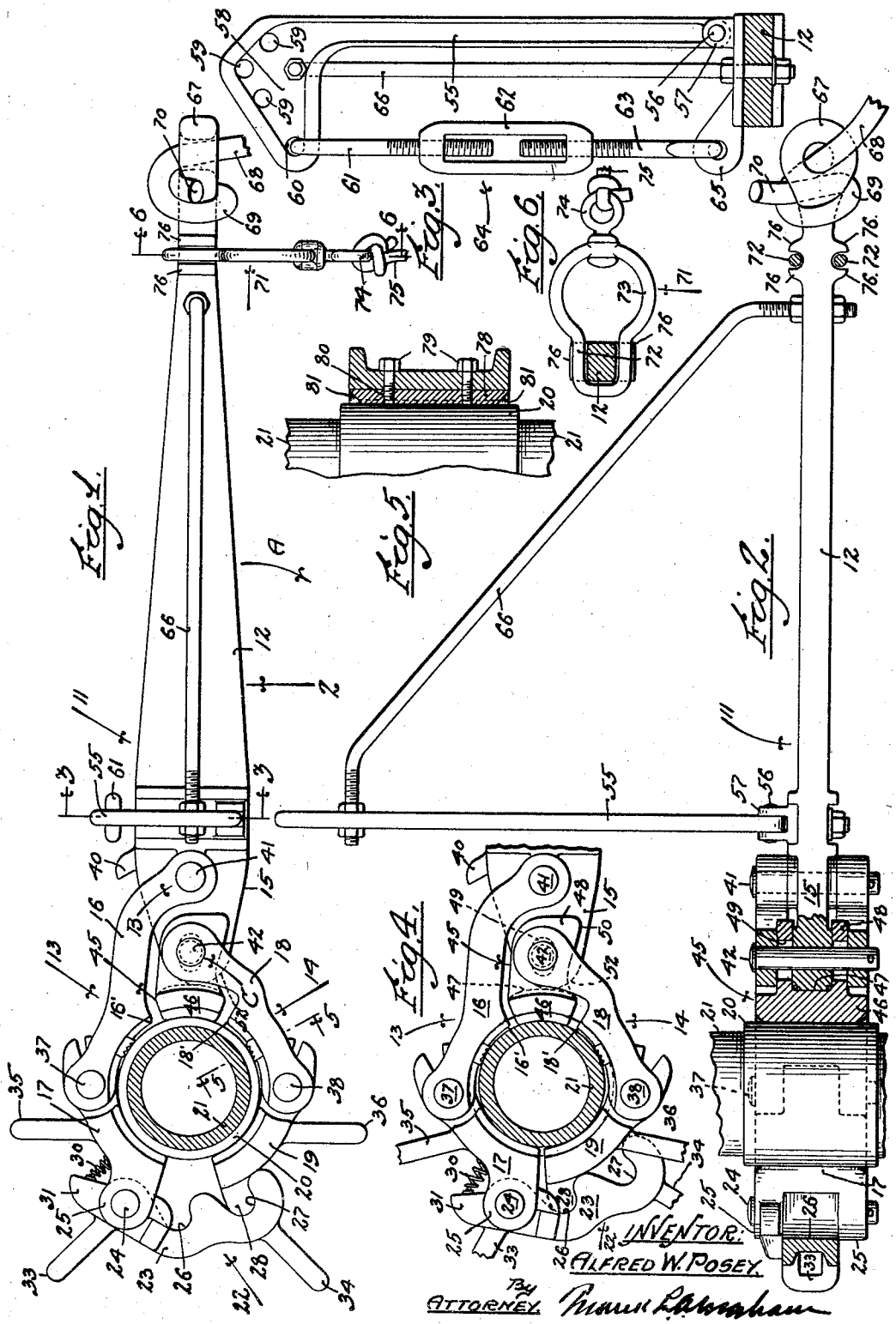
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DRILL PIPE TONG ASSEMBLY

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DRILL PIPE TONG ASSEMBLY

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Fig. 7.

