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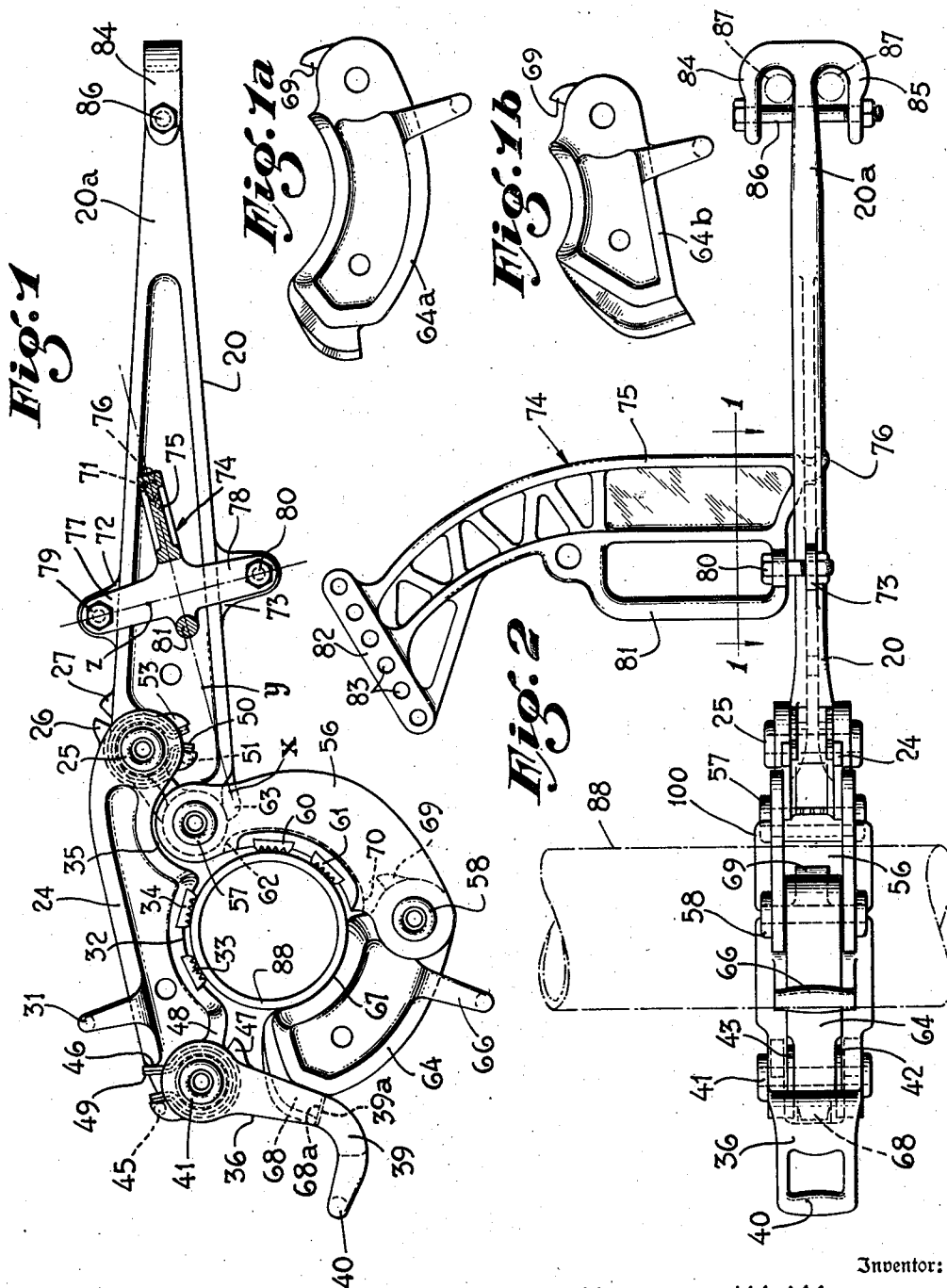
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2,406,520

