Dec. 22, 1931. L. F. BAASH ET AL 1,837,645

TONGS

Filed April 8, 1930 2 Sheets-Sheet 1

Fig. 1.

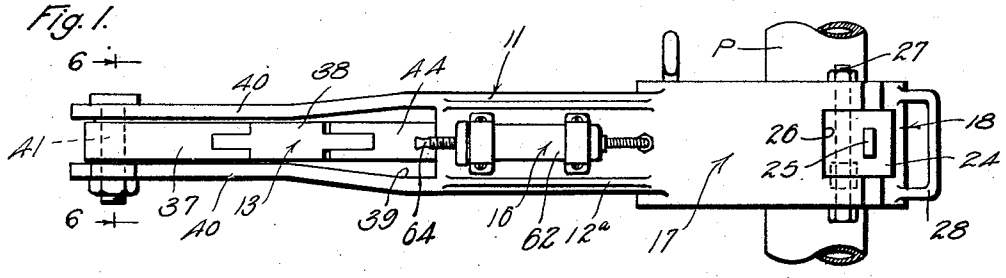


Fig. 2.

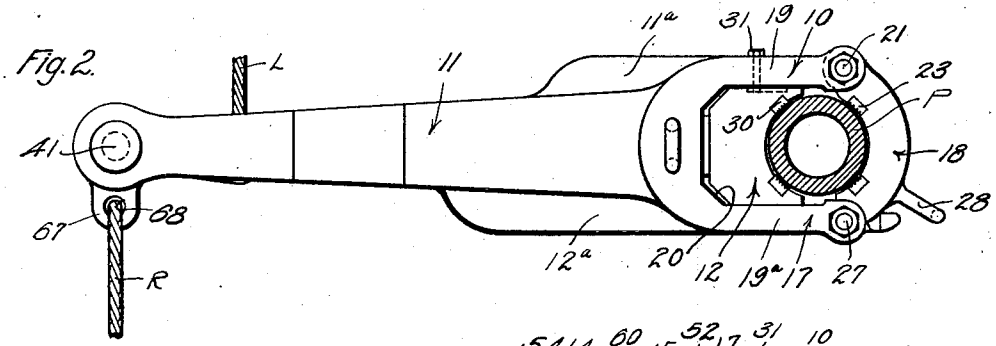


Fig. 3.

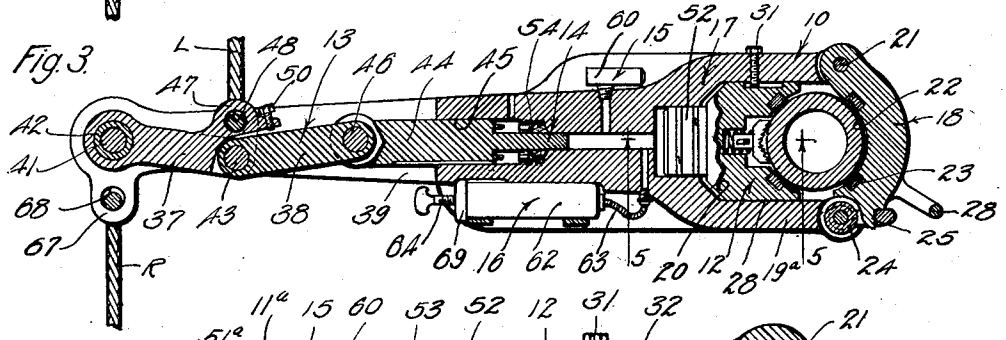
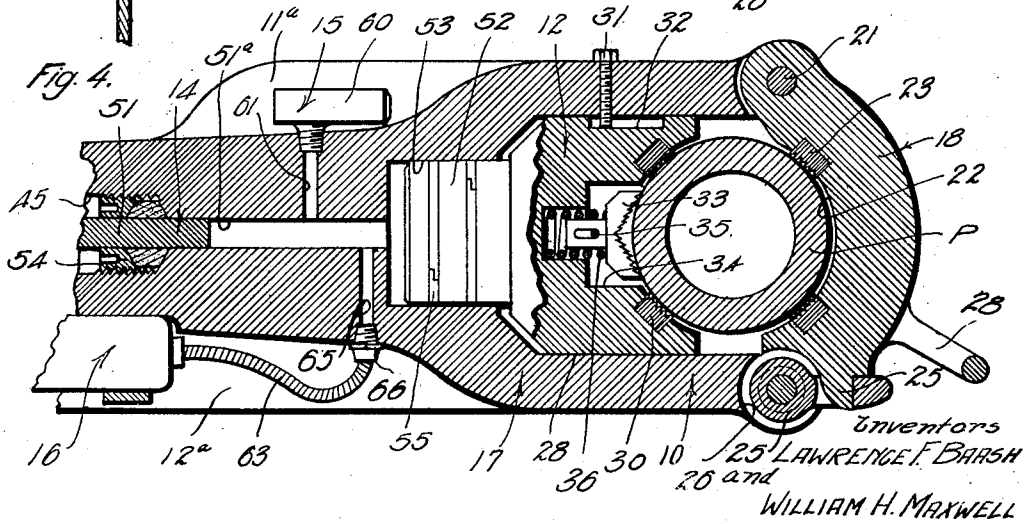