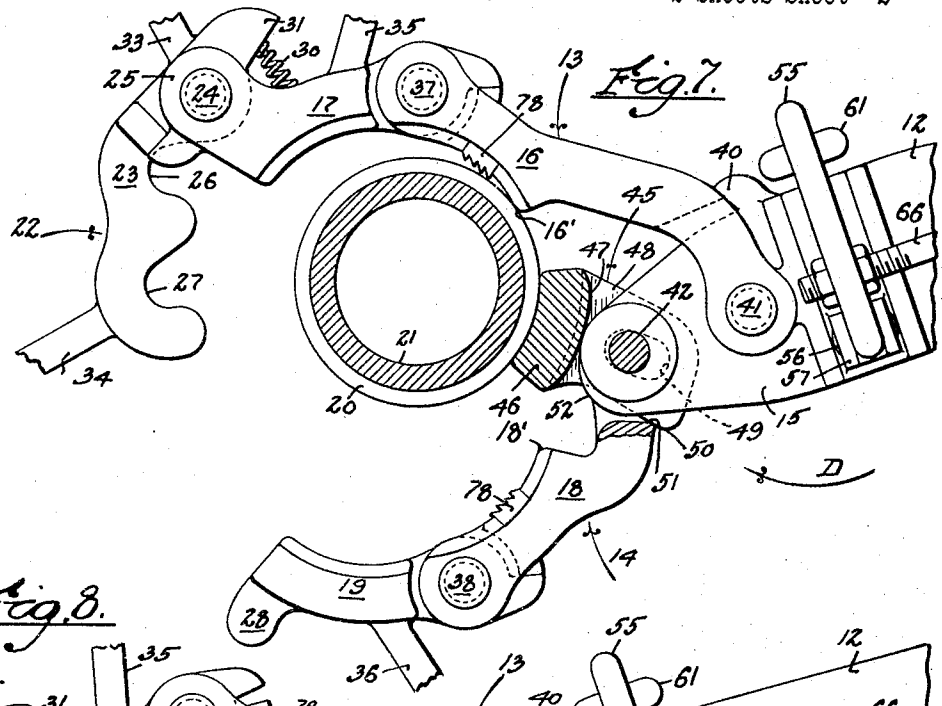


Fig. 8.

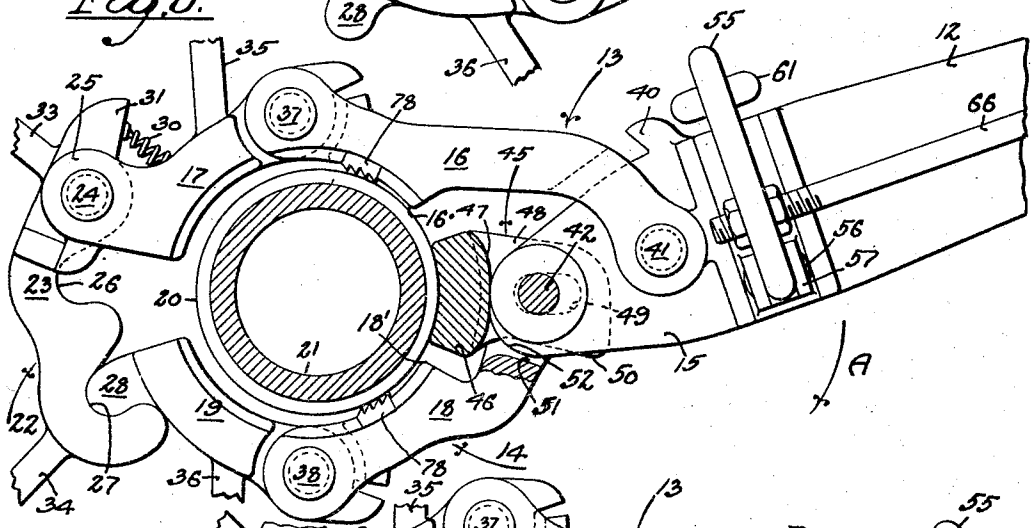
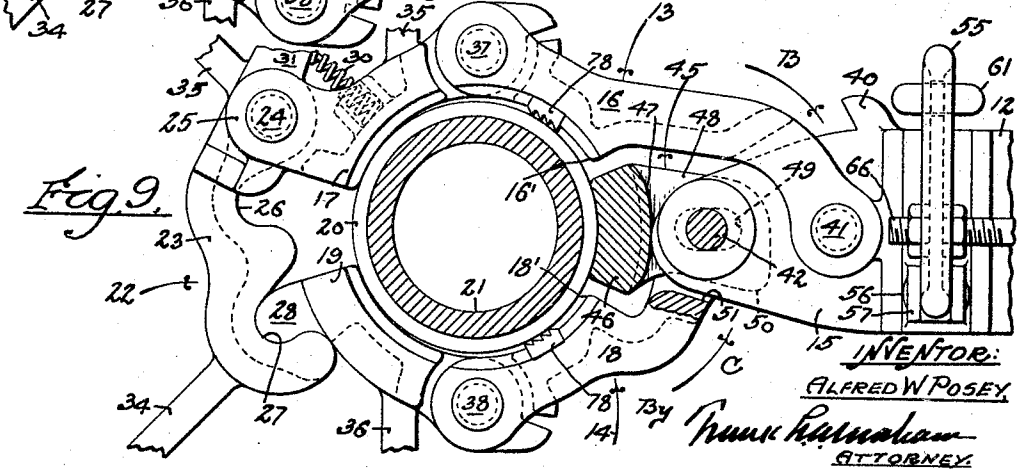


Fig. 9.