PIPE TONG

Filed June 8, 1943

3 Sheets-Sheet 1



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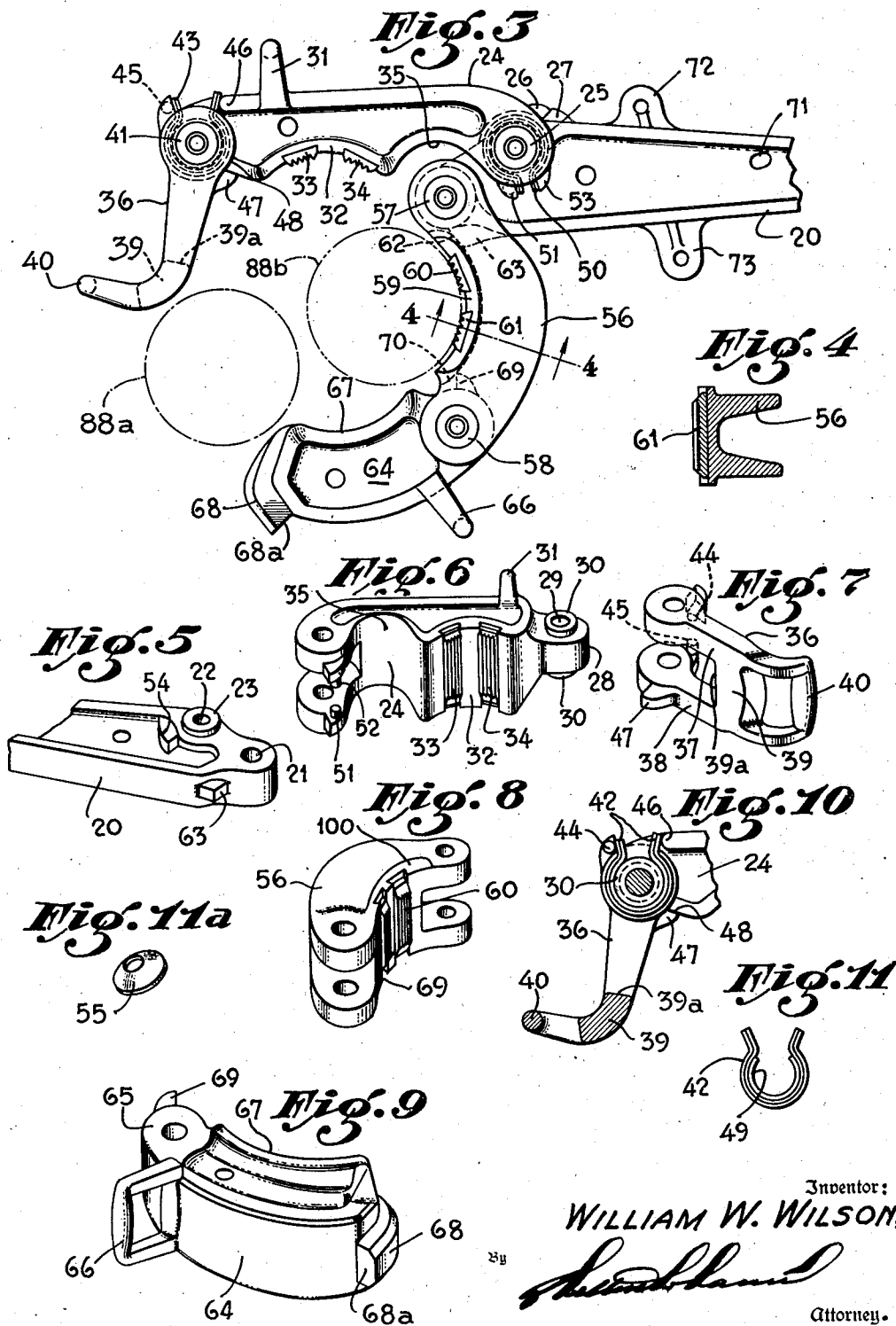
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