Fig. 4.



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Dec. 22, 1931. L. F. BAASH ET AL 1,837,645

TONGS

Filed April 8, 1930 2 Sheets-Sheet 2

Fig. 5.

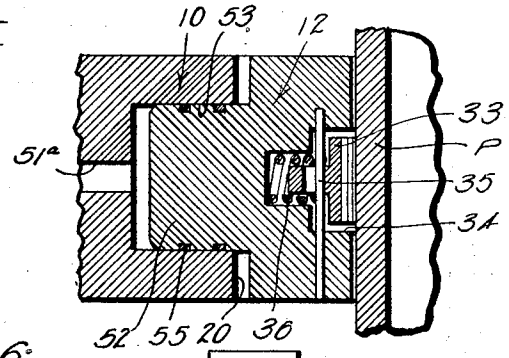


Fig. 6.

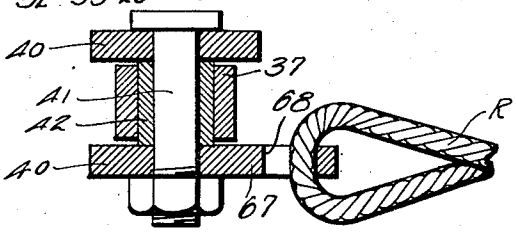


Fig. 7.

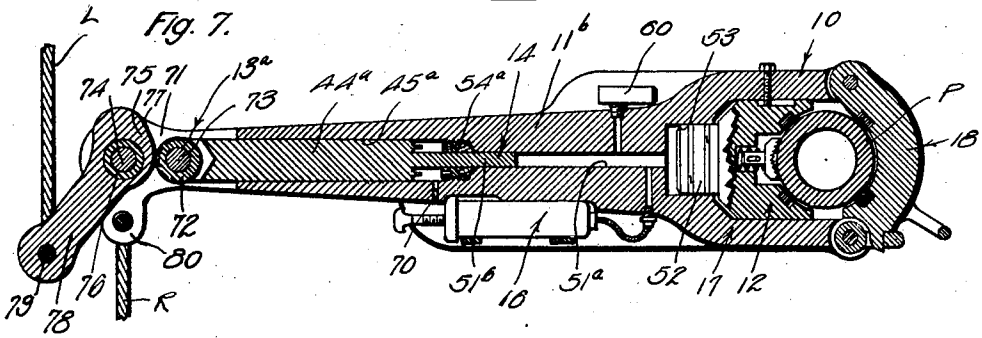
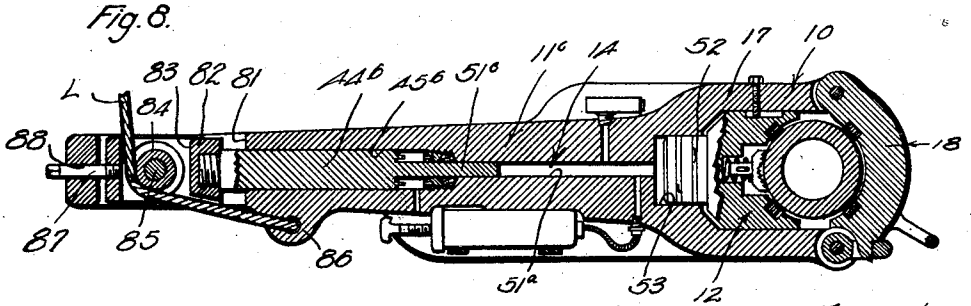


Fig. 8.



