Sept. 24, 1946. B. L. LURIE 2,407,990

PIPE WRENCH

Filed May 17, 1943 3 Sheets-Sheet 1

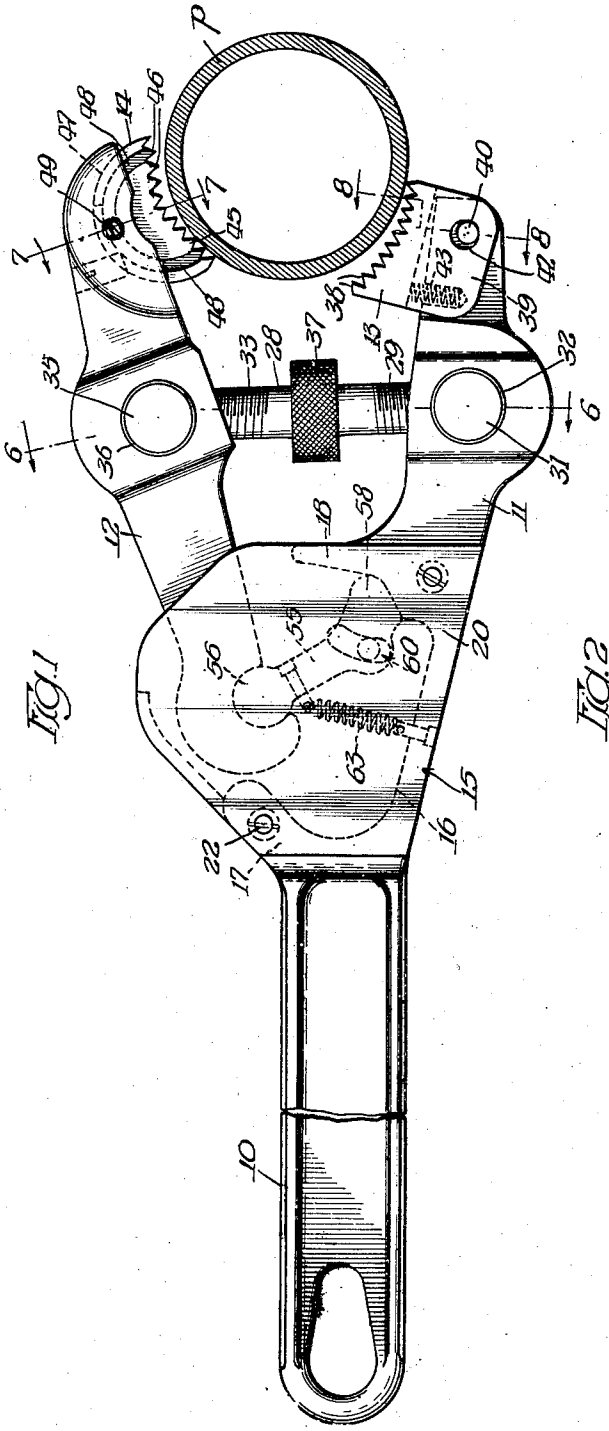


FIG. 1

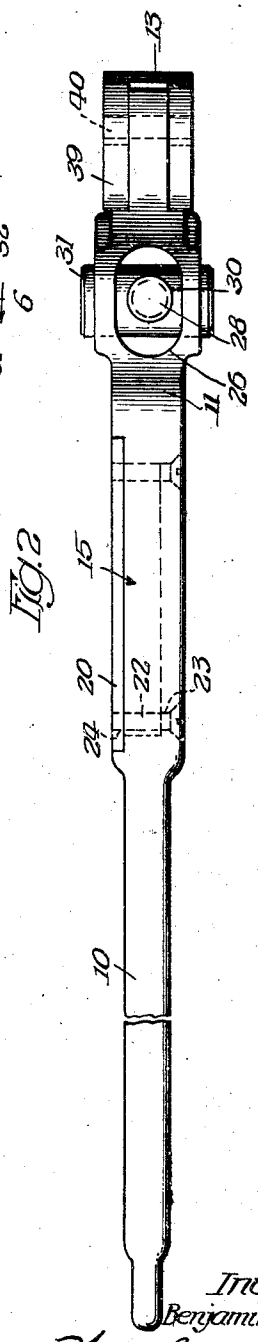


FIG. 2

Inventor
Benjamin L. Lurie

By Fred Gerlach Atty.