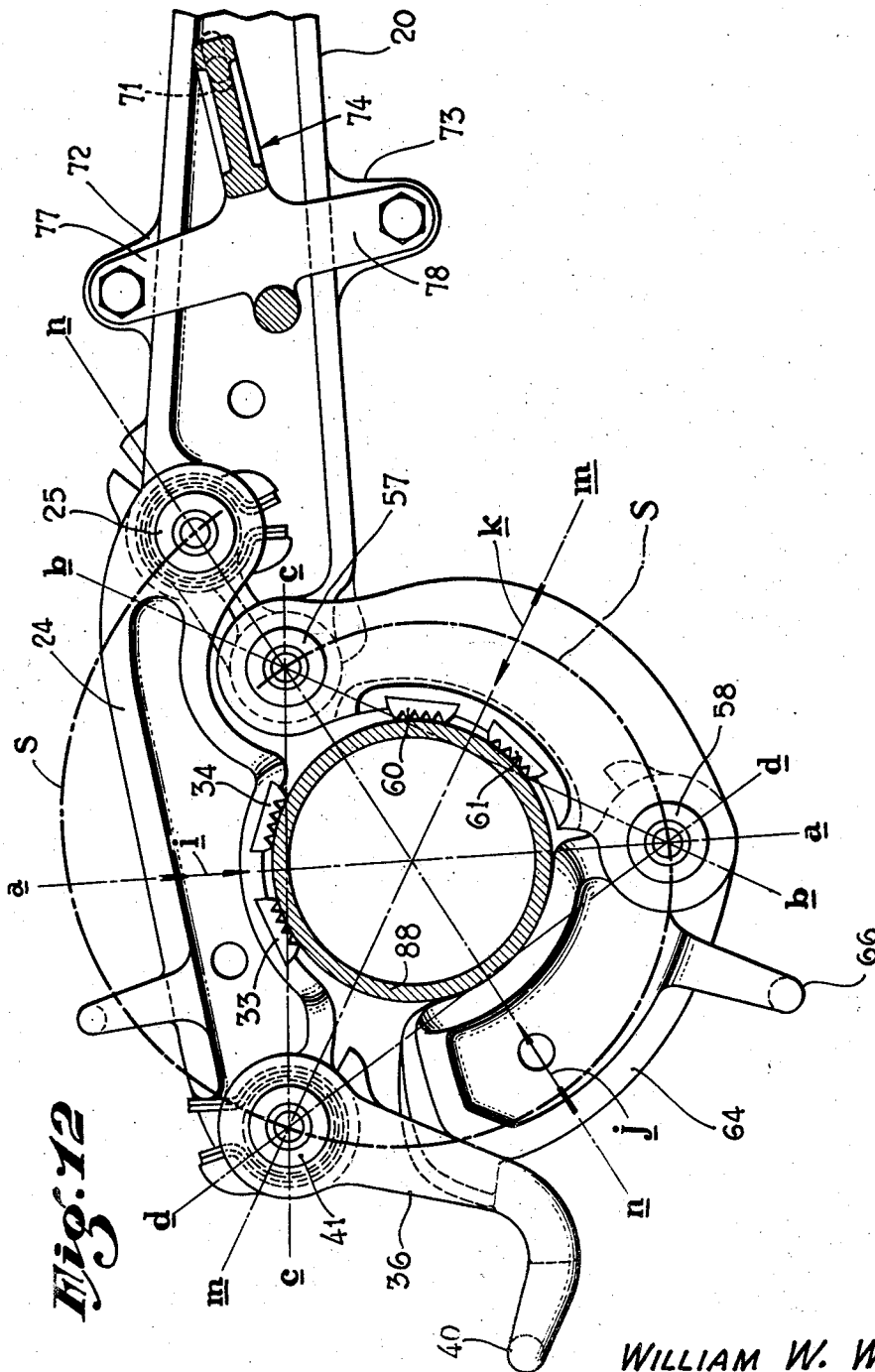


Fig. 12

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UNITED STATES PATENT OFFICE

2,406,520

PIPE TONG

William W. Wilson, Los Angeles, Calif.

Application June 8, 1943, Serial No. 490,007

12 Claims. (Cl. 81—66)

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This invention relates to tongs of the type used in screwing together and unscrewing pipe sections, and particularly to tongs used in oil well drilling operations where the safe, efficient and rapid operation of the tong is a considerable factor, for example, in the speed with which the pipe is run out of the hole and back in again, in the process of changing drill bits.

This application is a continuation-in-part of my copending application, Serial No. 305,350, filed November 20, 1939, for Tong and method of producing same.

It is an object of the invention to provide a tong wherein the jaws are so formed and the pivots are so arranged that ample rotational force is transmitted by the tong to the held pipe without danger of crimping the pipe or producing permanent distortions thereof, and the shearing forces carried through the pins during the use of the tong are nearly balanced so that one or more pins are not over-stressed while others are under-stressed.

It is an object of the invention to provide a tong having a characteristic arrangement of pivots for connecting the jaws, this arrangement of pivots contributing to or being characteristic of an articulated jaw arrangement whereby the forces applied to the surface of the pipe are substantially evenly distributed and proportioned or balanced so that there is not a heavy concentration of pressure in localized areas of the pipe which will result in crushing or crimping the pipe when heavy torsional force is transmitted between the tong and the pipe held thereby. This valuable result is accomplished without sacrifice of any ability to transmit ample rotational force through the tong to the pipe and a marked improvement over existing tongs is attained. This valuable result is accomplished by the applicant's new spiral arrangement of pins and formation of jaws without sacrifice of any desirable quality in the tong, but with other improved results such as the handling of the tong in its normal use by a single operator; whereas, two operators are ordinarily employed in the operation of prior art tongs of comparative size.

It is an object of the invention to provide a tong having rear jaw means and front jaw means, the rear jaw means having limited movement relative to the handle, so that the pipe engaging portions of the rear jaw means may be readily brought into engagement with the rear side of a pipe in response to movement of the handle by a single operator, and the front jaw means being swingable through a relatively wide

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arc and consisting of at least two jaw members which move toward the operator of the jaws when they swing into open position, with handle means operable by the operator to swing the front jaws quickly around the front side of the pipe and into engagement with latch means so as to be connected to the rear jaw means in operative relation, the entire operation of the jaw being accomplished by a single operator.

A further object of the invention is to provide a three-jaw tong having the characteristics set forth in the foregoing, wherein three of the pivots are disposed so as to define around the pipe a substantially equilateral triangle.

A further object of the invention is to provide a three jaw tong wherein the balance of clamping forces is made possible by the provision of a long rear jaw, a shorter front jaw and a lug jaw pivotally connected to the outer end of the short jaw and connected to the outer end of the long jaw by latch means, the long jaw having pipe engaging means lying on a line substantially tangential to the held pipe and passing through the outer pin of the long jaw, this pipe engaging means being disposed relatively near to the center of the long jaw and moving into engagement with the surface of the pipe substantially along a radial line which passes through the center of the pipe and through a point intermediate the ends of the pipe engaging means of the long jaw.

