March 9, 1943. F. B. SAPP 2,313,270

WRENCH

Filed Oct. 23, 1940 2 Sheets-Sheet 1

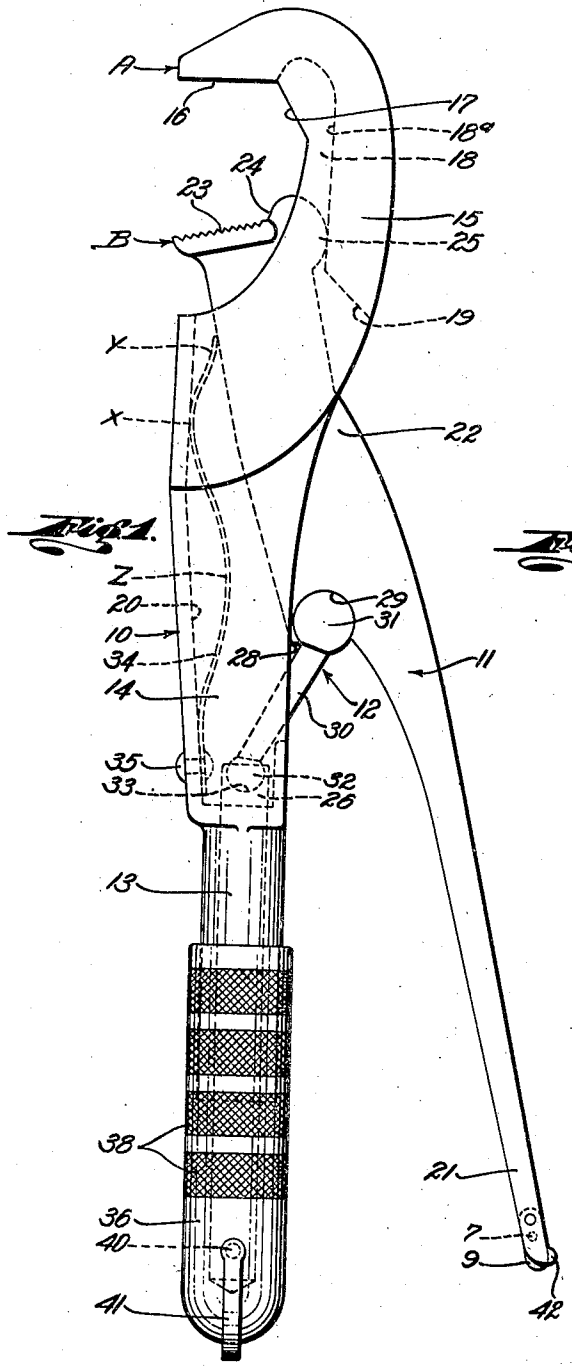


Fig. 1.