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Fig. 3

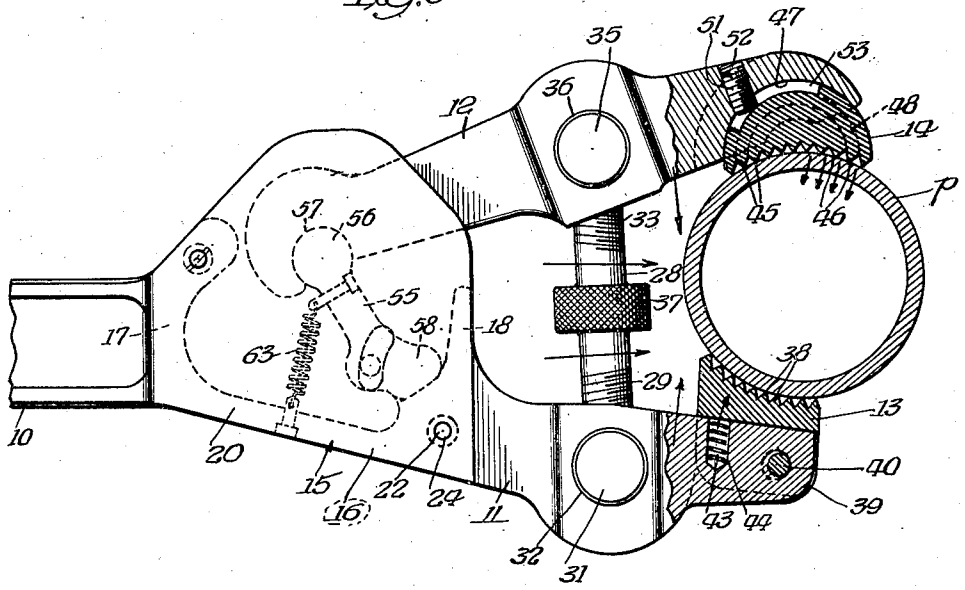
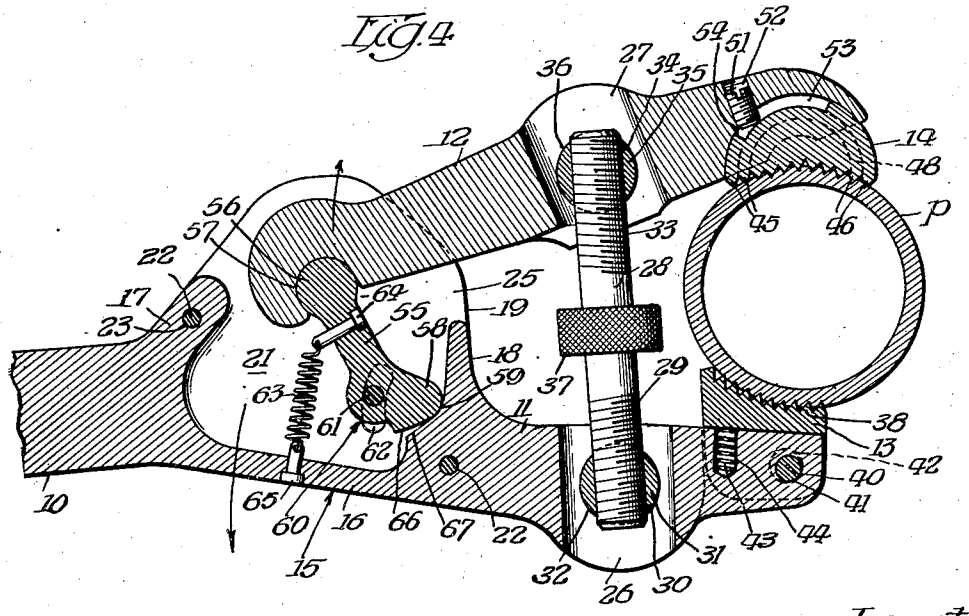


Fig. 4



Inventor

Benjamin L. Lurie

By Fred Gerlach Atty.