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UNITED STATES PATENT OFFICE

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DRILL PIPE TONG ASSEMBLY

Application filed February 6, 1931. Serial No. 513,859.

This invention has to do with tongs, such as are commonly used in oil well drilling operations, for handling drill pipe and casing. Tongs of this nature are applied to the pipe or pipe collars and the final tightening movement of the tongs is applied through the medium of a so-called "pull-line" from a suitable source of powder.

The usual construction of tongs of this nature comprises a handle which has a set of pipe engaging jaws pivotally mounted on one end, and is provided at its other end with means for securing the pull line thereto.

In tongs of this nature, the most satisfactory results have been obtained with tongs wherein the jaws are sectional in form, and are pivotally attached to the handle in spaced relation with each other so that the swinging movement of the handle brings the jaws into pressure engagement with the pipe.

It has heretofore been considered necessary to provide sufficient space between the jaws at the point at which they engage the handle to permit free swinging movement of the handle during a pipe gripping operation. This construction results in the provision of a heel or shoulder at one or more places within the space enclosed by the jaws, having an open gap between the adjacent jaws so that when torque is applied to the handle, the shoulder or shoulders apply unequal stress to the pipe, tending to crush it at one or more points.

It is a primary object of this invention to produce pipe tongs of the class described which are constructed so that the clamping action is brought about by a swinging movement of the handle, and to provide such tongs with means whereby the clamping pressure is applied uniformly over substantially the entire pipe surface which is being acted upon by the tongs. In other words, the device contemplated by this invention is constructed so that there is no substantial gap formed between shoulder or heel on the pipe engaging surface of the tongs which tends to permit unequal pressure upon the pipe and consequently crush or weaken the same.

This object is accomplished by pivotally mounting the jaws upon the end of the handle and interposing a pipe engaging shoe between the jaws in a manner such that the shoe is pressed inwardly into pressure engagement with the pipe during a swinging movement of the handle. The jaws and the shoe are so arranged relative to each other and are so connected with the handle that during a swinging movement of the handle the jaws, together with the shoe, are pressed inwardly toward the pipe to effect a uniform application of pressure to all parts of the pipe engaged by the tongs.

It is a noteworthy feature of this invention that the shoe referred to above is provided with a stop that cooperates with one of the jaws to prevent the shoe interfering with the action of the other jaw.

It is a further object of this invention to produce a device of the class described which is provided with a latch that is positive in its action, may be easily manipulated from either side of the tongs, and in which the application of force to the handle locks the latch against disengagement.

In view of the fact that tongs of this nature must be made quite heavy, they are generally suspended in the derrick, and for this purpose the handle is provided with a pair of vertical links provided with turn buckles whereby the tong unit may be leveled. It is a further object of this invention to produce an improved construction for suspending the tongs in the derrick, such construction being provided with means whereby the tongs may be leveled through manipulation of a single adjusting unit.

As pointed out above, the operation of tongs of this nature is generally effected by applying tension to the pull line which is attached to one end of the tong handle. In the usual construction of these tongs, the pull line is attached to the handle through an eye which is positioned with its axis normal to the plane of the handle, and since this line is in constant engagement with the metal of the handle, it wears quickly and must be repaired from time to time. I consider it a further object of my invention to provide an improved form of handle which is constructed so that the line, instead of being in constant

engagement with the metal of the handle, is drawn over a section of the line, and, consequently, the wear in the line is greatly reduced.

In manipulation of tongs of this nature, it is sometimes desirable to move the tongs relative to the pipe to a point at which the jaws encircle a collar or a tool joint on the pipe. In the usual type of tongs such movement is impaired due to the shoulders on the edges of the jaws and the dies engaging the collar or the tool joint. It is a noteworthy feature of the device contemplated by this invention that the edges of the jaws are beveled or rounded so as to form guiding means for directing the jaws over the collar or the tool joint on the pipe.