It is a further object of the invention to provide a three-jaw tong device having therein the valuable features enumerated hereinbefore, this tong device having a handle with a first jaw pivoted thereon, a second jaw pivotally connected thereto, and a complement of third jaws, each of a different size, adapted to be separately connected to the second jaw, thereby making it possible by changing one part of the tong in use to adapt the tong for a different size of pipe. I am aware of the use of additive links or jaw members adapted to be inserted in an existing arrangement of tong jaws to increase the nominal size of the tong, but I have found nowhere a suggestion teaching the herein set forth use of three jaws so arranged that the nominal size of the tong may be changed by replacing one of the jaws with a jaw of different size, in which tong satisfactory gripping of the pipe is obtained and ease of handling is achieved in all of the uses of the tong from a range of three and one-half inches to over ten inches pipe diameter.

Further objects and advantages of the invention will be brought out in the following part of the specification.

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Referring to the drawings which are for illustrative purposes only,

Fig. 1 is a plan view of the new tong with the hanger shown in section on line I—I of Fig. 2.

Fig. 1a is a plan view of a jaw substitutable for the intermediate or lug jaw shown in Fig. 1.

Fig. 1b is a plan view of a jaw likewise substitutable for the intermediate jaw of Fig. 1.

Fig. 2 is a side elevation of the tong and hanger.

Fig. 3 is a plan view of the jaw end of the tong with the jaws in fully open position.

Fig. 4 is a section substantially on line 4—4 of Fig. 3.

Fig. 5 shows in perspective the jaw end of the tong handle with the jaws removed.

Fig. 6 shows the long jaw in perspective.

Fig. 7 shows the latch in perspective.

Fig. 8 shows the short jaw in perspective.

Fig. 9 shows the lug jaw in perspective.

Fig. 10 is a longitudinal section through the latch and the associated end of the long jaw.

Fig. 11 is a plan view of a spring.

Fig. 11a shows a friction washer in perspective.

Fig. 12 is an enlarged fragmentary view for pointing out relationships with greater particularity.

Referring first to sheets one and two of the drawings, the tong comprises the handle 20 which is tapered from its jaw carrying end to its free end and which, for the purpose of lightness and strength, may be of I-section. At its jaw carrying extremity the handle is provided with a bore 21 and spaced from this bore toward the free end of the handle is a bore 22 defined at both ends by integral collars as at 23, Fig. 5. The axes of the bores lie in a common plane perpendicular to the plane of the handle. The long jaw 24 has a bifurcated end pierced to receive a pintle pin 25, which may be referred to as the working pin or pivot means of the tong, which is passed through the bore 22. The jaw 24 is provided with a stop 26 which cooperates with the stop 27 on the handle to limit the opening movement of the jaw, as shown in Fig. 3. At its opposite end, the jaw 24 is provided with a tongue 28 which has a bore 29 defined at each end by a collar as at 30, Fig. 6. Near the tongue 28, the jaw 24 is provided with a handle 31 which extends outwardly so as to be conveniently gripped by the operator. The jaw 24 is further provided with an inner curved face 32 into which are set dies 33 and 34. The curved face 32 is somewhat nearer the tongue end 28 of the jaw than the bifurcated end and between the latter and the curved face, the jaw is provided with an arcuate recess 35.

The latch 36 comprises parallel bar portions 37 and 38 which are preferably integrally joined by a cross portion 39 beyond which is formed a stirrup or U-shaped handle 40. The portion 39 has a preferably flat latch face 39a. At their free extremities the portions 37 and 38 are pierced to receive a pintle pin 41, parallel to 25, which passes through the bore 29 of the tongue 28. The collars, as at 30, are embraced by substantially U-shaped springs 42 and 43, whose ends are respectively engaged with abutments 44 and 45 on the latch and with an abutment surface 46 on the jaw 24. The springs yieldably urge the latch inwardly, their effect being limited by the engagement of the abutment portions 47 and 48 on the latch and on the jaw respectively. As shown, the springs 42 and 43 are each made up of two nested identical components, although if weaker action is desired, one of the springs may be omitted or one component of each of the springs may be

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omitted. If a stronger spring is required, it may be provided by the addition of an inner leaf, such as is shown at 49, Fig. 11. Opening movement of the latch is arrested by the coming together of the ends of the springs 42 or 43, which ends do not over-lap each other.

The collars, as at 23 on the handle 20, are similarly embraced by springs as at 50, Fig. 3, the ends of these springs bearing against abutments 51 and 52 on the jaw 24, and abutments 53 and 54 on the handle, Figs. 1, 3, 5, and 6. The springs as at 50 tend to hold the jaw 24 in fully open position with the abutments 26 and 27 in engagement as shown in Fig. 3. If desired, the springs may be replaced by friction washers as at 55, Fig. 11a. These may be of dish form and interposed between the collars surrounding the bore 22 of the handle and the overlying portions of the bifurcated end of the jaw 24. Such washers will serve to hold the jaw yieldingly in adjusted position relative to the handle.

The short jaw 56, preferably of the U-section shown in Fig. 4, has bifurcated ends which are pierced to receive pintles 57 and 58 parallel to the others, of which the former passes through the bore 21 of the handle and may be referred to as the fulcrum pivot pin or pivot means 57 of the tong. The jaw 56 has a curved inner face 59 into which are set dies 60 and 61. This jaw has an abutment surface 62 which cooperates with an abutment portion 63 on the handle to limit opening movement of the jaw, as shown particularly in Fig. 3.

