April 21, 1936. O. T. BERNHARDT 2,038,262

INSERT PIPE WRENCH

Filed July 13, 1934

Fig. 1.

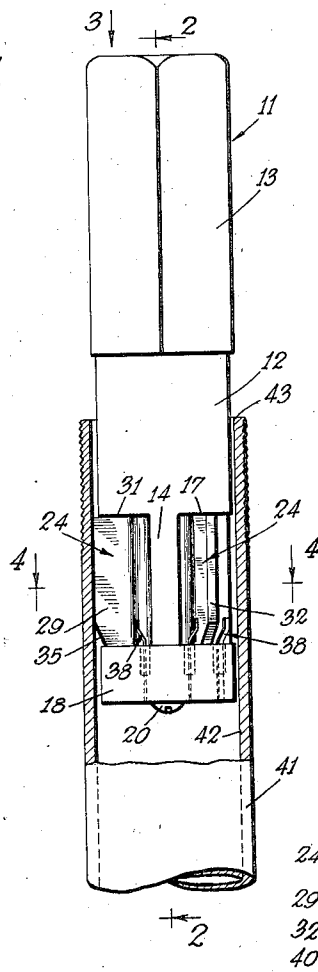


Fig. 3.

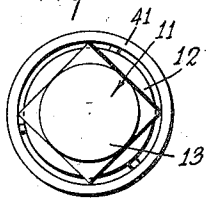


Fig. 2.

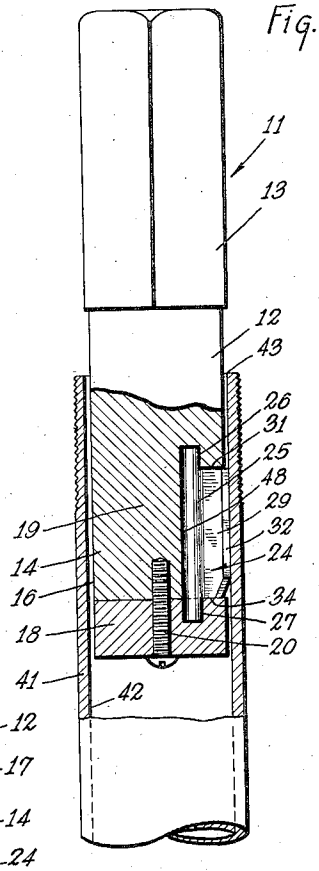


Fig. 7.

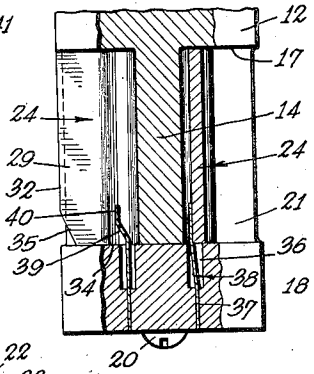


Fig. 4.

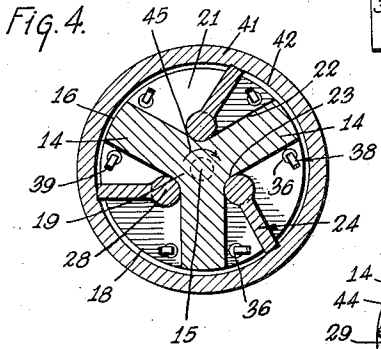


Fig. 6.

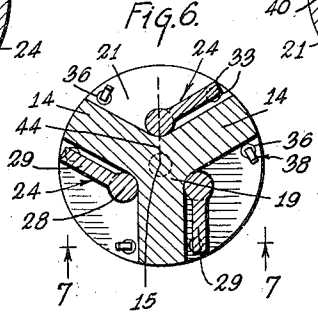
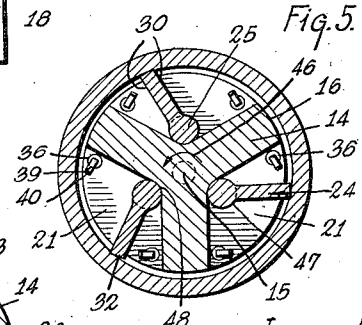


Fig. 5.