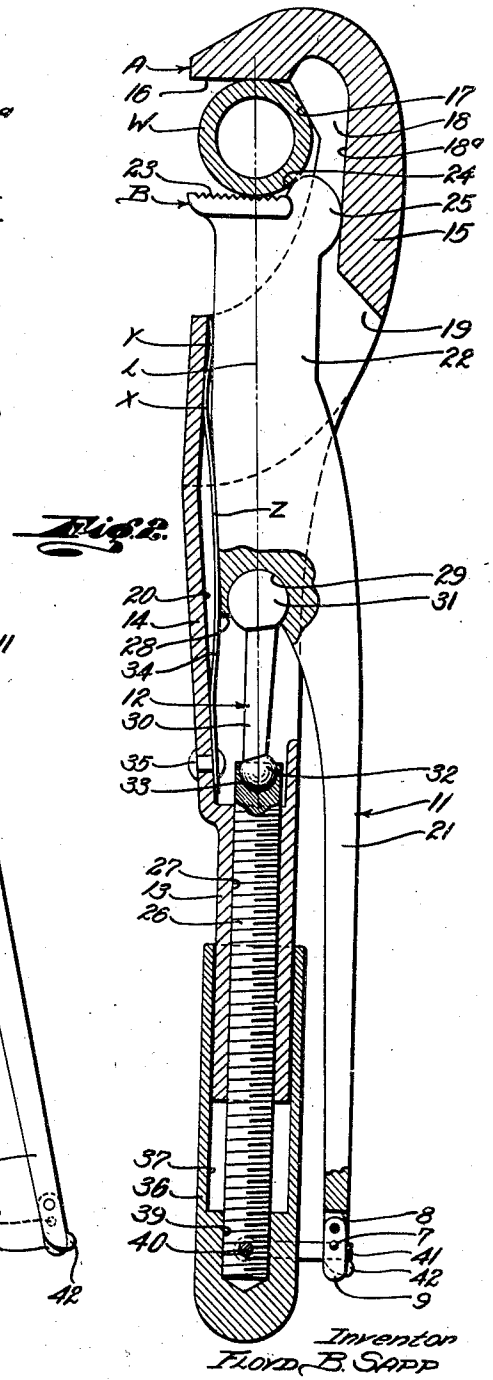


Fig. 2.

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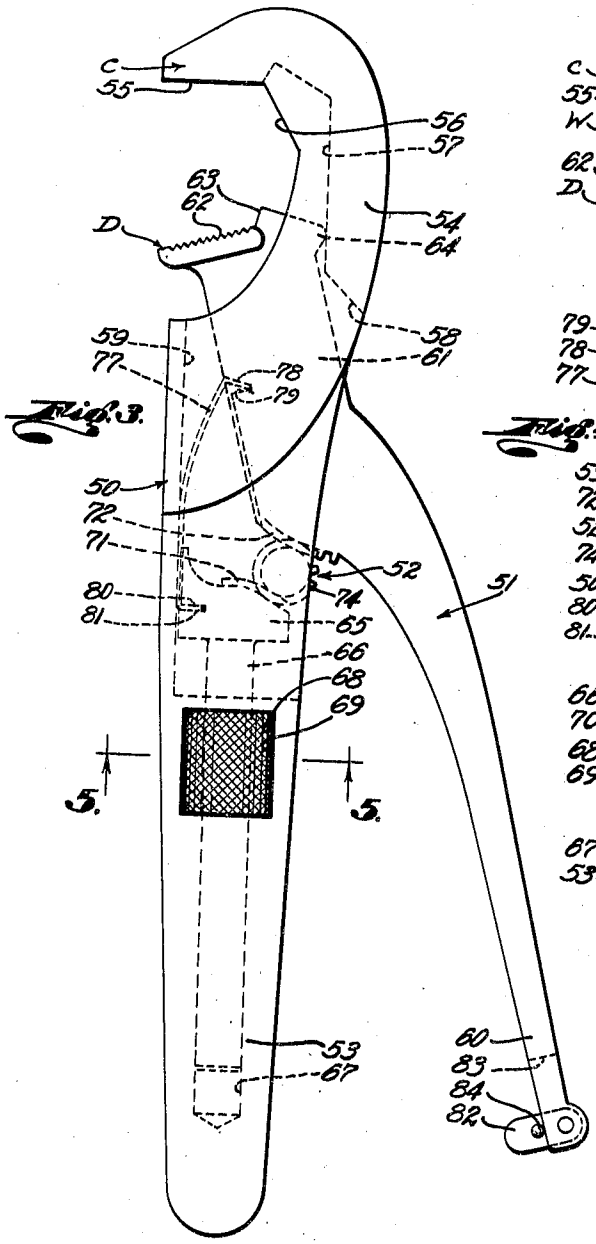


Fig. 3.