The intermediate or lug jaw 64 has a tongue 65 provided with a bore for the reception of the pintle 58 by means of which the jaws 56 and 64 are pivoted together. The jaw 64 has an outwardly projected handle 66 adjacent the pintle 58 and has an inner curved face 67. At its end opposite the tongue 65, the jaw 64 has a lug 68 with beveled side edges and a flat face 68a for cooperation with the face 39a of the latch. Opening movement of the jaw 64 relative to the jaw 56 is limited by means of the cooperating abutment portions 69 and 70, as particularly shown in Fig. 3.

The handle 20 is provided with an oblong opening 71 offset somewhat to the side of the handle away from the center of gravity X and substantially spaced from the latter. Between the hole 71 and the pintle 25, the handle is provided with laterally projecting ears 72 and 73 whose ends are provided with openings. The ear 72 is somewhat nearer the jaw end of the handle than the ear 73, and the long dimension of the opening 71 extends on a line *y* substantially perpendicular to and bisecting the line *z* joining the centers of the ear openings. The ear 73 on the side of the handle on which the two jaws 56 and 64 are mounted is longer than the ear 72 in order to compensate for the greater jaw weight on that side of the handle. The ear openings are equally spaced at the sides of the lines *y* of lateral balance.

A hanger 74 consists of a curved web or body portion 75 which at its lower end has a hook formation 76 adapted to be engaged in the opening 71 of the handle. The body portion 75 has a foot portion constituted by laterally extending ears 77 and 78, having openings equally spaced from the web 75 adapted to register with the openings in ears 72 and 73 so that the foot portion and the handle may be connected by a pair of bolts 79 and 80 which supplement the hook 76. The foot portion of the hanger is also connected with the body portion by a handle portion 81.

The body portion of the hanger is surmounted

by a rectilinearly extending head portion 82 which is provided with a number of transverse holes 83. With the hanger mounted as shown in Fig. 2, its upper portion is curved toward the jaw end of the handle and the head portion 82 is inclined downwardly toward the said jaw end.

At its free extremity the handle is provided with hook formations 84 and 85 extending above and below the handle back toward the jaw end of the latter. The extensions and the handle are pierced to receive a bolt 86 which is adapted to close the open ends of the hook formations and to retain in the latter a rope loop 87.

With the tong suspended in proper balance, the jaws are opened to their widest extent, as shown in Fig. 3, in order to receive the pipe to be turned, as indicated by phantom lines 88a. The jaws 56 and 64 are preferably free pivoting and may be swung by gravity to open position merely by tilting the tong. The operator, standing on the side of the handle 20 from which the jaw 56 projects, may now conveniently grasp the handle 81 with his right hand and move the tong toward the pipe until the jaw 56 comes into contact therewith, as indicated by dotted lines 88b. Now, by forcing forwardly on the handle 81 with his right hand and with the left hand simultaneously pushing the handle 66 in leftward direction, the jaws 24 and 64 are rotated toward each other and the lug 68 is brought into engagement with the cross piece 39 of the latch 36 with a camming effect so that the latter is moved outwardly and then snaps automatically behind the lug due to the action of the springs 42 and 43. Behind the face 62a, the lug is rounded away in order that the mentioned camming effect may be smoothly accomplished.

It will be recognized, of course, that an operator, standing adjacent the lug 73, may readily move the tong so as to bring the pipe engaging means represented by the dies 23 and 34 both into engagement with the rear face of the pipe, after which a pressure applied leftward to the handle 66 will have the effect of throwing the jaws 56 and 67 into closed position around the pipe.

The foregoing is an important feature of the invention, since it enables a single operator to handle the tong. All of the parts which he must move in handling or operating the tong are within his grasp or reach without it being necessary for him to move from his position adjacent the lug 73. The jaw means represented by the long jaw 24 has little movement relatively to the handle 20, and, in fact, when the tong is opened, as shown in Fig. 3, the rear jaw means 24 has a fixed relation to the handle 20 by reason of the fact that the spring 50 holds the stop lug 25 against the stop lug 27. Therefore, the positioning and movement of the rear jaw means is accomplished by movement of the handle 20, and movement of the front jaw means, consisting of the jaws 56 and 67, is accomplished through force applied to the handle 66. This control of the movement of the rear jaw means by movement of a handle 20 makes possible the hereinbefore set forth ease of operation of the tong by a single operator, since he is able to control the rear jaw means through movement applied to the handle, while the front jaw means is controlled by the handle 66.