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Fig. 5

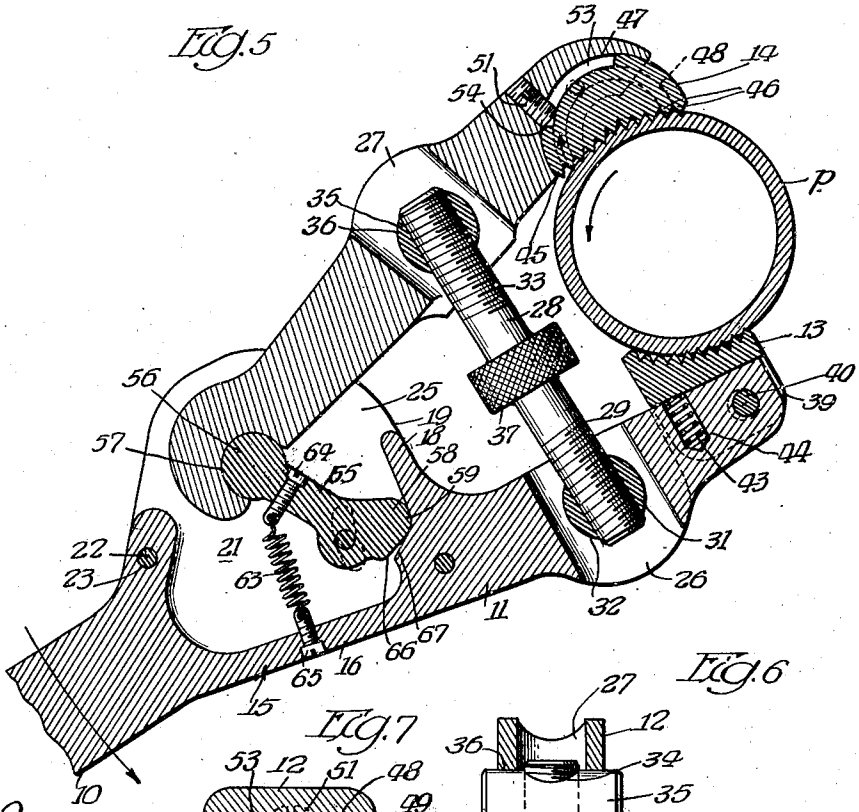


Fig. 6

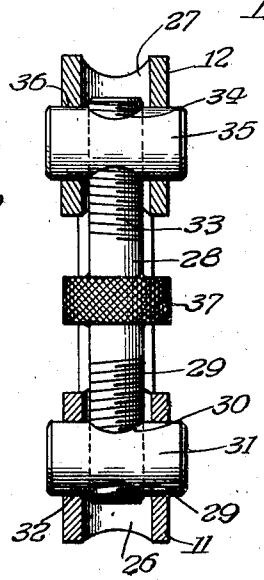


Fig. 7

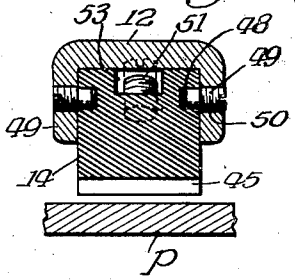


Fig. 9

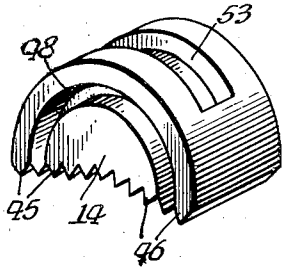
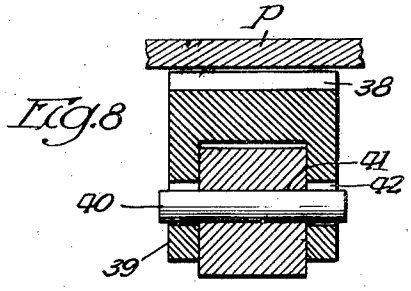


Fig. 8



Inventor
Benjamin L. Lurie
By Fred Gerlach
Atty

Patented Sept. 24, 1946

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UNITED STATES PATENT OFFICE

2,407,990

PIPE WRENCH

Benjamin L. Lurie, Chicago, Ill.

Application May 17, 1943, Serial No. 487,265

4 Claims. (Cl. 81—118)

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The present invention relates generally to wrenches. More particularly the invention relates to that type of wrench which is primarily designed for use in turning a pipe or like article and comprises an elongated handle having at one end thereof a pair of opposed jaw carrying arms, one of which is fixedly connected to the adjacent end of the handle and the other of which is movable to and from the fixed arm in order to adapt the wrench for use in connection with pipes that vary in diameter.

One object of the invention is to provide a wrench which is an improvement upon, and has certain advantages over, previously designed pipe wrenches and is characterized by durability and high efficiency.

Another object of the invention is to provide a pipe wrench of the type under consideration which is so designed and constructed that during use thereof it will not deform the pipe to which it is applied in the same manner as a straight jaw variety pipe wrench, such, for example, as a Stillson wrench.