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Patented Dec. 22, 1931 1,837,645

UNITED STATES PATENT OFFICE

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TONGS

Application filed April 8, 1930. Serial No. 442,541.

This invention relates to tools for handling pipe and like objects and relates more particularly to tongs for handling and gripping pipe, tubing, etc.

The usual forms of tongs employed for handling comparatively large pipe or casing, for example, well casing and drill pipe, have certain characteristics limiting their effectiveness and practicability. The types of tongs employed for handling comparatively large pipe usually embody a head for engaging the object to be handled, a handle for the head, and a pipe gripping element that is operated into gripping engagement with the casing by lever means at the head. It is undesirable to form the head of the common forms of tongs very large as it makes the tool unbalanced and inconvenient to operate and handle. Accordingly, the lever mechanism for operating the pipe gripping parts must be made comparatively small and with but short leverage. For these and various other reasons it has been found difficult to provide tongs of the character referred to that are convenient to handle and which are capable of gripping an object with great force.

A general object of the invention is to provide tongs that are adapted to grip an object very securely or with great force, and which are well balanced and convenient to handle and operate.

Another object of the invention is to provide a tool of the character mentioned embodying a gripping element or jaw operated by the operating line for operating or turning the tongs.

It is another object of the invention to provide tongs of the character mentioned in which the operating line for operating and turning the tool and for operating the gripping jaw leaves or passes from the handle of the tool at a point a considerable distance from the object engaged by the tool so that a substantial leverage is obtained for turning or rotating the object.

It is another object of the invention to provide tongs of the character mentioned in which the force or pull applied to the tool for turning the tool and for operating the gripping element is increased through the medium of a fluid pressure mechanism to operate the gripping jaw with great force.

Another object of the invention is to provide tongs of the character mentioned that may embody various forms of mechanisms for utilizing and for applying the force delivered through the operating line to put pressure on the jaw actuating fluid. The construction may embody toggle means, cam means, etc., for converting the pull or force applied through the operating line to a force for acting on the fluid pressure mechanism for operating the gripping jaw.

It is another object of the invention to provide tongs of the character mentioned that embody means for supplying fluid to the fluid pressure means to compensate for leakage, etc.

It is a further object of the invention to provide tongs of the character mentioned that include a control or safety valve for the fluid to prevent the pressure from reaching an excessive amount and to prevent the jaw from injuring or crushing a pipe or part handled by the tongs.

Other objects and features of our invention will be best and more fully understood from the following detailed description of typical forms and applications of the invention, throughout which description reference is had to the accompanying drawings, in which:

Fig. 1 is a side elevation of one form of our present invention illustrating it in engagement with a pipe. Fig. 2 is a top or plan view of the tongs illustrated in Fig. 1. Fig. 3 is a horizontal detailed sectional view of the tool illustrated in Figs. 1 and 2. Fig. 4 is an enlarged detailed horizontal sectional view of the head portion of the tongs. Fig. 5 is an enlarged transverse detailed sectional view taken as indicated by line 5—5 on Fig. 3. Fig. 6 is an enlarged transverse detailed sectional view taken as indicated by line 6—6 on Fig. 1. Fig. 7 is a horizontal detailed sectional view of another form of the invention, and Fig. 8 is a horizontal detailed sectional view of another form of the invention.

The broader principles of our invention are capable of embodiment in tongs and tools of various characters for handling various

types of objects. Further, the invention is susceptible of embodiment in tongs or tools for handling objects of various sizes, and the invention contemplates the modification and variation of the parts to suit any particular class of work and is not to be considered as limited to the particular embodiments described in the following disclosure.