The latch face 39a is flat and to compensate for springing of the metal in the lug jaw 64 when under heavy stress, is so disposed that its inner edge is nearer pintle 41 than its outer edge, and the lug face 68a is complementarily inclined. Due to this undercut arrangement of these coop-

erating faces, when the inner edge of the face 39a passes the outside top of the latch lug, the latch is free for an instant so that the latch springs have an opportunity to completely close the latch. Thus the danger of throwing a heavy strain on the tong with the latch partly closed is avoided. The tong is either completely latched, or not latched at all and once engaged, the faces cannot become accidentally disengaged while the tong is under load. By the same token, it is necessary to swing the handle 20 in counterclockwise direction in order to relieve closing pressure of the jaws in order to release the latch from the lug. Any extreme inward movement of the latch such as would impair or destroy the locking effect is prevented by the stop 47. The lug has its lateral edges beveled, as heretofore mentioned, so that it will always be properly guided to latching position, even though the pivot holes are worn so as to prevent the jaws from lining up with original precision.

With the jaws operatively linked about the pipe, the handle is pulled so that the pivot 25 is swung in a clockwise direction relative to the pivot 57, thereby moving the jaws into engagement with the pipe. As to the jaws 24 and 56, their engagement with the pipe is through the dies with which their faces are equipped. The pipe is preferably directly engaged by the curved face of the jaw 64, which exerts a force inward as indicated by the arrow *j* of Fig. 12 to react against the forces *i* and *k*. With the two die-containing jaws permanent in the tong through all sizes, and the lug jaw only being replaceable to fit work of widely varying circumferences, the best combination of curvature—fitting—is obtained. With the die-containing jaws only the sharp ridges of the dies contact the pipe—ridges that are necessary to make the tong grip; hence the jaws that must work with the greatest range of sizes do not contact the work through a face, but through the relatively sharp projections or ridges of the dies. This eliminates the difficulty of attempting to have a face which is cut for the largest pipe size attempting to fit the smallest diameter pipe. The only jaws that approximate the curvature of the pipe are the lug jaws, and the full range of the tong is divided among three or more of these lug jaws. As here shown, the common plane of the axes of pintles 25 and 57 is at about a 35° angle with the longitudinal medial line of the handle, and I find that this disposition is highly effective in assuring a powerful contracting action of the jaws. While the angle referred to is preferably about 35°, it desirably should not be less than 20°, or more than 45°. When the jaws are engaged with a work piece of the relative size shown at 88 in Fig. 1 and a lug jaw of the relative size shown in that figure is used, and the common plane of pintles 25 and 57 intersects the axis of the work piece, the pintles 41, 58 and 57 are substantially equi-angularly spaced at about 120°.

The evident superiority of my new tong results from a proportioning of the jaws and the placing of the pivots so that there is not a great difference in the shearing stress applied to these pivots, thereby making it possible to use pivot pins which are all of the same diameter and use of these pins under conditions wherein one or more of the pins are not liable to failure due to excessive force applied as the result of unbalance of levers formed by the jaws connected by the pins. A distinguishing characteristic of my new tong is the placing of the pins so that they lie on a spiral S, Fig. 12, generated around the cen-

ter of the pipe so that its inner end starts with the center of the fulcrum pin 57 and its outer end passes through the center of the working pin 25. Accordingly, this spiral S has its inner end on the center end of the fulcrum pin 57 and passes progressively through the pins 58 and 41 as it enlarges, and ends with the center of the working pin 25. This characteristic feature of the invention is not suggested by the prior art. The foregoing and other features contribute to the balance of pressure applied by the jaws to the pipe so that ample gripping effect is obtained without distorting, crimping, or crushing the pipe. It will be noted that the long jaw 24 has a length between the centers of its pivots 41 and 25 which is greater than twice the diameter of the pipe 88. This proportioning of the long jaw 24 with respect to the diameter of the pipe places the pivot 41 at a considerable distance to the left of the line *a-a*, Fig. 12, which passes through the centers of the pin 58 and the held pipe 88, intermediate the lateral extremities of the die means 33 and 34 and preferably substantially centrally between these die means 33 and 34. Also, the die means 33 and 34 are disposed so as to lie close to the line *c-c* which passes through the centers of the pins 41 and 57 and is approximately tangential to the wall of the pipe 88 at the point where the line *a-a* intersects the pipe 88 proximate to the dies 33 and 34. When force is applied to the tong handle in clockwise direction, a closing force will be applied to the rightward end of the long jaw to swing the long jaw 24 in clockwise direction on the outer pin 41, thereby moving the dies 33 and 34 toward the pipe in the radial direction indicated by the arrows *i*. A similar condition exists with relation to the dies 60 and 61 of the short jaw for the reason that these dies substantially coincide with the line *b-b* which is substantially tangential to the wall of the pipe 88, and which passes through the centers of the pins 57 and 58, the result being that when the short jaw 56 is swung in clockwise direction around the pivot 58, the dies 60 and 61 will move radially inward, as indicated by the arrow *k*, as engagement of the dies 60 and 61 with the surface of the pipe is made. Also, the face of the lug jaw 64 which engages the surface of the pipe 88 substantially coincides with the line *d-d* which is tangential to the pipe wall 88 and passes through the centers of the pivots 41 and 58. Further characteristic conditions of the applicant's device are that the line *m-m* which passes through the center of the held pipe 88 and intermediate the lateral extremities of the dies 60 and 61 is substantially perpendicular to the line *b-b*, and that the line *n-n* which passes through the center of the held pipe and through the center of the fulcrum pivot pin 57 is perpendicular to the line *d-d* and intersects this line *d-d* at substantially the center thereof. Furthermore, it will be perceived that the lines *b-b*, *c-c*, and *d-d* define a substantially equilateral triangle, having at its corners the fulcrum pin 57 and the outer pivot pins 41 and 58.