Another object of the invention is to provide a pipe wrench of the aforementioned type in which the jaws are so arranged and designed that they will effectively grip a galvanized or greasy pipe regardless of whether the teeth thereof are slightly worn.

Another object of the invention is to provide a pipe wrench of the last mentioned character in which the jaws are of novel design and are so mounted on their respective arms that in connection with use of the wrench a maximum number of their teeth grip the pipe to which the wrench is applied.

A further object of the invention is to provide a pipe wrench of the type and character under consideration which includes novel means for adjusting the movable jaw carrying arm to and from the fixed arm and also novel means for automatically controlling the movable arm so that the jaw thereof moves towards the jaw on the fixed arm into firm gripping relation with the pipe directly upon initial swinging of the handle in connection with a pipe turning operation.

A still further object of the invention is to provide a pipe wrench which is generally of new and improved construction, may be manufactured or produced at a comparatively low cost, and not only is useable to turn pipes which are in inaccessible or restricted places, such, for example, as overhead pipes or pipes in corners or against walls or floors, but also is quickly released in connection with the initial part of reverse swinging of the handle.

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Other objects of the invention and the various advantages and characteristics of the present pipe wrench will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawings which accompany and form a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a side view showing a pipe wrench embodying the invention directly before the jaws thereof are pushed or shifted into gripping relation with a pipe;

Figure 2 is an inverted plan or bottom view of the wrench;

Figure 3 is a fragmentary side view showing the wrench after the jaws thereof have been fully shifted into engagement with the pipe preliminary to swinging of the handle in connection with a pipe turning operation, the jaws and the adjacent ends of the arms being shown in section for illustrative purposes;

Figure 4 is a fragmentary longitudinal section showing the wrench after the handle has been initially swung in connection with a pipe turning operation and illustrating the manner in which the automatic control means serves to swing the jaws on the movable arm towards the jaw on the fixed arm into gripping relation with the pipe;

Figure 5 is another fragmentary longitudinal section showing the jaws in full gripping relation with the pipe due to further swinging of the handle;

Figure 6 is a transverse section taken on the line 6—6 of Figure 1 and illustrating in detail the construction and design of the adjusting screw constituting the means for moving the movable arm to and from the fixed arm in order to adapt the wrench for use in connection with pipes that vary in diameter;

Figure 7 is an enlarged tranverse section taken on the line 7—7 of Figure 1 and showing the construction and design of the jaw on the movable arm and the manner in which it is rotatably supported;

Figure 8 is an enlarged transverse section taken on the line 8—8 of Figure 1 and illustrating in detail the manner in which the jaw on the fixed arm is mounted; and

Figure 9 is a perspective of the jaw which is

associated with, and mounted to rotate relatively to, the movable arm.

The wrench which is shown in the drawings constitutes the preferred form or embodiment of the invention. It is primarily designed or adapted for use in turning a pipe *p* and comprises as its main or principal parts an elongated handle 10, a pair of arms 11 and 12 and a pair of jaws 13 and 14.

One end of the handle is adapted to be gripped by the user in connection with use of the wrench. The other end of the handle is provided with an enlarged housing 15. The latter consists of a bottom wall 16, an inner end wall 17, an outer end wall 18, a side wall 19, and a removable plate 20. The walls 16, 17, 18 and 19 are formed integrally with said other end of the handle 10 and together define or form a pocket 21 having one side thereof open. The plate 20 is shaped correspondingly to the side wall 19 and serves as a closure for the open side of the pocket. Screws 22 extend through holes 23 in the inner and outer end walls 17 and 18 and into registering threaded holes 24 in the plate 20 and serve releasably or removably to secure the plate 20 in its operative or normal position. Removal of the screws 22 releases the plate 20 so that it may be withdrawn in order to provide access to the pocket 21. The inner end wall 17 of the housing 15 extends upwards to the upper central portion of the side wall 19, as shown in Figures 4 and 5. The upper end of the outer end wall 18 terminates beneath the upper end of the inner end wall and defines with said upper end of the inner end wall and the adjacent marginal portions of the side wall 19 and the plate 20, an opening 25 leading into the outer upper portion of the pocket 21.