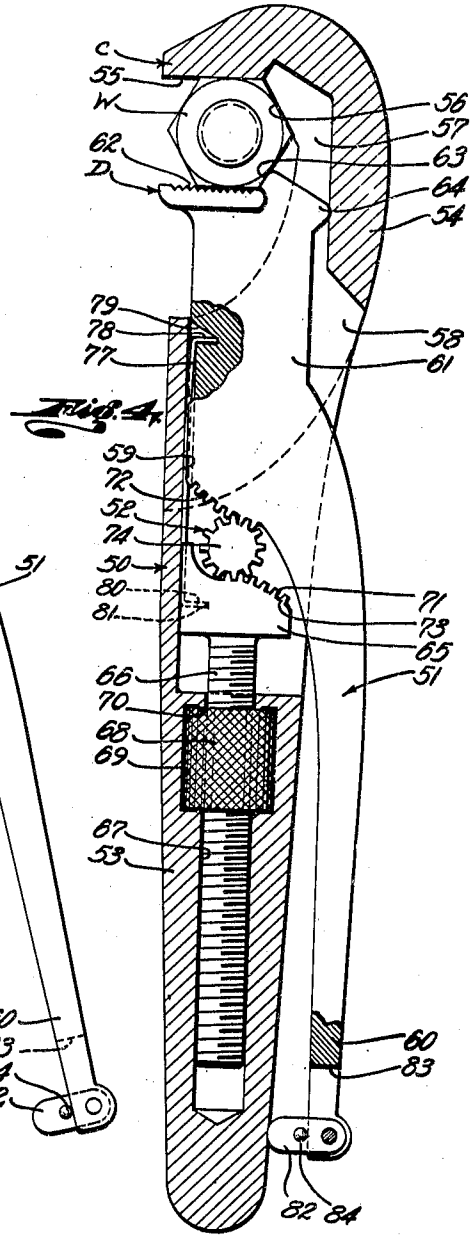


Fig. 4.

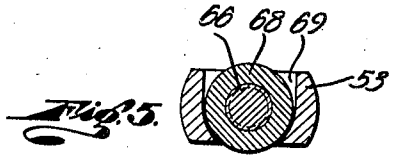


Fig. 5.

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2,313,270

UNITED STATES PATENT OFFICE

2,313,270

WRENCH

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Application October 23, 1940, Serial No. 362,321

2 Claims. (Cl. 81—84)

This invention relates to wrenches and it is a general object of the invention to provide a simple, sturdy, inexpensive wrench operable to obtain a powerful grip on pipe and other work with a minimum of manual movement and effort.

Another object of this invention is to provide a wrench embodying a one-piece lever element having a jaw opposing a fixed jaw on the body and formed to constitute a part of a toggle means which moves the shiftable jaw toward and away from the fixed jaw upon relative pivotal movement between the body and the lever element. The wrench of the present invention is characterized by its simplicity comprising only two main elements, namely, the wrench body and the lever element, each of which carries a gripping jaw and each of which may be a simple, one-piece part.

Another object of this invention is to provide a wrench of the character referred to embodying a novel toggle means or jaw actuating means comprising a simple toggle part engaged between the lever element and the jaw adjusting screw on the body. The jaw actuating means in the wrench of the present invention does not require the use of a number of toggle parts or the use of pivot pins, screws, or the like, subject to loosening, detachment and failure.

Another and important object of the invention is to provide a wrench of the character referred to which may be readily conditioned or set to obtain a firm, lasting grip on pipe and other work of different sizes or to have a ratchet action for turning pipe, etc. The present invention provides an all-purpose wrench adapted to be locked in the position where it maintains a powerful grip on the work and capable of being easily conditioned to have releasable gripping engagement with pipe and the like when it is desired to ratchet the wrench to intermittently turn the pipe.

The various objects and features of my invention will be fully understood from the following detailed description of typical preferred manners of carrying out the method and typical forms of apparatus of the invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a side elevation of one form of wrench of the invention with the parts in the unactuated positions. Fig. 2 is a longitudinal detailed sectional view of the wrench shown in Fig. 1 with parts of the lever element in elevation, illustrating the wrench in gripping engagement with a piece of work. Fig. 3 is a view similar to Fig. 1 showing another form of the invention. Fig. 4 is a longitudinal detailed sectional view of the wrench shown in Fig. 3 with the certain parts in elevation and illustrating the jaws in gripping engagement with the work and Fig. 5 is a transverse detailed sectional view taken as indicated by line 5—5 on Fig. 3.

The wrench of the invention illustrated in Figs. 1 and 2 may be said to comprise, generally, a body 10 having a stationary jaw A, a lever element 11 shiftably fulcrumed in the body 10 and having a jaw B opposing the jaw A and adjustable toggle means 12 for producing movement of the jaw B toward and away from the jaw A upon pivoting or swinging of the lever element 11 with respect to the body 10.