By the described characteristic placing of the pivot pins 41, 57 and 58, I provide a tong in which I assure substantially even distribution of stress among all the pivot pins and I assure that no pivot pin has substantially less stress than the fulcrum pivot pin or substantially greater stress than the work pivot pin. The characteristic placing of the pins results in substantially an even stress on the pins, equal stress of jaws

against the work, the pressure of the jaws against the pipe equally spaced around the pipe, and allows the handle ends of the long and short jaws to remain in circular alignment over much wider swing of the handle 20 than any previous tong, thus making the tong cover a wider range than any previous tong.

In addition to the foregoing, the dies 33, 34, 60, and 61 move radially as they engage the pipe and therefore the dies have no sliding, shearing, or scarifying effect upon the surface of the pipe as the result of tangential movement of the jaws as they engage the surface of the pipe, a condition found in a number of prior art tongs. It will be perceived that the radial inward movement of the dies as they engage the pipe results in minimum wear on the dies, for the reason that tangential stresses are not applied to the knife edges of the dies until they are firmly seated in the surface of the pipe and rotational torque is transmitted from the tong to the pipe.

A special feature of my invention is the provision of a practical and efficient tong assembly which may be used with a wide range of pipe sizes, thereby reducing the number of pipe tongs which must be kept around a derrick, or which must be available. I provide a basic tong unit consisting of a handle, a first jaw and a second jaw pivotally connected to the handle in cooperative relation, and a complement or group of third jaws 64, 64a, and 64b, each of a different size and each being adapted to be separately employed with the basic tong unit. These links 64, 64a, and 64b may be referred to as the replaceable adaptor links of the device, since, by their use, they adapt the tong for a different range of sizes. The substitution of one adaptor jaw for another is readily accomplished by removal of the outer pivot pin 58 so that the adaptor jaw then in use may be replaced by the selected adaptor jaw, which will be held in operative position by the reinserted pivot pin 58.

The rope attachment means constituted by the hook formations 84 and 85 at the power end of the handle are preferably made integral with the latter and, as before stated, the bolt 86, serves to hold the rope in place. This rope attachment means has several advantages over types heretofore used. The rope is applied to the tong in such a way as to pull on the handle between the horizontal extensions of the hook formations, and is positively held in place by the bolt 86. In attaching or removing the rope or ropes only one part, namely the bolt 86, need be removed and there are no loose parts other than this bolt. A rope may be applied to pull in either or both directions as is often the case in actual practice. Should the tong be pulled around to such a position that the tong handle is in line with the line of pull, the rope is still pulling on the solid metal of the handle.

I claim as my invention:

1. A tong for gripping a pipe, comprising: a handle having at one end thereof a working pivot and a fulcrum pivot; a long jaw connected to said working pivot and having an outer pivot and pipe engaging die means substantially coinciding with the central portion of a line which passes through said fulcrum pivot and said outer pivot when the tong is closed around the pipe whereby inward swinging of said jaw on said outer pivot will move said die means into engagement with the pipe along a line which is a radius of said pipe; a short jaw pivoted on said fulcrum pivot and having at the end thereof an outer pivot which lies on a line passing through said ful-

crum pivot and being substantially tangential to the outer face of the held pipe, said last named line being disposed at substantially an angle of 60° from said first named line; and jaw and latch means to connect said outer pivots.

2. A tong for gripping a pipe, comprising: a handle having at one end thereof a working pivot and a fulcrum pivot; a long jaw connected to said working pivot and having an outer pivot and pipe engaging die means substantially coinciding with the central portion of a line which passes through said fulcrum pivot and said outer pivot when the tong is closed around the pipe whereby inward swinging of said jaw on said outer pivot will move said die means into engagement with the pipe along a line which is a radius of said pipe; a short jaw pivoted on said fulcrum pivot and having at the end thereof an outer pivot which lies on a line passing through said fulcrum pivot and being substantially tangential to the outer face of the held pipe and on a line which passes through the center of said pipe and substantially the central portion of said die means; die means carried by said short jaw in a position to coincide with the central portion of said line which extends through said fulcrum pivot and the pivot at the outer end of said short jaw; and jaw and latch means to connect said outer pivots.

3. A tong including at least three work encircling jaws, latch means to hold said jaws in a position to encircle the work, a handle, and a series of pivot pins including a work pivot pin, a fulcrum pivot pin on said handle, and interconnecting pivot pins carried by said jaws, all of said pivot pins lying in a spiral which begins at the fulcrum pivot pin, progresses by operative connections through all of the jaws and ends at the work pivot pin, said pivot pins being progressively more distant from the center of the encircled work from the said beginning to the said end of said spiral.