The arm 11 is disposed outwards of the housing 15 and is in substantially longitudinal alignment with the handle 10. It embodies a vertical socket 26 in its central portion and has a substantially flat upper surface. The inner end of the arm 11 is formed integrally with the outer end wall 18 of the housing 15 with the result that the arm 11 is in fixed or rigid relation with the handle 10. The socket 26 extends completely through the central portion of the arm 11, as shown in Figures 4 and 5. The outer end of the arm 11 is of reduced width or thickness, as shown in Figure 2.

The arm 12 overlies the arm 11. It is movable to and from the latter as hereinafter described. The inner end of the arm 12 extends into the pocket 21 through the opening 25. The central portion of the arm 12 is provided with a substantially vertical socket 27 and this extends completely through the arm and is substantially vertically aligned with the socket 26 in the central portion of the arm 11. A screw 28 serves as a medium for adjusting the movable arm 12 to and from the arm 11. This screw extends substantially vertically and has the lower end thereof disposed in the socket 26 and its upper end disposed in the socket 27. The lower end of the screw has a right hand screw thread 29 and extends through a threaded hole 30 in the central portion of a transversely extending pivot pin 31. The ends of the pivot pin are journalled in a pair of coaxial or aligned holes 32 in the sides of the socket defining central portion of the arm 11. The pivot pin 31 permits the screw to swing back and forth between the outer end of the arm 11 and the outer end wall 18 of the housing 15. The upper end of the screw 28 is provided with a left hand screw thread 33 and extends

through a threaded hole 34 in the central portion of a pivot pin 35. The ends of the pivot pin are journalled in a pair of coaxial holes 36 in the sides of the socket defining central portion of the arm 12. The central portion of the screw 28 is provided with an integral enlarged cylindrical knob 37 for turning purposes. The periphery of this knob is knurled for gripping purposes. When the screw 28 is turned in one direction the arm 12 is moved towards the fixed arm 11 and when the screw is reversely turned or rotated the arm 12 is moved away from the fixed arm. By turning the screw 28 the arms 11 and 12 may be adjusted to receive pipes of different diameters. The pivot pin 35 permits the arm 12 to rock or swing relatively to the adjusting screw 28.

The jaw 13 is associated with, and carried by, the fixed arm 11. It is located at the outer end of such arm and has a concave upper face and a flat bottom face. The concave upper face is provided from the front end thereof to the rear end with transversely extending pipe engaging teeth 38. The rear end of the jaw 13 is higher than the front end with the result that the arcuate series of teeth 38 slopes outwards and downwards. The bottom portion of the jaw 13 is provided with a pair of laterally spaced, depending, integral lugs 39 and these straddle the outer end of the fixed arm 11 as best shown in Figure 8. A pin 40 extends through, and is fixed within, a transverse hole 41 in the outer extremity of the arm 11. The ends of this pin project beyond the sides of the outer end of the arm 11 and fit within holes 42 in the front ends of the depending lugs 39. The ends of the pin 40 and the hole defining portions of the lugs form a pivotal connection whereby the inner or rear end of the jaw 13 may be swung upwards and downwards to a limited extent relatively to the arm 11. When the jaw 13 is in its normal pipe gripping position the flat bottom face thereof rests flatly against the flat upper surface of the outer end of the arm 11, as shown in Figures 3, 4 and 5. The holes 42 are of slightly greater diameter than the pin 40 in order that the jaw 13 is free to slide outwards and inwards to a limited extent relatively to the outer end of the arm 11 and thus properly seat itself with respect to the pipe during a pipe gripping operation. A compression spring 43 serves to urge the jaw 13 upwards and outwards away from the outer end of the arm 11. This spring is disposed in a socket 44 which extends downwards from the upper surface of the arm 11 and is located midway between the pin 40 and the socket 26. The upper end of the spring engages the rear portion of the flat bottom face of the jaw 13. When the wrench is not in use the spring 43 holds the jaw 13 in its upwardly tilted position. When the jaw 13 is shifted into engagement with the pipe as hereinafter described, the jaw 13 swings downwards against the force of the spring 43 until the flat bottom face thereof is in seated relation with the flat upper surface of the outer end of the arm 11.