The wrench body 10 may be said to carry the various other parts of the tool and forms one of the main lever and handle elements. The body 10 is an elongate member whose inner portion forms a stem or shank 13. The shank 13 is preferably round or cylindrical in transverse cross section. A somewhat thickened and broadened portion 14 extends outwardly from the shank 13. The portion 14 may have slightly flared sides or edges and its outer end merges with the wrench head or jaw portion 15. The portion 15 curves laterally and forwardly and carries or presents the jaw A. The jaw A projects inwardly or horizontally at the outer end of the portion 15 and its inner or rearwardly facing side forms the work engaging face 16. The face 16 is preferably substantially normal to the longitudinal axis of the shank 13. The portion 15 and the jaw A are preferably of increased width or thickness to increase the strength of the parts and to broaden the jaw face 16. Where the wrench is designed to grip objects such as bolt heads, nuts, pipe, etc., it is preferred to provide a set or pair of angularly related faces at the jaw A. In the case illustrated a rearwardly and laterally pitched work engaging face 17 is provided on the inner edge of the portion 15 at the under side of the jaw A. The face 17 is intersected or divided by a longitudinal groove 18 provided in the inner edge of the portion 15. A lateral window or opening 19 is provided in the body 10. The opening 19 extends through the head portion 15 from one edge to the other and joins the groove 18. An elongate slot or groove 20 is formed in an edge of the body portion 14. The groove 20 is formed in the opposite side of the gody from the groove 18 and faces toward the groove 18. The groove 20 joins the opening 19 forming a continuation

or extension of the opening. The opposite side walls of the groove 18, opening 19 and groove 20, preferably occupy common planes and are flat and parallel. It will be observed that the body 10, just described, may be a simple, sturdy one-piece member.

The lever element 11 carries or presents the jaw B and constitutes a handle or lever which may be pivoted and shifted relative to the body 10 to bring the jaw B against the work W. In accordance with the invention the element 11 may be a simple, inexpensive one-piece member. The element 11 includes an elongate operating stem or handle 21 which is adapted to lie adjacent or alongside of the body shank 13. The element 11 has a broadened portion 22 at the outer end of the handle 11. The portion 22 passes through the opening 19 and may have flat opposite side surfaces to work or bear on the side walls of the opening 19 and on certain parts of the walls of the grooves 18 and 20. The jaw B is provided or formed on the outer end of the broadened portion 22 and is arranged to oppose the jaw A. The jaw B may be laterally broadened to present an extensive work engaging face 23. The parts are formed and related so that the work engaging faces 16 and 23 of the jaws A and B are substantially parallel when the wrench is in operation. It is preferred to tooth or roughen the face 23 and to provide a forwardly and laterally pitched work engaging face 24 at the jaw B.

In accordance with the invention the lever element 11 has shiftable pivotal engagement with the body 10. A lug is provided on an edge of the portion 22 to form the fulcrum 25 of the element 11. The lug or fulcrum 25 presents a round or convex edge which bears on the bottom wall 18a of the groove 18. The wall 18a is preferably flat and slightly pitched rearwardly and inwardly relative to the longitudinal axis of the body shank 13. The fulcrum 25 is adapted to freely shift along the wall 18a when the element 11 is bodily moved during adjustment of the means 12 and when the means 12 is actuated to cause the jaws A and B to grip the work W. The groove 18 is preferably extended outwardly at the jaw A to receive the fulcrum 25 when the wrench is fully closed. The side surfaces of the fulcrum 25 may shiftably bear on the side walls of the groove 18 to assist in stabilizing the element 11 and the face 24 for engaging the work W may be formed on the fulcrum. It will be observed that the fulcrum of the lever element 11 is adjacent the work engaging jaw B.

The means 12 is operable to forcibly shift the jaw B of the element 11 toward the fixed jaw A upon swinging or pivoting of the handle 21 toward the shank 13. The means 12 may be easily and quickly adjusted to adapt the wrench for the gripping of objects varying considerably in size. The operating means 12 includes a shiftable or adjustable abutment on the body 10. In the form of the invention illustrated this abutment is in the nature of a threaded stem or screw 26. The screw 26 has threaded engagement in a central longitudinal opening 27 which extends through the body shank 13. The screw 26 is proportioned to project from the opposite ends of the shank 13. The lever element 11 is formed with an abutment spaced from and substantially opposing the forward end of the screw 26. This abutment may be a shoulder 28 occurring where the handle 21 joins the broadened portion 22 and in the structure illustrated the abutment shoulder 28 has a socket 29. The socket 29 may be formed by providing a cylindrical transverse opening in the element 11 at the shoulder 28.