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2,038,262

INSERT PIPE WRENCH

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Application July 13, 1934, Serial No. 734,944

9 Claims. (Cl. 81—72)

My invention relates to a type of pipe wrench in which the wrench is inserted in the open end of a pipe and in which gripping jaws or devices engage the interior of the pipe on rotation of the wrench and thus the wrench may be utilized for either tightening or loosening threaded joints in the pipe.

An object and feature of my invention in the above mentioned type of wrench is in making a wrench which may be used in reverse directions, that is, when rotated in one direction the interior gripping jaws engage the interior of the pipe and twist this in one direction. If it is desired to twist the pipe in the opposite direction the wrench tool must be removed and again re-inserted, but the same jaws in another position will twist the pipe in an opposite direction. Thus, with my pipe wrench, by simply inserting it in the pipe with the jaws initially positioned in the correct relation to the fixed part of the wrench structure and the pipe, it may be used for either twisting or turning pipe in, for instance, a clockwise or counter clockwise direction.

Another and more detailed object and feature of my invention is forming the gripping jaws in the manner of pivoted plates, the pivots being off center but preferably concentric for all of the jaws as to the axis of the wrench. The plates of the jaws are of such length that when occupying extreme positions on opposite sides of a radial line through the center of the tool and the center of the jaw pivot, the edge of the jaw plates will be out of contact with the pipe, and on rotation of the tool, will be brought closer into alignment with the above mentioned radial line and thus grip the inside of the pipe. By using a plurality of jaws mounted in this manner, the pipe may be evenly gripped on its interior surface.

Another detailed feature of my invention relates to forming the body portion of the wrench with a plurality of substantial ribs, preferably three, with cut out sections between the ribs and the pivot jaw blades pivoted at the corners formed by the ribs. These corners are obtuse and as the jaws are pivoted close to each corner the pivotal center of each jaw is on a radial line through the axial center of the tool.

Another feature of my invention relates to the mounting and use of springs in the relatively fixed part of the tool designed to engage each jaw and to urge each jaw away from its adjacent rib and into contact with the interior surface of the pipe.

Another detailed feature relates to forming the plates of the jaws with a bevel on their ends which is inserted first in the pipe so that by a slight twist of the tool while being inserted the jaws may be swung over to one side of the above mentioned radial lines into a position adjacent a rib and in contact with the springs above mentioned.

My invention is illustrated in connection with the accompanying drawing, in which:

Fig. 1 is an elevation of my invention inserted in a pipe, the pipe being broken away and the jaws illustrated as expanded or forced outwardly into contact with the interior of the pipe.

Fig. 2 is a longitudinal section on the line **2—2** of Fig. 1 in the direction of the arrows, part of the tool being shown in elevation.

Fig. 3 is an end view taken in the direction of the arrow **3** of Fig. 1.

Fig. 4 is a transverse section on the line **4—4** of Fig. 1 in the direction of the arrows showing the position of the jaws when the tool and the pipe are being rotated in a clockwise direction.

Fig. 5 is a section similar to Fig. 4 when the tool, jaws and pipe are rotated in a counter clockwise direction.

Fig. 6 is a section similar to Figs. 4 and 5 but showing the position of the jaws when the tool is being inserted in the pipe.

Fig. 7 is a partial longitudinal section on the line **7—7** of Fig. 6 in the direction of the arrows.