In the drawings we have illustrated three simple forms of our invention differing from one another, principally, in the means or mechanisms for applying or transposing the pull or force from the operating line for operating the tongs, to the fluid for operating the gripping jaw. The mechanisms or devices for translating the force delivered through the operating line to the fluid may be varied considerably in principal and construction, and the invention is not to be construed as limited to the particular mechanisms herein set forth for acting upon the fluid.

The form of the invention illustrated in Figs. 1 to 6, inclusive, of the drawings includes, generally, a pipe encircling head 10, a handle 11, a gripping element or jaw 12 carried by the head 10, means 13 operable by an operating line L, or the like, to act through a fluid pressure means 14 to actuate the jaw 12, a control or safety valve 15 for the fluid pressure means 14, and means 16 for supplying fluid to the means 14.

The pipe encircling head 10 is intended to engage or surround a pipe P, or the like, and carries the gripping jaw 12 for gripping the pipe. The head 10 may be varied in construction to adapt it for handling pipe or other objects of various classes. In the particular form of the invention illustrated in the drawings the head 10 includes two main parts, namely, a body 17 and a closure or gate 18.

In the preferred form of the invention, the body 17 of the head 10 carries the gripping jaw 12 and is provided with the operating lever or handle 11. The body 17 may be a simple unitary part of substantially U-shaped configuration. The body 17 may have spaced side parts 19 and 19^a forming an opening 20. The side parts 19 and 19^a may be substantially parallel and the side walls of the opening 20 may be flat and parallel to slidably carry the gripping jaw 12.

The gate 18 of the head 10 is in the nature of a closure for the opening 20 and is provided to retain a pipe P, or the like, in position for engagement by the gripping jaw 12. The gate 18 may be any suitable form of closure for the outer end of the opening 20 and may be mounted on the body 17 in any suitable manner. In the particular case shown the gate 18 is a rigid unitary part pivotally mounted on the side part 19 of the body 17. The gate may be pivotally secured to the side part 19 by a pivot pin or bolt 21. The inner side 22 of the gate is formed to effectively seat against or engage the pipe P, it may be curved to conform to the configuration of the pipe and may be provided with gripping parts in the form of dies 23.

In accordance with the invention means is provided for releasably retaining or holding the gate 18 in the closed position. A suitable latch 24 may be pivotally mounted on the side part 19^a of the body to cooperate with a lug 25 on the outer or free end of the gate 18 to releasably hold the gate in the closed position. The latch 24 may be pivotally mounted in a socket 26 in the side part 19^a by means of a pivot pin 27. An operating handle 28 may be provided on the outer side of the gate 18.

The handle 11 is provided to carry the means 13 and 14 and to facilitate the handling and operation of the tool. The handle 11 is preferably provided in connection with the body 17 of the head 10. The handle 11 may be formed integral with the body 17 and projects outwardly or rearwardly from the body 17. The handle 11 may be made comparatively long. In the preferred form of the invention reinforcing or protective ribs or parts are formed on the handle 11 adjacent the body 17. In the particular case illustrated there are two spaced reinforcing ribs 11^a on one side of the handle and spaced reinforcing ribs 12^a on the opposite side of the handle. The ribs 11^a and 12^a may join or be continuous with the body 17. The outer end portion of the handle 11 may be provided with means for connection with a return line R or other means for returning the tongs after actuation. In the form of the invention illustrated in the drawings, a lug 67 projects laterally from the handle 11 adjacent its outer end and is provided with an opening 68 for passing a return line R, or the like.

The gripping element or jaw 12 is slidably carried by the head 10 and is adapted to engage or grip a pipe P, or the like, extending through the head 10. The jaw 12 is slidably carried in the opening 20 of the body 17 and may be a simple, rigid part having flat parallel sides 28 to slidably operate on the side walls of the opening 20. The forward or active pipe engaging end of the jaw 12 is preferably shaped to effectively engage the exterior of the pipe P. The active end of the jaw 12 may be curved or made concave to engage the pipe and may be provided with pipe engaging or gripping dies 30. The invention may include means for limiting the movement of the jaw 12 in the opening 20. A screw or bolt 31 may extend through the side part 19 to project from the side wall of the opening 20 into a longitudinal groove 32 in a side of the jaw 12. The movement of the jaw 12 in opposite directions is limited by the ends of the groove 32 engaging the screw 31.