The jaw 14 is associated with, and carried by, the movable arm 12. It underlies the outer end of the movable arm and is disposed slightly outwards or forwards of the jaw 13. As shown in Figure 9, the jaw 14 is substantially semi-cylindrical and has a reentrant V-shaped bottom portion, the inner half of which has a substantially straight series of downwardly extending transverse teeth 45 and the outer half of which has a substantially straight series of downwardly ex-

tending transverse teeth 46. The curved or arcuate peripheral portion of the jaw 14 fits within a semi-circular recess 47 in the lower portion of the outer end of the movable arm 12. This recess extends longitudinally of the arm 12. It has the same radius as the arcuate peripheral portion of the jaw 14 and permits the jaw to turn or rotate back and forth about the axis or center thereof. The sides of the jaw 14 are provided with arcuate grooves 48 and these are in concentric relation with the arcuate peripheral portion of the jaw 14. A pair of screws 49 serves to hold the jaw 14 in connected relation with the outer end of the arm 12 while at the same time permitting the jaw to rock or rotate about its axis. These screws 49 extend through a pair of coaxial or longitudinally aligned threaded holes 50 in the side portions of the outer end of the arm 12 and are arranged so that the inner ends thereof fit within the arcuate grooves 48 (see Figure 7). A screw 51 extends through a threaded hole 52 in the upper portion of the outer end of the movable arm 12 and serves to limit rotation or rocking of the jaw 14. The inner end of the last mentioned screw extends into the upper or central portion of the semi-cylindrical recess 47 and projects into an arcuate groove 53 in the arcuate peripheral portion of said jaw 14, as shown in Figures 3, 4 and 7. The portion of the jaw 14 that defines the inner end of the arcuate groove 53 forms a stop shoulder 54. The latter coacts with the inner end of the screw 51 to limit clockwise rotation of the jaw 14 as viewed in Figures 1, 3, 4 and 5. Preparatory to applying the wrench to the pipe *p* the jaw 14 is rotated to a small extent in a counterclockwise direction as viewed in the aforementioned figures. In connection with a pipe turning operation the teeth 45 are brought into engagement with the pipe as shown in Figure 1. As the wrench is further shifted toward the pipe the jaw 14 turns in a clockwise direction and causes the teeth 46 to be brought into engagement or gripping relation with the pipe, as shown in Figure 3.

In addition to the parts heretofore described the wrench comprises means for automatically swinging the outer or front end of the movable arm 12 forwards and downwards into firm gripping relation with the pipe *p* directly upon initial swinging of the handle 10 in connection with a pipe turning operation. Such means comprises a toggle link 55 in the pocket 21. This toggle link extends between the inner end of the movable arm 12 and the inner lower portion of the outer end wall 18 of the housing 15. It is arranged so that it extends upwards and inwards at an angle of approximately 60° with respect to the horizontal when the wrench is so positioned that the handle 10 extends horizontally. The upper end of the toggle link 55 is provided with an enlarged cylindrical head 56 which fits within a three-quarter round socket 57 in the lower portion of the inner end of the movable arm 12. The lower end of the toggle link embodies a forwardly extending convexly curved lug 58 which fits against a concavely curved surface 59 on the inner lower portion of the outer end wall 18 and permits the toggle link to rock outwards and inwards relatively to the opening 25 for the pocket 21. When the jaw 14 is in gripping relation with the pipe *p* and the handle 10 is initially swung downwards in connection with a pipe turning operation the upper end of the toggle link 55 swings forwards to a small or limited extent and causes the arm 12 to swing forwards about the

axis of the pivot pin 31 and also causes the arm to swing in a clockwise manner as viewed in the drawings about the axis of the pivot pin 35. Such swinging on the part of the movable arm results in the jaw 14 being urged in the direction of the jaw 13 and into firm gripping relation with the pipe *p*. The amount of rocking or swinging of the movable arm by the toggle link 55 increases as the amount of downward force on the handle 10 increases. A pin and slot connection 60 serves to hold the lug 58 in seated relation with the curved surface 59 while at the same time permitting the toggle link 55 to swing outwards and inwards. This connection comprises a laterally extending pin 61 on the inner end of the toggle link 55 and an arcuate groove 62 in the inner face of the side wall 19 of the housing 15. The outer end of the pin 61 projects into the groove 62, as shown in Figures 4 and 5. Such groove is disposed adjacent the concavely curved surface 59. A tension spring 63 serves to swing inwards the toggle link 55 and effect retraction of the movable arm 12 immediately after the jaw 14 is released from the pipe after a pipe turning operation. This spring is disposed in the inner portion of the pocket 21 and has one end thereof anchored to a pin 64 on the central portion of the toggle link 55 and its other end anchored to a pin 65 on the central portion of the bottom wall 16 of the housing 15. A pair of coacting flat surfaces 66 and 67 serve to limit retraction or inward swinging of the toggle link 55 by the spring 63. The surface 66 is formed on the lower end of the toggle link 55 directly beneath the convexly curved lug 58. The surface 67 is formed on the inner lower portion of the outer end wall 18 directly beneath the concavely curved surface 59. When the toggle link 55 rocks forward in connection with a pipe turning operation the surface 66 swings away from the surface 67, as shown in Figures 4 and 5. When the toggle link 55 is retracted after a pipe turning operation as the result of the action of the tension spring 63 the flat surface 66 swings into contact or engagement with the surface 67 and thus serves to limit retraction of the toggle link by the spring.

