms, and a pawl controlling spring pivoted between said face and said ratchet in alignment with the axes of said ratchet and pawl and having a portion movable bodily across and cooperating with said face.

6. In a ratchet wrench, a rotatable ratchet, an oscillating pawl having spaced ratchet engaging arms and a cam face between the ends thereof, and a pawl controlling spring pivoted between said arms and said cam face having a depending portion movable bodily across and cooperating with said face and normally disposed at the junction between one of said arms and said face.

7. In a ratchet wrench, a rotatable ratchet, a cooperating pawl having spaced ratchet engaging arms and a cam face between the same, a spring pivoted between said arms having a depending portion movable bodily across and cooperating with said face and normally disposed at the junction of one of said arms and said face, and means for at will disposing said spring at the junction of the other arm and said face.

8. In a ratchet wrench, a body having a chamber provided with an end wall, a ratchet rotatably mounted in said chamber, an elongated oscillating pawl having spaced ratchet engaging arms and a journal on the end wall of said chamber, and means located between said arms and selectively engaging said arms for snapping a ratchet engaging arm into engagement with the next tooth of the ratchet as the other arm moves toward the latter but before said other arm engages a ratchet tooth.

9. In a ratchet wrench, a body having a chamber, a ratchet rotatably mounted in said chamber, an elongated oscillating pawl having spaced ratchet engaging arms and a journal in said chamber, and means between said arms for selectively engaging said arms and for snapping a ratchet engaging arm into engagement with the next tooth of the ratchet as the other arm moves toward the latter but before said other arm engages a ratchet tooth including a cam face on said pawl between said arms and a swinging spring cooperating with said face movable about a pivot between the latter and said ratchet and normally disposed at the junction of said face with one of said arms.

10. In a ratchet wrench, a body having a chamber provided with a rounded end wall, a ratchet rotatably mounted in said chamber, an elongated oscillating pawl having spaced ratchet engaging arms and a journal on the round end wall of said chamber, means between said arms for snapping a ratchet engaging arm into engagement with the next tooth of the ratchet as the other arm moves toward the latter but before said other arm engages a ratchet tooth including a cam face on said pawl between said arms and a swinging spring having a portion selectively engaging said arms and cooperating with said face movable about a pivot between the latter and said ratchet, and means for swinging said spring at will to the junction of said face with another arm to reverse the operation of the wrench.

11. In a ratchet wrench, a ratchet, an oscillating pawl having spaced ratchet engaging arms and a cam face disposed generally transversely between said arms, and a spring pivoted between said face and said ratchet independently of said pawl and having a depending portion adapted to move bodily along said face during operation of said pawl and normally disposed at the junction between one of said arms and said face and at one side of a straight line extending through the axes of the ratchet and pawl and the spring pivot.

12. In a ratchet wrench, a ratchet, an oscillating pawl having spaced ratchet engaging arms and a cam face disposed generally transversely between said arms, a pawl setting spring pivoted between said face and said ratchet and having a depending portion adapted to move bodily along said face during operation of said pawl and normally disposed at the junction between one of said arms and said face and at one side of a straight line extending through the axes of the ratchet and pawl and the spring pivot, and means for at will swinging said spring to reverse the operation of the wrench and dispose said depending portion on the opposite side of said line at the junction of the other arm and said face.

13. In a ratchet wrench, a ratchet, an oscillating pawl having spaced ratchet engaging arms and a cam face disposed generally transversely between said arms, a pawl controlling spring pivoted between said face and said ratchet and having a depending swinging portion adapted to travel along either end of said face during reverse operations of said pawl, and means for at will reversing the operation of the wrench including a connecting portion between said spring pivot and said depending portion and means engaging said connecting portion to reverse the spring and pawl.

14. In a ratchet wrench, a ratchet, an oscillating pawl having spaced ratchet engaging arms and a cam face disposed generally transversely between these arms, a pawl controlling spring

pivoted between said face and said ratchet and having a depending portion adapted to travel along either end of said face during reverse operations of said pawl, means for at will reversing the operation of the wrench including a connecting portion between said spring pivot and said depending portion, a casing enclosing said elements, and a member adjustable from the exterior of said casing and having a slot receiving said connecting portion.

15. In a ratchet wrench, a rotatable ratchet, a cooperating pawl having ratchet engaging arms and an elongated body having a rounded opposite bearing end, a support for said ratchet having a rounded cooperating bearing receiving the thrust directly from the working end of either arm, and spring means controlling the position of said pawl.

16. In a ratchet wrench, a rotatable ratchet, a cooperating pawl having ratchet engaging arms and a body having a rounded opposite bearing end, a support for said ratchet having a rounded cooperating bearing receiving the thrust directly from the working end of either arm, and spring means controlling the position of said pawl, the thrust from the working ends of said pawls to said bearing surfaces being disposed in either position of said pawl at one side of the axis from which said bearing surfaces are struck.