In the preferred form of the invention means is provided for resisting rotation of the tool relative to the pipe P during the start of operation of the jaw 12. A spring pressed pipe engaging member 33 may be mounted in a recess 34 in the active end of the jaw 12 to engage the pipe P. The member 33 may be pivotally and slidably mounted in the recess 34 on a pin 35 extending transversely through the recess. A compression spring 36 may be arranged in the recess 34 to urge the member 33 outwardly into engagement with the pipe P. The pipe engaging face of the member 33 may be made concave and may be provided with gripping parts or teeth to grip the pipe.

The means 13 is adapted to be actuated by the line L to act on the fluid means 14 to operate the jaw 12 into gripping engagement with the pipe P. The means 13 in the form of the invention illustrated in Figs. 1 to 6, inclusive, of the drawings is in the nature of lever or toggle means and operates to convert the lateral pull imparted to the tool through the line L to an inward thrust or push for acting on the means 14. The means 13 is carried in the outer portion of the handle 11 and includes two pivotally connected links, an outer link 37, and an inner link 38. The outer portion of the handle 11 may be yoked to have a central slot or opening 39 and spaced side parts 40. The link 37 is pivotally supported by the side parts 40 of the handle. A pivot pin or bolt 41 may extend transversely between the outer portions of the parts 40 and through an opening in the outer portion of the link 41 to pivotally mount the link on the handle 11. A suitable bushing 42 may be provided on the pin 41. The inner end of the link 37 is pivotally connected with the inner link 38 by a pivot pin 43. The inner end of the inner link 38 is connected with a rod or stem 44 slidable in a longitudinal opening 45 in the handle 11. The link 38 is pivotally connected with the outer end of the rod 44 by a pivot pin 46. The links 37 and 38 are mounted and related so that when they are operated inwardly from a buckled position toward a position in alignment with the rod 44, they operate or force the rod 44 inwardly toward the jaw 12.

Means may be provided in connection with either of the links 37 or 38 for connection with the operating line L. In the particular case illustrated a lug 47 projects outwardly from the link 37 adjacent its point of connection with the link 38 for receiving the line L. The lug 47 may have an opening 48 for passing the line. A lateral pull on the line L tending to operate the links inwardly into alignment with the rod 44 from an out position acts to shift the rod inwardly. It is preferred to provide means for limiting the inward movement of the links 37 and 38 to prevent them from assuming a position in direct axial alignment with the rod 44. A stop screw 50 may be provided on the lug 47 adapted to engage the link 38 to limit the relative pivotal movement of the links 37 and 38.

The means 14 is provided for increasing the force imparted to the tool by the line L through the means 13 for operating the gripping jaw 12 into tight gripping engagement with the pipe P. The means 14 is in the nature of a fluid pressure means and includes a plunger 51 operated by the rod 44 and slidable in a longitudinal opening 51^a in the handle 11 and a piston or plunger 52 on the jaw 12 operable in a cylinder 53 in the body 17 communicating with the opening 51^a. The plunger 51 is provided at the inner end of the slidable rod 45 and may be formed integral with the rod. The plunger 51 may be of smaller diameter than the rod 44 and slidably fits the walls of the opening 51^a which communicates with the opening 45. The plunger 50 is provided to act upon fluid, say, oil, confined in the opening 51^a and the cylinder 53. A packing gland 54 may be provided in the inner end of the opening 45 to pack around the plunger 51. A suitable check valve 66 is provided in connection with the line 63 to allow the entrance of fluid into the opening 51^a and to prevent the discharge of fluid from the opening. The screw 64 may be operated to force fluid into the opening 51^a when the supply of fluid in the opening and cylinder 53 becomes reduced or exhausted through leakage, etc. The outer end of the reservoir 62 may be provided with a removable end or head plate 69 which may be removed to permit filling of the reservoir.