In my invention, the tool assembly is designated by the numeral **11**, and in this I employ preferably a cylindrical plug **12** having a head **13** at the top. This head is illustrated as being square in cross section and forms a wrench grip head. Extending below a cylindrical section there are a plurality of ribs **14**, these being illustrated as three in number, radiating from the center **15**. These ribs have cylindrical outside edges **16** and extend downwardly from the terminal shoulder **17** of the cylindrical section **12**. End block **18** which is cylindrical and has parallel end surfaces at right angles to the axis of the plug is secured to the center of hub section **19** of the rib portion by a screw **20**, or the like. This construction leaves a plurality of angular recesses **21** between the longitudinal faces **22** of the ribs. The angles **23** formed by these surfaces of the ribs are obtuse angles. The gripping jaws designated by the assembly numeral **24** are three in number and each has a hinge or pintle rod **25**, the upper end of each rod being illustrated as pivoted in a pivot socket **26** in the plug section **12** of the tool and at the bottom in the complementary cylindrical socket **27** in the

block 18. Thus, the jaws may turn or rotate on the axis center 28 of the pintle rods 25 which are located close to the obtuse angle 23, such angles preferably having a curved corner.

Each of the jaws has a jaw plate 29 extending outwardly from its pivot rod. These plates have preferably parallel opposite sides 30 extending longitudinally. The upper end has a transverse shoulder 31 forming an operating surface with the shoulder 17 of the plug 12. The outside edge 32 of each plate is parallel to the axis of its pintle and such edge is not cylindrical but is a chord of a circle, leaving two sharp longitudinal corners 33 at the junction corners of the sides 30 and the longitudinal edge 32. The lower end 34 of each jaw plate is at right angles to its pintle and forms a close working contact with the upper surface of the plug 18. Each jaw edge has a lower bevel section 35 for a purpose hereinunder detailed.

The block 18 has three deep recesses 36 extending downwardly from its upper surface and terminating in slots or kerfs 37. Leaf springs 38 have a fixed end portion in the kerf 37 and are secured therein in any suitable manner. The portion of each spring which extends through the recess 36 is preferably straight and in alignment with the portion secured in the kerf as illustrated by the left hand spring in Fig. 7. Each spring has an offset bend 39, and an upper tip end 40 extending above the block 18. There are two of these springs in each of the angular recesses 21 and preferably located contiguous to the surface 22 of the ribs 14. The offset ends 39 and the ends 40 are bent and thus positioned to spring away from its adjacent rib.

A pipe is indicated at 41 and has an interior surface 42. The plug and block 18 are of less diameter than the inside surface of the pipe so that the block and plug may be readily inserted in the pipe.

When the tool is inserted in the pipe, the springs 38 normally retain the jaws slightly spaced from the surface 22 of a rib and, if the beveled edges 35 of the jaws engage the inside corner 43 of the pipe then by giving the tool a slight twist, the jaws may be forced to fit close to one of the surfaces 22 of the ribs on one side of the obtuse recess 21. This compresses the springs by distorting them towards the surface 22 as illustrated by the right hand spring of Fig. 7, and as shown in the cross section of Fig. 6. It will thus be seen that when the jaws are forced to one side in this manner so that the side surface 30 of the jaw is substantially parallel to the longitudinal surface 22 of a rib, that the sharp corners 33 of the jaws are within the circular confines of the plug 12 and the block 18 and thus the block, jaws, and part of the plug may be readily inserted in the open end of the pipe.

A characteristic feature of my invention is that the axial line of the center 15 of the tool and the axial center 28 of each of the pivot rods lie in a radial plane 44 through the center 15 of the tool and the obtuse angle 23 of each adjacent rib.

The jaws thus may be inserted in the pipe in the position shown in Fig. 6. When once inserted and the head 13 with the plug 12 and all of the parts of the tool are given a rotation in a clockwise direction as indicated by the arrow 45, the springs 38 are given an impulse away from the adjacent rib of the jaw so that one of the sharp edges 33 of each jaw engages the inside surface 42 of the pipe and clamps tight to the pipe and therefore the rotation of the tool forces a rotation of the pipe and either threads it into place or unthreads the pipe in accordance with the type of threads used on the pipe.