The means 12 further includes a toggle link 30 engaged between the above mentioned abutments. The link 30 is an elongate member provided at its opposite ends with heads 31 and 32. The head 31 on the outer end of the link 30 may be a flat sided partially cylindrical part which bears and pivots in the socket 29. The mouth of the socket 29 is reduced or constricted to retain the head 31 in the socket 29 and yet allow working or pivoting of the head. The head 32 on the inner end of the link 30 may be smaller than the head 31 and is partially spherical to bear and work in a socket 33 in the end of the rotatable screw 26. The mouth or outer end of the socket 33 is reduced or constricted to retain the head 32 in the socket and yet allow free working and pivoting of the head in the socket. It will be seen that the link 30 forms a connection between the screw 26 and the element 11 whereby the element may be bodily shifted or adjusted relative to the body 10 by threading of the screw 26. When the handle 21 is extended or in its unactuated position of Fig. 1 the link 30 is inclined or pitched outwardly and forwardly. It will be seen that the fulcrum 25 and the link heads 31 and 32 form angularly related pivot points of triangular toggle means. When the lever handle 21 is swung inwardly toward the body shank 13 the triangular toggle means straightens out, that is, the head 31 moves inwardly so that the element 11 is forced outwardly turned the jaw A and the work W is clamped or gripped between the jaws A and B.

Means is provided for yieldingly holding the lever element 11 in its extended inactive position and for returning the element to this position after operation. This means may comprise a leaf spring 34 arranged in the groove 20 to bear against the opposing inner edge of the element portion 22. The inner or rear end of the spring 34 may be fixed to the body 10 as by a rivet 35. A substantial intermediate portion of the spring 34 is bowed outwardly or toward the element 11 and then curves back toward the bottom wall of the groove 20 to have engagement with said wall at X. The free end portion of the spring 34 is bent or curved laterally to bear against the edge of the lever element portion 22 at Y. With the element 11 in its extended inactive position the spring 34 engages the element at Y. When the lever element 11 is in an actuated position the spring 34 is compressed or partially flattened and has engagement with the element 11 at Y and at a point Z on its bowed intermediate portion (see Fig. 2). It will be observed that the spring 34 is entirely housed within the body 10 to be protected against injury during use of the wrench.

It is preferred to provide a handle 36 for the adjusting screw 26. The handle 36 may be associated with the body shank 13 to form an effective wrench grip as well as a handle for the adjusting screw. The handle 36 may be an elongate member provided with a longitudinal socket 37 for slidably or freely receiving the body shank 13. The inner or rear end of the handle 36 is closed and rounded. The external surface of the handle 36 may be roughened or provided with knurling 38. The adjusting handle 36 is fixed or secured to the projecting rear end of the screw 26. The screw 26 may be received in a reduced socket 39 in the handle 36 and a transverse pin 40 may be arranged through openings in the handle and the screw to secure the handle to the screw. It will be seen that the handle

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36 may be easily manipulated to turn the screw 26 to either advance or retract the lever element 11.

Means may be provided for stopping or retaining the element 11 in the position where it is actuated with the jaws A and B in firm gripping engagement with the work W and where it is free to retract when the workman releases or lessens his grip. The stop means includes a stop finger 9 pivotally mounted in a slot 8 in the end of the lever handle 21. The finger 9 may be pivoted between a retracted position in the slot 8 and an active projecting position where it extends from the inner side of the handle 21. When the stop finger 9 is in its extended position it is adapted to engage the handle 36 to limit the inward movement of the lever handle 21. The finger 9 serves to stop the inward movement of the lever element 11 when the element reaches the position where the axes of the heads 31 and 32 lie in the center line L of the work W or before the element reaches this position and thus serves to prevent the toggle means 12 from throwing over center. The stop finger 9 may be provided with a detent dimple 7 for frictionally bearing in the slot 8 to retain the finger in its inactive position and for engaging with the inner edge of the handle 21 to hold the finger 9 in its extended position. As illustrated in the drawings the stop finger 9 may project slightly beyond the extremity of the lever handle 21 when the finger is in its retracted position so that it may be easily engaged for projection. A saddle shaped lock 41 may straddle the end portion of the handle 36 to be swingably or pivotally connected with the handle. The above described pin 40 may serve to pivotally secure the opposite end portions of the lock 41 to the handle. When the lever element 11 is brought to the active position in adjacent substantially parallel relation to the shank 13 the lock 41 may be swung to engage over the end of the lever handle 21. A slight rise or lug 42 may be provided on the lever handle 21 to releasably retain the lock 41 in engagement with the handle. The lock 41 may be engaged and disengaged from the lug 42 following a slight movement of the handle 21 toward the handle 36, and may be used to retain the lever element 11 in when the tool is not in use.