It is a still further object of this invention to provide the jaws with improved means for attaching dies thereto.

The details in the construction of a preferred form of my invention, together with other objects attendant to its production, will be best understood from the following description of the accompanying drawings which are chosen for illustrative purposes only, and in which

Fig. 1 is a plan view showing a preferred form of tong assembly contemplated by this invention;

Fig. 2 is an enlarged view, partly in section, which may be considered as having been taken in the general direction of arrow 2 in Fig. 1;

Fig. 3 is an elevational view represented by the line 3—3 in Fig. 1;

Fig. 4 is a plan view of the jaw unit shown in Fig. 1, illustrating same as having been applied to a pipe or tubing instead of a pipe or tubing collar;

Fig. 5 is an elevational view taken in a plane represented by the line 5—5 in Fig. 1;

Fig. 6 is a sectional view taken in a plane represented by the line 6—6 in Fig. 1; and

Figs. 7, 8 and 9 are enlarged plan views partly in section illustrating the details in the construction and operation of the jaws during a pipe engaging and pipe gripping operation.

More particularly describing the invention herein illustrated, reference numeral 11 indicates a set of pipe tongs shown as embodying a handle 12 and jaws 13 and 14 pivotally attached to the jaw supporting end 15 of the handle. The jaws 13 and 14 are preferably made in sections, the jaw 13 being shown as comprising a rear section 16 and a front section 17, and the jaw 14 being shown as comprising a rear section 18 and a front section 19. All of these sections are provided with curved pipe engaging inner surfaces which are adapted to engage a pipe collar 20, as shown in Fig. 1, or a pipe 21, as illustrated in Fig. 4.

Reference numeral 22 indicates a latch which is shown as comprising a finger or gate plate 23 pivotally attached to the outer end of the jaw section 17 by a pivot pin 24 which extends through cheeks 25 on the jaw section 17. The latch plate or finger 22 is provided with a pair of under cut recesses 26 and 27 which are positioned in spaced relation with each other and are adapted to engage and interlock with a correspondingly undercut tooth or projection 28 which is formed on the outer end of the jaw section 19. This interlocked latch construction is of a nature such that locking action of the latch becomes more secure with increasing torque on the handle, where the usual type of latch has a tendency to disengage when the force on the handle becomes excessive. The finger or gate plate 23 is maintained toward a latching position by a conical compression spring 30 which is interposed between a projection 31 of the finger 23 and the outer surface of the jaw section 17. The gate plate 23 is also provided with a pair of handles 33 and 34 whereby the latch may be engaged or disengaged. The jaw sections 17 and 19 are also provided with handles 35 and 36 which are adapted for use in conjunction with the handles 33 and 34 in manually manipulating the jaws and the latch from either side of the tongs.

The jaw sections 16 and 17 and the jaw sections 18 and 19 are pivotally connected together through the medium of pivot pins 37 and 38, respectively. These pins preferably extend through replaceable bushings, not shown.

Reference numeral 40 indicates a stop boss or lug which is provided on the handle 12 behind the jaw 16 and is arranged so as to be engaged by the jaw when the tongs are opened for engaging the pipe.

It was pointed out in the first part of the specification that the primary object of this invention was to produce tongs of a nature such that during the pipe gripping operation, the pressure from the jaws is applied uniformly to substantially the entire engaged surface of the pipe. It will be noted that the jaw 16 is pivotally attached to the handle 12 by means of pivot pin 41 and that the pin 41 is a substantial distance behind a pivot pin 42 which secures the section 18 to the handle. In this form of my invention, it will be noted that the pivot points 41 and 42 are substantially on the center line of the handle, and it will be apparent that as the handle is swung in the general direction of the arrow A in Fig. 1, the jaw section 16 will have a movement in the direction of the arrow B, and the jaw section 18 will have a movement in the direction of the arrow C. In other words, the jaw section 16 tends to swing about the pivot pin 41 as a fulcrum, and the jaw section 18 tends to swing about the pivot pin 42 as a fulcrum. This resultant movement brings the inner pipe engaging surfaces

of the jaws into pressure engagement with the pipe, tending to crush the pipe at these points. To prevent this crushing action and to equalize the stress applied to the pipe, I provide what will hereinafter be referred to as a floating shoe which is indicated by reference numeral 45 and is shown as being interposed between the inner shoulders 16′ and 18′ of the two jaw sections 16 and 18 respectively.