When it is desired to use the wrench the user first adjusts the movable arm 12 so as to space apart the jaws 13 and 14 to the proper extent to receive the pipe. The adjustment is effected by turning the screw 28 in one direction or the other depending upon whether it is desired to move the arm 12 to or from the fixed arm 11. After the arm 12 is properly adjusted so that the jaws are set or positioned to receive the pipe, the handle 10 is grasped and the wrench is shifted bodily towards the pipe. During the initial part of shift of the wrench towards the pipe the teeth 45 on the jaw 14 and the outer teeth on the jaw 13 are brought into engagement or contact with the pipe, as shown in Figure 1. During further shift of the wrench towards the pipe the jaw 14 rotates in a clockwise direction as viewed in the drawings with the result that the teeth 46 are brought into engagement with the pipe and the pipe is forced inwards into complete seated relation with the teeth 38 on the upper portion of the jaw 13. Clockwise rotation of the jaw 14 also causes the pipe to depress the jaw 13 against the force of the compression spring 43. The pressure which is exerted by this spring causes both jaws to grip the pipe before the handle 10 is swung for pipe turning purposes (see Figure 2). After the wrench is shifted towards the pipe as far as possible the handle 10 is swung downwards.

During the initial part of downward swing of the handle the jaw 14 rotates in a clockwise manner until it is stopped as the result of abutment of the inner end of the screw 51 against the stop shoulder 54 at the inner end of the arcuate groove 53. During clockwise rotation of the jaw 14 in connection with initial downward swinging of the handle 10 the teeth 46 continue to force the pipe downwards against the teeth 36 and the jaw 13 is depressed or swung downwards until the bottom face thereof is in seated relation with the upper flat surface of the arm 11. As soon as the jaw 13 is depressed to its fullest extent in connection with initial downward swinging of the handle the two jaws are in fixed or rigid relation with their respective arms. During further downward swinging of the handle 10 the arm 12 moves outwards relatively to the handle and fixed arm in an arc about the axis of the pivot pin 31. As the arm 12 moves outwards the toggle link 55 swings outwards in the direction of the pipe and causes the arm 12 to swing or rock in a clockwise manner about the center or axis of the pivot pin 35. Such swinging or rocking of the arm 12 forces the jaw 14 towards the jaw 13 and causes the teeth on the two jaws to bite into the pipe, as shown in Figure 4. As soon as the teeth of the two jaws are caused to bite into the pipe further downward swinging of the handle results in turning of the pipe. By reason of the fact that a maximum number of teeth are in gripping relation with the pipe the load or gripping force on the pipe is evenly distributed and there is no likelihood of the pipe being crushed in connection with turning thereof by the wrench. Reverse or upward swinging of the handle reverses the action of the various parts and elements and releases the jaws from the pipe. As soon as the jaws are released from the pipe in connection with upward swinging of the handle 10 the tension spring 63 swings the toggle link 55 and the arm 12 inwards until they are stopped as a result of abutment of the flat surface 66 against the surface 67. If it is desired to turn the pipe in a clockwise direction as viewed in the drawings the wrench is reversed, i. e., turned upside down.

The herein described wrench is extremely efficient so far as operation is concerned and involves a rugged construction which tends towards durability. It may be produced at a reasonably low cost and is useable in connection with pipes in inaccessible places, such, for example, as overhead pipes or pipes in corners or against walls or floors.