If it is desired to rotate the tool in a counter clockwise direction as indicated by the arrow 46 of Fig. 5, the tool is inserted so that the jaws are in a reverse position to that of Fig. 6, that is, on the opposite side of the radial planes 44. Then, when the tool is rotated in this counter clockwise direction, one of the edges 33 of each jaw plate engages the inside surface of a pipe, clamps thereto, and rotates the pipe.

It will be seen that my tool is applicable to turning the pipes in two directions, that is, with a clockwise or counterclockwise movement depending on which side of the radial planes 44 the jaw plates are initially positioned when the wrench is inserted in the pipe. In order to take part of the inward thrust on the jaws it is to be noted that the pintle rods 25 are formed cylindrical as indicated at 47, and they have a sliding contact on the concaved corners 48 of the obtuse angles 23. Thus, the surfaces 47 and 48 being in a rubbing contact, take up part of the jaw thrusts against the inside surface of the pipe and reduce the thrust taken by the end of the pintle rods 25 in the two sockets 26 and 27 which sockets are of sufficient size to allow the pintle rods to have a loose fit.

Various changes may be made in the details of construction without departing from the scope of the invention as defined by the appended claims.

I claim:

1. An insert pipe wrench having a plug with a solid portion of circular cross section of but slightly less diameter than a hollow article in which the plug is to be inserted, the plug having a plurality of equally spaced recesses, the margins of the recesses being defined by ribs, each recess forming an obtuse angle less than 180°, the corners of each recess between the faces of adjacent ribs being concave, a gripping jaw mounted in each recess, each jaw having a pintle with a rounded surface to engage the adjacent concave corner of a recess and each jaw having a flat jaw plate extending outwardly from its pintle, each jaw plate having parallel gripping edges shaped to contact the internal surface of the article to be gripped by the wrench, means to confine each pintle in its adjacent corner, said confining means permitting each pintle to rotate on its axis but preventing circular movement of the pintle around the axis of the plug, each pintle and the axis of the plug being in a radial plane and the jaw plate of each jaw being adapted to turn on its pintle through an angle greater than 90° and limited in its movement by the ribs defining each recess, each jaw plate when turned to the limit of its recess being within the circle of the solid portion of the plug whereby the plug with the jaws may be inserted in an article to be gripped with the gripping edges of the jaw plates out of contact with the inner surface of said article, each jaw plate when rotated on its pintle to bring it towards a radial plane through the axis of the plug and its pintle being adapted to engage the inside surface of the hollow article to be gripped, the radial distance from the gripping edges of each jaw plate when said jaw plate is in a radial plane through the axis of the plug and the axis of its pintle being greater than the radius of the circular portion of the plug and greater than the distance from the gripping edges of the jaw plate when in contact with a rib and the axis of the plug.

2. An insert pipe wrench as claimed in claim 1, each jaw plate having a beveled edge at the end

of its gripping edges, such beveled edge being adapted to engage the end of the hollow article in which the plug is thrust and on partial rotation of the plug in one direction the said beveled edges forcing the jaw plates in a relatively opposite direction to bring each plate contiguous to one of the ribs defining a recess in which the jaw is mounted and thereby permit insertion of the plug with the jaws in the hollow article.

3. An insert pipe wrench as claimed in claim 1, each pintle having an extension beyond the ends of its jaw plate, the plug having sockets to receive the extensions of the pintle, a leaf spring secured in the plug at one end of each jaw plate and contiguous to the surface of each rib, each spring being adapted to engage a jaw plate when forced towards the surface of a rib and on rotation of the plug to urge each jaw plate into gripping engagement with the inside of the hollow article to be gripped.