In the form of the invention illustrated in Fig. 7 of the drawings, the pipe encircling means 10 may be of the same construction as that described above, that is, it may include a body 17 and a gate 18 for encircling the pipe P. The body 17 may slidably carry the gripping jaw 12 and may be provided with the handle 11^b. The fluid means 14 of this form of the invention may be substantially the same as the means 14 of the form of the invention described above and may include a piston 52 on the jaw 12 operable in a cylinder 53 in the body 17. The means 14 may further include the plunger 51^b slidable in an opening 51^a communicating with the inner end of the cylinder 53. A safety valve 60 may be provided in connection with the opening 51^a to prevent the pressure in the opening 51^a and cylinder 53 from becoming excessive. A fluid supply means 16 may be provided in connection with the means 14 for supplying fluid to the opening 51^a and cylinder 53.

The handle 11^b of the form of the invention illustrated in Fig. 7 may be integral with the body 17 and may be of substan-

tially the same construction as the handle 11 described above. In this form of the invention the means 13ª for acting upon the fluid in the opening 51ª and cylinder 53 is in the form of a cam means and includes a rod 44ª slidable in an opening 45ª in the handle and carrying the plunger 51ᵇ. The plunger 51ᵇ may be formed integral with the rod 44ª. A suitable packing gland 54ª may be provided in the inner end of the opening 45ª to pack around the plunger 51ᵇ. An opening 70 may be provided in the handle 11ᵇ to communicate with the inner end of the opening 45ª to permit the discharge of air trapped in the inner end of the opening. The outer end portion of the handle 11ᵇ is provided with a slot or opening 71. The outer end of the rod 44ª projects into the opening 71 and carries at its outer end an anti-friction roller 72. The roller 72 is rotatably carried on a pin in the shaft 73.

A cam 75 is rotatably mounted in the opening 71 at the outer end of the handle to be directly operable by an operating line L to engage the roller 71 for operating the rod 44a inwardly. The cam 75 is rotatably mounted in the opening 71 of the shaft 74. A suitable bushing 76 may be provided on the shaft 74. The cam 75 includes a cam face 77 eccentric to the axis of rotation of the cam to engage the roller 72. An operating lever or arm 78 is provided on the cam 74 for connection with the line L. The arm 78 projects outwardly from the cam 74 and may be formed integral with the cam. It is preferred that the arm 78 project outwardly beyond the outer end of the handle 11ᵇ so that an operating line L connected to the arm at its outer end may pass the outer end of the handle. An opening 79 may be provided in the outer end of the arm 78 to pass the operating line L. The line L may be employed to turn or operate the tongs and extends laterally from the arm 78 at the outer end of the handle 11ᵇ. Upon actuation of the line L the cam 74 is rotated causing the cam face 77 to operate the rod 44ª and the plunger 50ª inwardly to act upon the fluid in the opening 51 and the cylinder 53. Actuation of the line L also causes turning or rotation of the tool. A lug 80 may be provided at the outer end of the handle 11ᵇ for receiving a return line R, or the like.

It is believed that the operation of the form of the invention illustrated in Fig. 7 will be readily apparent from the foregoing detailed description of that form of the invention. Inward movement of the rod 44ª and plunger 51ᵇ caused by rotation of the cam 74 causes the fluid carried in the opening 51ª and cylinder 53 to act upon the piston 52 to force the gripping jaw 12 into gripping engagement with the pipe P.

In the form of the invention illustrated in Fig. 8 of the drawings the pipe encircling means 10 may be of the same construction as that described above; that is, it may include a body 17 and a gate 18. The gripping jaw 12 and parts in connection therewith may be the same as in the forms of the invention described above. This form of the invention includes a fluid means 14 through which the gripping jaw 12 is operated. The fluid means 14 of this form of the invention may be of the same general construction as that described in connection with the form of the invention illustrated in Figs. 1 to 6, inclusive, of the drawings and may include a piston 52 to operate in a cylinder 53 in the body and a plunger 51ᶜ slidable in an opening 51a in the handle 11ᶜ.