Whereas the wrench has been described as a medium for turning a pipe it is to be understood that it may be used to turn any other article. It is also to be understood that the invention is not to be restricted to the details set forth since these may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. A pipe wrench comprising a handle, an arm having one end thereof connected fixedly to one end of the handle, a laterally disposed jaw pivotally mounted on the outer end of the arm to swing to and from said arm and having on the outer portion thereof a concave pipe engaging face with transverse teeth thereacross, spring means for urging said jaw away from the arm, a second arm disposed in opposed relation with the first mentioned arm and having its outer end projecting a short distance beyond the outer end of said first mentioned jaw and provided with a longitudinal arcuate recess facing the jaw, a substantially semi-circular jaw seated and rotatably mounted in the recess and having exteriorly of said recess a reentrant V-shaped pipe engaging face with transverse teeth thereacross, an adjusting screw adapted to move the second arm to and from the first mentioned arm and having the ends thereof pivotally connected to the central portions of said arms, respectively, and means operative automatically in response to swinging of the handle in a direction away from the second arm after application of the jaws to the pipe to move the second arm outwards away from the handle and also to swing or tilt said second arm in such direction as to cause the jaw thereon to move towards the jaw on the first mentioned arm, and embodying an angularly disposed toggle link having one end thereof pivotally connected to the inner end of said second arm and its other end in pivotal relation with said one end of the handle, and so arranged or inclined that said one end thereof extends away from the adjusting screw and its said other end extends towards the adjusting screw.

2. A pipe wrench comprising a handle, an arm having one end thereof connected fixedly to one end of the handle and embodying at its outer end a laterally extending pipe engaging jaw, a second arm disposed in opposed relation with the first mentioned arm and having its outer end provided with a laterally extending pipe engaging jaw, an adjusting screw adapted to move the second arm to and from the first mentioned arm and having the ends thereof pivotally connected to the central portions of said arms, respectively, means operative automatically in response to swinging of the handle in one direction after application of the jaws to the pipe to move the second arm outwards away from the handle and also to swing or tilt said second arm in such direction as to cause the jaw thereon to move towards the jaw on the first mentioned arm, and embodying an angularly disposed toggle link having one end thereof pivotally connected to the inner end of said second arm and its other end in pivotal relation with said one end of the handle, and so arranged or inclined that said one end thereof extends away from the adjusting screw and its said other end extends towards the adjusting screw, and a spring extending between, and connected to, the toggle link and said one end of the handle, and arranged to move and swing said second arm reversely when the handle is swung into the opposite direction after a pipe turning operation.

3. A pipe wrench comprising a handle, an arm having one end thereof connected fixedly to one end of the handle and embodying at its outer end a laterally extending pipe engaging jaw, a second arm disposed in opposed relation with the first mentioned arm and having its outer end projecting a short distance beyond the outer end of said first mentioned arm and provided with a laterally extending pipe engaging jaw, an adjusting screw adapted to move the second arm to and from the first mentioned arm and having the ends thereof pivotally connected to the central portions of said arms, respectively, means operative automatically in response to swinging of the handle in one direction after application of the jaws to the pipe to move the second arm outwards away from the handle and also to swing or tilt said second arm in such direction as to cause the jaw thereon to move towards the jaw

on the first mentioned arm, and embodying an angularly disposed toggle link having one end thereof pivotally connected to the inner end of said second arm and its other end in pivotal relation with said one end of the handle, and so arranged or inclined that said one end thereof extends away from the adjusting screw and its said other end extends toward the adjusting screw, a spring applied to the toggle link and operative to move and swing said second arm reversely when the handle is swung in the opposite direction after a pipe turning operation, and means consisting of a pair of coacting substantially flat surfaces on said other end of the toggle link and the adjacent portion of said one end of the handle for limiting reverse movement and swing of said second arm by the spring.

4. A pipe wrench comprising a handle, an arm having one end thereof connected fixedly to one end of the handle and embodying at its outer end a laterally extending pipe engaging jaw, a second arm disposed in opposed relation with the first mentioned arm and having its outer end provided with a longitudinal arcuate recess facing

the jaw, a substantially semi-circular jaw seated and rotatably mounted in the recess and having exteriorly of said recess a reentrant substantially V-shaped pipe engaging face, an adjusting screw device adapted to move the second arm to and from the first mentioned arm and having the ends thereof pivotally connected to the central portions of said arms, respectively, and means operative automatically in response to swinging of the handle in a direction away from the second arm after application of the jaws to the pipe to move the second arm outwards away from the handle and also to swing or tilt said second arm in such direction as to cause the jaw thereon to move towards the jaw on the first mentioned arm, and embodying an angularly disposed toggle link having one end thereof pivotally connected to the inner end of said second arm and its other end in pivotal relation with said one end of the handle, and so arranged or inclined that said one end thereof extends away from the adjusting screw and its said other end extends toward the adjusting screw.

BENJAMIN L. LURIE.