It is believed that the operation of the wrench illustrated in Figs. 1 and 2 will be understood from the foregoing detailed description. Preparatory to operating the wrench the handle 36 may be turned to adjust the element 11 relative to the body 10 and thus move the jaw B toward or away from the jaw A to condition it for engagement with the work. This adjustment of the element 11 adapts the wrench for gripping objects varying considerably in size. When the element 11 is in the unactuated position of Fig. 1 the jaw B slopes rearwardly and laterally with respect to the jaw A to facilitate the easy engagement of the wrench with the work. With the element 11 adjusted as just described, the wrench is engaged with the work and the element 11 is pivoted by swinging its handle 21 toward the handle 36. In practice the operator or workman may grasp the handles 21 and 36 and merely force them together or toward one another to pivot the element 11. Upon swinging or pivoting of the element 11 with respect to the body 10, about the fulcrum 25, the toggle link 31 is swung inwardly and produces a positive longitudinal movement of the element 11 toward the jaw A. This causes the work W to be firmly and positively gripped by the jaws A and B. The compound pivoting and bodily movement of the element 11 brings the jaw B from its pitched inactive position to its active angle or position where it is parallel with the jaw A.

The workman may maintain his grasp to hold the jaws A and B in firm positive engagement with the work W or may adjust the wrench so that the axis of the head 31 is thrown over the center line L when the jaws A and B tightly grip the work W. This over-center condition of the toggle means locks or retains the jaws A and B in positive gripping engagement with the work until the lever element is again swung outwardly. It will be observed that with the relationship of the parts shown in Fig. 2 of the drawings, the pivotal centers of the link heads 31 and 32 lie in the center line L which intersects the work W and the wrench is not locked. The stop finger 9 may stop the element 11 in this position or before it reaches this position. If it is desired to ratchet the wrench to intermittently turn the work by swinging the wrench back and forth, the stop finger 9 is used and the workman's grasp on the handles 21 and 36 is relaxed to some extent when the wrench is swung in the reverse or retrograde direction. This relaxing of the workman's grasp allows the element 11 to swing toward its inactive position so that the jaws A and B may move or ratchet to position for new engagement with the work.

The form of the invention illustrated in Figs. 3, 4 and 5 of the drawings may be said to comprise, generally, a body 50 having a fixed gripping jaw C, a lever element 51 shiftably fulcrumed in the body 50 and presenting a second jaw D, and adjustable cam means 52 for actuating the jaws C and D into firm gripping engagement with the work W upon pivoting of the lever element 51.

The wrench body 50 is an elongate member and in accordance with the invention may be integral or of but one piece. The inner or rear portion of the body 50 forms a shank or handle 53, while the outer portion of the body 50 is broadened and thickened to form the wrench head 54. The handle 53 may have flat sides and suitably rounded edges, as best shown in Fig. 5. The head 54 curves laterally and outwardly at the outer end of the handle 53 and the jaw 54 projects transversely at the outer end part of the head 54. The fixed gripping jaw C presents an active gripping face 55 which is preferably substantially normal to the longitudinal axis of the wrench body 50. The head 54 may be provided at its inner edge with a second gripping face 56 angularly disposed to the face 55. A longitudinal groove 57 in the inner side of the head 54 divides the angular gripping face 56. An opening 58 extends through the head 54 from one edge to the other and joins the groove 57. A longitudinal groove 59 is provided in the outer portion of the handle 53 and the adjacent part of the head 54. The groove 59 joins the opening 58 and opposes and is spaced inwardly from the groove 57. The side walls of the grooves 57 and 59 and the opening 58 are preferably flat and lie in common parallel planes. The bottom walls of the grooves 57 and 59 are preferably flat and substantially parallel with the longitudinal axis of the body 50.