4. An insert pipe wrench having a cylindrical plug with three longitudinal recesses, the recesses being spaced apart and defined by three radial ribs, each recess forming an angle of substantially 120° and each having its corner adjacent the axis of the plug, such corner having a concave curve, the diameter of the plug being slightly smaller than the inside cylindrical surface of an article to be gripped by the wrench, a jaw mounted in each recess, each jaw having a pintle with a bearing surface to engage a concave corner of a recess, and each jaw having a flat jaw plate with parallel sides connected to its pintle, each jaw plate having two parallel gripping edges, said edges being parallel to the axis of the plug, means to confine the pintles whereby each gripping jaw may rotate on its pintle through an angle greater than 90°, the confining means preventing a bodily movement of the pintle around the axis of the plug, each pintle being located in a radial plane through the axis of the plug and the jaw plate, when occupying such radial plane, having its gripping edges extending beyond the circumference of the cylindrical plug, each jaw plate being proportioned whereby when rotated on its pintle its maximum amount until engaging the side of a rib, the gripping edges then being within the circumference of the cylindrical plug whereby the plug with the jaws may be inserted within an article having a cylindrical inside surface to be gripped, the said jaws on rotation of the plug being adapted to rotate on their pintles to bring the gripping edge of each jaw into gripping relation to the inside cylindrical surface of the article to be engaged by the wrench, the edges in contact with the article being evenly spaced around the article.

5. An insert pipe wrench as claimed in claim 4, the end of each jaw plate on the portion first insertable in the article having an end surface at right angles to the axis of its pintle and having a beveled surface connecting with the gripping edges, the bevel of each jaw plate being adapted to engage the end edge of an article having a cylindrical inside surface in which the plug is adapted to be inserted whereby on rotation of the plug in one direction each jaw plate is rotated on its pintle in the opposite direction, thereby swinging each jaw plate to provide clearance for insertion in the hollow article.

6. An insert pipe wrench as claimed in claim 4, a leaf spring secured in the plug adjacent the face of each rib and substantially parallel to such face and contiguous to the periphery of the plug, the movement of a jaw plate into contiguity to a rib being adapted to tension a spring, the reaction of the spring being adapted to force the gripping edges of a jaw plate into engagement with the inside surface of the article to be engaged by the wrench.

7. An insert pipe wrench as claimed in claim 4, a pair of secondary recesses in each of the main recesses and adjacent the surface of a rib, a leaf spring secured to have a portion thereof in the secondary recess and an end portion in the main recess contiguous to a rib, each jaw plate having a beveled edge connected to its gripping edges, and each bevel being adapted to engage the end of an internal cylindrical article in which the wrench is inserted whereby on rotation of the plug in one direction each jaw plate is moved in a reverse direction, each jaw plate being adapted to engage the free end of a leaf spring and to compress such spring towards a rib for insertion of the plug in an article, the spring engaged by the jaw plate being adapted to rotate a jaw plate towards the radial plane through the axis of the plug and its pintle to bring the gripping edge of a plate into contact with the internal surface of an article to be engaged by the wrench.

8. An insert pipe wrench having a plurality of main recesses extending longitudinally thereof, each recess being defined on its sides by ribs, a jaw plate having a pintle, each pintle being mounted at the angle formed by two ribs, each jaw plate having gripping edges, the plug having a pair of secondary recesses connected with each main recess and adjacent the surfaces of the two ribs defining such recess, leaf springs secured in the plug, each spring extending through a secondary recess and having a free end in the main recess, the free end being contiguous to the surface of a rib, each free end being adapted to be engaged by a jaw plate on rotation on its pintle towards a rib to tension the spring, the reaction of the tensioned spring being adapted to move a jaw plate away from one of the ribs towards the center of the main recess to bring the gripping edges of the jaw plate into engagement with an internal surface of an article to be engaged by the wrench.

9. An insert pipe wrench as claimed in claim 8, each jaw plate having a beveled edge on the portion first inserted in a tubular article, each beveled edge being adapted to engage the end of such article whereby on rotation of the plug in one direction each jaw plate is rotated on its pintle in an opposite direction to bring each jaw plate into contact with the free end of one of the leaf springs in the main recess in which such jaw plate is mounted.

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