In the form of the invention shown in Fig. 8 the handle 11ᶜ is provided at its outer end with a transverse opening 81. An operating rod 44ᵇ is slidable in an opening 45ᵇ and carries the plunger 51ᶜ. The plunger 51ᶜ is provided at the inner end of the rod 44ᵇ and may be formed integral with the rod. The rod 44ᵇ projects into the opening 81 of the handle 11ᶜ. A block 82 is mounted on the outer end of the rod 44ᵇ in the opening 81. The block 82 may be slidably carried on the side walls of the opening 81. The block 82 is provided with a transverse opening 83 which carries a pulley 84. The pulley 84 may be rotatably mounted in the opening 83 on a pin 85. The pulley 84 is provided to pass an operating line L for operating the tongs. The line L may have its end secured to a lug 86 on a side of the handle 11ᶜ and may extend outwardly from the lug 86 and then over the outer side of the pulley 84. The line L may pass laterally from the side of the handle 11ᶜ and may be operated for turning the tongs and for causing inward movement of the rod 44ᵇ. This form of the invention may include a guide rod 87 projecting outwardly from the outer end of the block 82 and slidable in an opening 88 in the outer portion of the handle 11ᶜ. An outward or lateral pull or force exerted on the line L tending to turn the tongs causes the rod 44ᵇ and the plunger 51ᶜ to be operated inwardly to act upon the fluid in the opening 51ª and cylinder 53.

It is believed that the operation of the several forms of the invention described in the foregoing disclosure will be readily apparent. In the form of the invention illustrated in Figs. 1 to 6, inclusive, of the drawings the operating line L may be employed to operate the gripping jaw 12 into gripping engagement with the pipe P and also to turn the tool. In this form of the invention the rod 44 is operated inwardly through the straightening of the toggle links 37 and 38 to act upon the fluid in the opening 51ª and cylinder 53. It is to be noted that the force applied on the line L which operates the rod 44 inwardly is materially increased

through the fluid means 14 to operate the jaw 12 so that it grips the pipe P with great force. The release of the pressure in the opening and cylinder permits the retraction of the gripping jaw 12.

The present invention provides tongs which may be operated directly by the operating line L to grip an object such as a pipe, for rotation. The invention provides a construction which may include various forms of mechanisms for applying the pull from an operating line, or the like, to act upon the force increasing fluid medium for directly operating the gripping jaw. The three mechanisms described above for acting upon the fluid are examples of mechanisms for acting upon the fluid and are not to be taken as limiting the invention.

The control means 15 provides a means for preventing the collapse or distortion of the pipe P through excessive pressure being applied on the gripping jaw 12. The valve 60 may be set or adjusted to release the pressure in the cylinder 53 upon the pressure reaching a predetermined amount. The means 15 provides for the replenishing of the opening 51^a and the cylinder 53 with fluid. The reservoir 62 and the valve 60 are protected by the ribs 12^a and 11^a and are mounted on the handle where they do not interfere with the handling or operation of the tool.

Having described only typical preferred forms of our invention, we do not wish to limit ourselves to the specific details set forth, but wish to reserve to ourselves any changes or variations that may appear to those skilled in the art or fall within the scope of the following claims:

Having described our invention, we claim:

1. A tool of the character described including, an object engaging means, a gripping element carried by the said means for operation by fluid pressure, and toggle means operable by an operating means for the tool to develop fluid pressure to operate the gripping element.

2. A tool of the character described including, an object engaging means, a gripping element carried by the said means for operation by fluid pressure, and toggle means operable by an operating line to develop fluid pressure to operate the gripping element.

3. A tool of the character described including, a handle, an object engaging head carried by the handle, a gripping member for engaging the object, and means for operating the gripping member including a piston connected with the gripping member and operable in a cylinder, a plunger slidable in an opening communicating with the cylinder, and toggle means for operating the plunger.

4. A tool of the character described including, a handle, an object engaging head carried by the handle, a gripping member for engaging the object, and means for operating the gripping member including a piston on the gripping member operable in a cylinder, a plunger slidable in an opening communicating with the cylinder, and toggle means on the handle for operating the plunger.

5. A tool of the character described including, a handle, an object engaging head carried by the handle, a gripping member for engaging the object, and means for operating the gripping member including a piston on the gripping member operable in a cylinder in the head, a plunger slidable in an opening communicating with the cylinder, and lever means for operating the plunger.

6. A tool of the character described including, a handle, an object engaging head carried by the handle, a gripping member for engaging the object, and means for operating the gripping member including a piston on the gripping member operable in a cylinder in the head, a plunger slidable in an opening in the handle communicating with the cylinder, and lever means on the handle for operating the plunger.