The lever element 51 is pivotally and shiftably supported in the body 50 and carries or presents the gripping jaw D. The element 51 has an elongate stem or handle 60 and a broadened portion 61 on the outer end of the handle. It is important to note that the lever element 51 may

be a simple one-piece member. The broadened portion 61 passes through the opening 58 and has flat parallel opposite side surfaces which may shiftably bear on the side walls of the opening. The handle 60 lies alongside of the body handle 53 when the element 51 is actuated. The jaw D is a laterally protruding broadened part on the outer end of the lever portion 61. The jaw D may present a toothed active face 62 for opposing the face 55 of the jaw C. A second gripping face 63 pitched with respect to the face 62 may be formed on the lever element 51 at the jaw D. In accordance with the invention the lever element 51 has a fulcrum 64 pivotally and slidably engaged in the body 50. In the preferred construction the fulcrum 64 is a lug projecting from an edge of the lever portion 61 slidably bearing on the bottom wall of the groove 57. The lug or fulcrum 64 is pointed or rounded to easily slide along and pivot in the groove 57. The groove 57 is of sufficient length to allow the jaws A and B to fully close.

The cam means 52 is operable to forcibly or positively shift the element 11 outwardly toward the jaw C when the lever handle 60 is swung inwardly toward the handle 53. The means 52 is preferably adjustable to adapt the wrench for work varying greatly in size. The adjustable actuating means 52 includes an abutment 65 shiftable or adjustable in the body 50. In the preferred construction this abutment 65 is a flat sided enlargement or head on the outer end of an adjusting screw 66. The abutment 65 is housed in the groove 59 and its flat sides shiftably engage the walls of the groove. The abutment 65 is rigidly formed on or secured to the screw 66 as by welding. The screw 66 is shiftably received in a longitudinal opening 67 in the body handle 53. Means is provided for operating the screw 66 to advance and retract the abutment 65. This means comprises a manually engageable nut or wheel 68 threaded on the screw 66, the nut or wheel 68 is turnable in a transverse opening 69 in the body handle 53. The opening 69 is increased in width at one side of the handle 53 to admit the wheel 68 during the assembling of the wrench. The inner and outer walls of the opening 69 preferably have raised bosses 70 engaged by the ends of the nut or wheel 68. The surface of the wheel 68 is preferably roughened or knurled and may protrude from the opposite sides of the handle 53 for ready manipulation. It will be apparent how rotation of the nut or wheel 68 shifts the screw 66 and abutment 65 longitudinally relative to the body 50.

The means 52 further includes opposing abutment faces or cam faces on the abutment 65 and the lever element 51 and a turnable member engaged between these faces. The outer end of the abutment 65 is in the nature of a pitched or curved cam face 71. The face 71 slopes or curves upwardly and inwardly from the exposed outer side of the abutment 65 and its inner portion curves forwardly, the face 71 having a substantially ogee curvature. An inwardly and forwardly pitched or curved face 72 is formed on the lever element 51 where the handle 60 joins the broadened portion 61 and this face 72 is spaced from and in opposition to the face 71. Gear teeth 73 are provided on the major inner portion of the face 71 and on the face 72. A shiftable or rolling gear 74 is engaged between the toothed faces 71 and 72. The teeth of the gear 74 mesh with the teeth 73. The gear 74 is shiftably received in the groove 59 to be held against lateral displacement thereby. The curved inner part of the cam face 71 may be plain or devoid of teeth to give the gear 74 suitable freedom when in its actuated position.

When the lever element 51 is in its extended inactive position the gear 74 is engaged on the inner or lower part of the face 71 and the outer part of the face 72. Upon swinging of the lever handle 61 toward the body handle 53 the gear 74 rides upwardly or outwardly on the cam face 71 and the cam face 72 moves to a position such as shown in Fig. 4. This action results in a forward or outward bodily movement of the element 51 bringing the jaw D in gripping engagement with the work W. The outward actuation of the element 11 is accompanied by pivoting or swinging of the jaw D from the inclined open position to a position where its face 62 is parallel with the face 55 of the jaw C.