4. A three-jaw tong including three work encircling jaws, latch means to hold said jaws closed around the work, a handle, and a series of pivot pins including a work pivot pin, a fulcrum pivot pin on said handle, and interconnecting pivot pins carried by said jaws, all of said pivot pins lying in a spiral, the inner end of which begins at the fulcrum pivot pin, progresses by operative connections through all of the jaws, and ends at the work pivot pin.

5. A tong unit of the character described, for use with any one of a set of complementary lug jaws of different sizes to produce a three jaw tong, comprising: a handle having at the front end thereof a work pivot means and a fulcrum pivot means in spaced relation; a first jaw swingable on said work pivot means when said tong is closed around a pipe and having first outer pivot means disposed at its outer end, said first jaw having a pipe engaging element positioned substantially on a line extending through said fulcrum means and said first outer pivot means when said tong is closed around a pipe; a second jaw swingable on said fulcrum pivot means and having a second outer pivot means at its outer end, said second jaw having a pipe engaging element positioned substantially on a line extending through said fulcrum pivot means and said second outer pivot means; and a latch member connected to said first outer pivot means for latching engagement with a selected one of said lug jaws, said second outer pivot means being adapted for connection to an end of a selected one of said lug jaws.

6. A tong unit of the character described, for use with any one of a set of complementary lug jaws of different sizes to produce a three jaw tong, comprising: a handle having at the front end thereof a work pivot means and a fulcrum pivot means in spaced relation; a first jaw swingable on said work pivot means when said tong is closed around a pipe and having first outer pivot means disposed at its outer end, said first jaw having a pipe engaging element positioned substantially on a line extending through said fulcrum means and said first outer pivot means when said tong is closed around a pipe; a second jaw swingable on said fulcrum pivot means and having a second outer pivot means at its outer end, said second jaw having a pipe engaging element positioned substantially on a line extending through said fulcrum pivot means and said second outer pivot means; and a latch member connected to one of said outer pivot means for latching engagement with a selected one of said lug jaws, the other of said pivot means being adapted for connection to an end of a selected one of said lug jaws.

7. A tong including work encircling jaws, a handle, and a series of pivot pins including a work pivot pin and a fulcrum pivot pin on said handle, all of said pivot pins lying in a spiral which begins at the fulcrum pivot pin, progresses by operative connections through all of the jaws and ends at the work pivot pin, said pivot pins being progressively more distant from the center of the encircled work from the said beginning to the said end of said spiral.

8. A tong including work encircling jaws, a handle, and a series of pivot pins including a work pivot pin and a fulcrum pivot pin on said handle, all of said pivot pins lying in a spiral which begins at the fulcrum pivot pin, progresses by operative connections through all of the jaws, and ends at the work pivot pin.

9. A tong including work encircling jaws, a handle, and a series of pivot pins forming operative connections through all of said jaws and said handle and including a work pivot pin and a fulcrum pivot pin on said handle, said pivot pins, beginning with said fulcrum pivot pin and progressing by operative connections through all of said jaws to said work pivot pin, being positioned progressively greater distances from the center of the encircled work.

10. A tong comprising work encircling jaws, including a long jaw and a short jaw, a handle, and a series of pivot pins forming operative connections through all of said jaws and said handle, and including a work pivot pin pivoting said long jaw to said handle, and a fulcrum pivot pin pivoting said short jaw to said handle, said pivot pins, beginning with said fulcrum pivot pin and progressing by operative connections through all of said jaws to said work pivot pin, being positioned progressively greater distances from the center of the encircled work.

11. A tong including work encircling jaws, a handle, and a series of pivot pins forming operative connections through all of said jaws and said handle and including a work pivot pin and a fulcrum pivot pin on said handle, said pivot pins, beginning with said fulcrum pivot pin and progressing by operative connections through all of said jaws to said work pivot pin, being positioned progressively greater distances from the center of the encircled work, adjacent ends of a pair of said work encircling jaws being releasably secured together by latching means comprising a latch pivoted to one of the jaws of said pair

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and a lug on the other jaw of said pair, said latch having a lug engaging face inclined inwardly and toward the pivoting axis of the latch and said lug having a latch engaging face inclined complementarily to said lug engaging face of said latch.

12. A tong unit of the character described for use with any one of a set of complemental lug jaws of different sizes to produce a three jaw tong, comprising: a handle having at the front end thereof a work pivot means and a fulcrum pivot means in spaced relation; a first jaw swingable on said work pivot means when said tong is closed around a pipe and having first outer pivot means disposed at its outer end, said first jaw having a pipe engaging element positioned substantially on a line extending through said

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fulcrum means and said first outer pivot means when said tong is closed around a pipe, and projecting within the space defined by said line and a line which extends through said work pivot means and said first outer pivot means; a second jaw swingable on said fulcrum pivot means and having a second outer pivot means at its outer end, said second jaw having a pipe engaging element positioned substantially on a line extending through said fulcrum pivot means and said second outer pivot means; and a latch member connected to said first outer pivot means for latching engagement with a selected one of said lug jaws, said second outer pivot means being adapted for connection to an end of a selected one of said lug jaws.

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