7. A tool of the character described including, a handle, an object engaging head carried by the handle, a gripping member for engaging the object, and means for operating the gripping member including a piston connected with the gripping member operable in a cylinder, a plunger slidable in an opening communicating with the cylinder, and toggle means for operating the plunger, the cylinder being of larger diameter than the opening.

8. A tool of the character described including, a handle, an object engaging head carried by the handle, a gripping element for engaging the object, means for operating the gripping element including, a piston connected with the gripping element operable in a cylinder, a plunger slidable in an opening communicating with the cylinder, toggle means for operating the plunger, and a safety valve in connection with the opening.

9. A tool of the character described including, a handle, an object engaging head carried by the handle, a gripping element for engaging the object, means for operating the gripping element including, a piston connected with the gripping element operable in a cylinder, a plunger slidable in an opening communicating with the cylinder, toggle means for operating the plunger, and means for supplying fluid to the opening and cylinder.

10. A tool of the character described including, a handle, an object engaging head carried by the handle, a gripping element for engaging the object, means for operating the gripping element including, a piston connected with the gripping element operable in a cylinder, a plunger slidable in an open-

ing communicating with the cylinder, toggle means on the handle for operating the plunger, and means for supplying fluid to the opening and cylinder including, a fluid reservoir.

11. A tool of the character described including, a handle, an object engaging head carried by the handle, a gripping member for engaging the object, and means for operating the gripping member including a piston connected with the gripping member, operable in a cylinder, a plunger slidable in an opening communicating with the cylinder, and means for operating the plunger including, two pivotally connected links, one link being connected with the plunger.

12. A tool of the character described including, a handle, an object engaging head carried by the handle, a gripping member for engaging the object, and means for operating the gripping member including a piston connected with the gripping member, operable in a cylinder, a plunger slidable in an opening communicating with the cylinder, and means for operating the plunger including, two pivotally connected links, one link being supported by the handle, the other being connected with the plunger.

13. A tool of the character described including, a handle, an object engaging head carried by the handle, a gripping member for engaging the object, and means for operating the gripping member including a piston connected with the gripping member, operable in a cylinder, a plunger slidable in an opening communicating with the cylinder, and means for operating the plunger including, two pivotally connected links at the outer end of the handle, one link being supported by the handle, the other being connected with the plunger.

14. A tool of the character described including, a handle, an object engaging head carried by the handle, a gripping member for engaging the object, and means for operating the gripping member including a piston connected with the gripping member, operable in a cylinder, a plunger slidable in an opening communicating with the cylinder, and means for operating the plunger, including a slidable rod in the handle carrying the plunger, and two pivotally connected links, one link being supported by the handle, the other link being connected to the rod.

15. A tool of the character described including, a handle, an object engaging head carried by the handle, a gripping member for engaging the object, and means for operating the gripping member including a piston connected with the gripping member, operable in a cylinder, a plunger slidable in an opening communicating with the cylinder, and means for operating the plunger, including a slidable rod in the handle carrying the plunger, and two pivotally connected links in an opening in the handle, one link being supported by the handle, the other link being connected to the rod.

16. A tool of the character described including, a handle, an object engaging head carried by the handle, a gripping member for engaging the object, and means for operating the gripping member including a piston connected with the gripping member, operable in a cylinder, a plunger slidable in an opening communicating with the cylinder, and means for operating the plunger, including, two pivotally connected links, one link being supported on the handle, the other link being connected with the plunger, and means on one of the links for connection with an operating member.

17. A tool of the character described including, a handle, an object engaging head carried by the handle, a gripping member for engaging the object, and means for operating the gripping member including a piston connected with the gripping member, operable in a cylinder, a plunger slidable in an opening communicating with the cylinder, and means for operating the plunger, including, two pivotally connected links, one link being supported on the handle, the other link being connected with the plunger, and means limiting relative pivotal movement of the links.

In witness that we claim the foregoing we have hereunto subscribed our names this 4th day of April, 1930.

LAWRENCE F. BAASH.
WILLIAM H. MAXWELL.