Means is provided for yieldingly holding the lever element 51 in the open position and for returning the element to this position after use. This means comprises a leaf spring 77 grooved or recessed in the inner edge of the lever portion 61 and the inner side of the abutment 65 to bear against the bottom wall of the groove 59. The spring 77 is shaped or bent to urge the element 51 outwardly and is tied or coupled between the abutment 65 and the element 51. The outer end of the spring 77 has a lug or tongue 78 engaged in a notch 79 in the lever portion 61 and the inner end of the spring 77 has a similar tongue 80 engaged in a notch 81 in the abutment 65. The tongue 78 has limited swinging movement in the notch 79 while the tongue 80 may be firmly received in the notch 81. The spring 77, in addition to returning the lever element 51 to its open position, ties the element to the abutment 65 to prevent loss and detachment of the lever element. The toothed cam face 72 engaged with the gear 74 assists in holding the lever element 51 against disconnection from the body 50.

Means is provided for stopping the lever element 51 in the actuated position so that the wrench will not remain locked on the work. This means may comprise a stop finger 82 pivotally secured in a slot 83 in the end of the handle 60. When the lever element 51 is in its actuated position with the handle 60 adjacent the handle 53 the projected finger 82 may engage the handle 53 and thus stop the element 51 so that it cannot reach a position where the means 52 holds the jaws C and D locked on the work. When not in use the finger 82 may be swung into the slot 83. A detent dimple 84 may be provided on the finger 82 to yieldingly hold the finger 82 in its two positions.

It is believed the operation of the wrench of Figs. 3, 4 and 5 will be readily understood from the foregoing detailed description. Prior to actuating the wrench the nut or wheel 68 may be turned to adjust the jaw D toward or away from the jaw C to condition the jaws for engagement with the work. The spring 77 assisted by the gear 74 transmits movement from the screw actuated abutment 65 to the lever element 51 during the screw threading adjustment of the element. Following the adjustment just described the operator grasps the handles 53 and 60 and draws them together. This results in outward shifting of the lever element 51 by reason of the rolling action of the gear 74 between the toothed cam faces 71 and 72. The positive outward movement of the element 51 forces the jaws C and D into tight gripping engagement with the work W. If desired, the finger 82 may be utilized to stop the element 51 in the position where the jaws

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grip the work but are not locked on the work. In other cases, the workman may retain the wrench grip by retracting the finger 82 and operating the element 51 to the locked position. When it is desired to ratchet the wrench on the work W the workman extends the finger 82 and slightly relaxes his grasp as the wrench is swung backward to permit limited retraction of the jaw D so that the jaws C and D may move to the desired position for the next gripping action.

Having described only typical preferred forms and applications of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art, or fall within the scope of the following claims.

Having described my invention, I claim:

1. A wrench comprising a body including a handle at one end and an inwardly facing gripping jaw at the other end rigid with the handle, the body having a transverse opening between the handle and jaw and a groove extending from the opening toward the jaw, a lever element extending through the opening having a handle at its inner end and a gripping jaw at its outer end opposing the first named gripping jaw, a fulcrum part on the element shiftably and pivotally bearing in the groove, an inwardly facing abutment on the inner side of the element, an adjusting screw on the inner side of the body handle, an abutment on the screw opposing the first named abutment, and a toggle link pivotally connected with the abutments operable to bodily shift the element outwardly to move its jaw toward said first named jaw when the handles are swung toward one another.

2. A wrench comprising a body including a handle at one end and an inwardly facing gripping jaw at the other end rigid with the handle, the body having a transverse opening between the handle and jaw and a groove extending from the opening toward the jaw, a lever element extending through the opening having a handle at its inner end and a gripping jaw at its outer end opposing the first named gripping jaw, a fulcrum part on the element shiftably and pivotally bearing in the groove, spring means bearing between the body and element urging the handles apart, an inwardly facing abutment on the element, an adjusting screw on the body handle, an abutment on the screw opposing the first named abutment, and a toggle link pivotally connected with the abutment operable to bodily shift the element outwardly to move its jaw toward said first named jaw when the handles are swung toward one another.

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