17. In a ratchet wrench, a rotatable ratchet, a cooperating pawl having ratchet engaging arms and an elongated body having a rounded opposite bearing end, a support for said ratchet having a rounded cooperating bearing receiving the thrust directly from the ratchet engaging end of either arm, spring means controlling the position of said pawl, and pawl shifting mechanism operatively connected to said pawl through said spring and free from thrust exerted by said arms.

18. In a ratchet wrench, a body having a chamber provided with rounded ends of different radius and walls converging toward the smaller of said ends, a ratchet journaled in the larger of said ends, a pawl having a rounded portion engaging the rounded smaller end of said chamber and ratchet engaging arms having converging walls selectively approaching said chamber walls as said pawl is oscillated, and means pivoted between said arms controlling the oscillation of said pawl.

19. In a ratchet wrench, a body having a chamber provided with rounded ends of different radius and walls converging toward the smaller of said ends, a ratchet journaled in the larger of said ends, a pawl having a rounded portion engaging the rounded smaller end of said chamber and ratchet engaging arms having converging walls selectively approaching said chamber walls as said pawl is oscillated, and means pivotally mounted between said arms independently of said pawl controlling the oscillation and position of said pawl and including a pivoted spring member and a cooperating cam surface on said pawl.

20. In a ratchet wrench, a body having a chamber provided with a rounded end, a ratchet in said chamber, a pawl having spaced ratchet engaging arms and a rounded portion engaging the rounded end of said chamber, means between said arms controlling the oscillation of said pawl including a spring member pivoted between said arms and a cooperating cam surface on said pawl, a cover for said chamber, and means adjustable from the exterior of said chamber engaging said pivoted spring member to adjust the latter to reverse the operation of the wrench.

21. In a ratchet wrench, a body having a chamber, a ratchet journaled in one end thereof, a pawl mounted for oscillation in the opposite end thereof and having ratchet engaging arms, pawl controlling spring means pivoted between said arms having a swinging operating portion movable into reversed positions, a cover for said chamber, and wrench operation reversing means adjustable from the exterior of said chamber having a portion engaging and adjusting said portion of said spring means.

22. In a ratchet wrench, a body having a chamber, a ratchet journaled in one end thereof, a pawl mounted for oscillation in the opposite end thereof and having ratchet engaging arms, pawl controlling spring means between said arms having a portion movable into reversed positions, a cover for said chamber, and wrench operation reversing means adjustable from the exterior of said cover having a portion engaging and adjusting said portion of said spring means, said ratchet having a portion above the same engaged and positioned by said spring engaging portion.

23. In a ratchet wrench, a body having a chamber provided with a rounded end, a ratchet in said chamber, a pawl having spaced ratchet engaging arms and a rounded portion engaging the rounded end of said chamber, means between said arms controlling the oscillation of said pawl including a pivoted spring member and a cooperating cam surface on said pawl, a cover for said chamber, and means adjustable from the exterior of said cover engaging said pivoted spring member to adjust the latter to reverse the operation of the wrench, and said cover also having communicating apertures therein permitting insertion of said spring engaging portion therethrough and providing means for positioning said last mentioned portion in engagement with said portion on said ratchet.

24. In a ratchet wrench, a body having a chamber, a ratchet journaled in one end thereof and having journal portions at the opposite ends of said ratchet, a pawl mounted for oscillation in the opposite end of said body and having ratchet engaging arms, pawl controlling spring means between said arms having a portion movable into reversed positions, a cover for said chamber engaging and positioning said ratchet and pawl, wrench operation reversing means adjustable from the exterior of said cover having a portion engaging said portion of said spring means and engaging and positioning a journal portion on said ratchet, and a bearing washer enclosing said journal portion and having an opening through which said spring engaging portion projects into engagement with said journal portion.

25. In a ratchet wrench, a rotatable ratchet, a pivoted cooperating pawl having spaced ratchet engaging arms and cam means between the same, a pawl controlling spring pivotally mounted between said arms and having a portion movable bodily across and cooperating with said cam means, a cover overlying said pawl, and means operable from one end of said cover and extending between the latter and said pawl for reversing said spring.

26. In a ratchet wrench, a rotatable ratchet, a pivoted cooperating pawl having spaced ratchet engaging arms and cam means between the same, a pawl controlling spring movable between said arms and having a portion cooperating with said cam means, a cover overlying said pawl, and means operable from one end of said cover and extending between the latter and said pawl for

reversing said spring including a horizontally swinging finger having a slotted inner end receiving said spring above said cooperating portion.

5 27. In a ratchet wrench, a casing having a countersink at one end and a cover, a rotatable ratchet in said casing, a cooperating pawl pivoted therein adjacent said countersink and having spaced ratchet engaging arms and cam means

between the same, a pawl controlling spring movable between said arms and having a portion cooperating with said cam means, and a swinging spring reversing member having a hub portion movable in said countersink, an external operating portion, and a portion disposed between said pawl and cover movable to reverse said spring. 5

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