The shoe 45 is shown as comprising a pipe engaging plate 46 having a rear bearing surface 47, on opposite sides of which cheeks 48 extend in a manner such that they may receive a cam formed on the forward end 15 of the handle 12. The cheeks 48 are provided with slots 49 which receive the pivot pin 42, and one or both of the cheeks is provided with an extension 50 which is adapted to engage a shoulder 51 on the jaw section 18 to prevent the shoe 45 swinging back to a point at which it would interfere with the action of the jaw 13.

It is important for the equalized application of pressure mentioned above that the shoe 45 receive a forward movement during the swinging movement of the handle in the direction of the arrow A or during the compressing or closing movement of the jaws 13 and 14. This movement is permitted by the slots 49 and is, in this form of my invention, accomplished through the medium of the cam surface 52 which is provided on the nose or inner end of the handle 12.

It was mentioned in the fore part of the specification that tongs of this nature are ordinarily suspended in the derrick, the means for suspending such tongs usually comprising a set of pivotal links which may not be adjustable. And it was mentioned as an object of this invention to provide the tongs with adjustable means of suspending them in the derrick. Such suspending means are best illustrated in Figs. 1 to 3 inclusive, where they are shown as comprising an upright arm 55 hingedly attached to the forward end of the lever 12 by means of a pivot pin 56 which extends through upwardly projecting ears on the handle 12 and a suitably positioned aperture in the bottom of the arm. The upper end of the arm 55 is provided with a hook-shaped plate section 58 which, in turn, may contain one or more apertures 59 for the reception of a suitable cable. The end of the hook section 58, opposite the arm 55, is provided with an aperture 60 which receives the upper end of a rod section 61. The rod section 61 cooperates with a turn buckle 62 and another rod section 63 to form an adjustable link 64. The lower end of the section 63 is in pivotable engagement with an ear 65 which is mounted on the handle 12 opposite the ears 57. It will be seen from the construction so far described, that the angular relation of the arm 55 and the handle 12 may be adjusted simply by manipulation of the turn buckle 62. This adjustment is used in leveling the tongs when they are suspended. Reference numeral 66 indicates a brace rod which extends from the upright arm 55 to the rear portion of the handle 12 for the purpose of holding the tongs in a substantially horizontal plane when they are suspended from the hook 58.

It was also mentioned as a further object of this invention to provide an improved means of attachment between the rear end of the handle 12 and a manipulating line. Such means of attachment is shown as comprising an eye 67 which is positioned with its axis in a plane common to a plane which contains the handle 12. In other words, the passage through the eye is normal to the opening in the jaws and is in line with the direction which the handle is moved in manipulating the tongs. By arranging the eye in this manner, the manipulating line 68 may be passed through the eye, as indicated in Figs. 1 and 2, looping over the handle, as indicated at 69, the free end of the line being drawn upwardly beneath the loop which goes over the handle, as indicated at 70. In this manner, tension applied to the line in the direction of the arrow A draws the looped portion of the line against the free end 70 so that the pressure against the line is applied to a fiber surface rather than a metal surface, as is the case in the usual construction of tongs of this nature.

Reference numeral 71 indicates an eye or loop which may be used in attaching a backup line to the tongs. It is necessary in the manipulation of tongs of this nature to have means for pulling the tongs from either side, and it is desirable that such means be of a nature such that they can be reversed. In reversing the backup line in the use of my invention, it is only necessary to turn the loop 71 over, and it will be noted that the loop is provided with an elongated section 72 which receives the handle 12, and an enlarged section 73 which may be turned about the handle 12 when it is desired to reverse the line. The enlarged portion 73 is provided with a swivel 74 to which the backup line 75 is attached. For the purpose of preventing side movement of the loop 71 on the handle, I provide the handle with oppositely disposed bosses or projections 76.

One of the features of the tongs contemplated by this invention resides in the manner of attaching the dies to the tongs. In this form of the invention I show the tongs as being provided with two dies, one in each of the jaw sections 16 and 18. In the ordinary construction of tongs of this nature, the dies are either wedged into dovetailed slots, or are welded in the jaws, and such construction makes their removal extremely difficult. In Fig. 5, the die 78 is shown as being re-

ceived in a rectangular slot formed in the jaw section, and is held therein by means of screws 79 which project inwardly from the outside of the jaw section and extend into suitable threaded apertures 80 which are provided in the dies. It will also be noted from Fig. 5, that both the top and bottom surfaces of both the jaws and the dies are rounded, as shown at 81, so as to provide a guiding surface for directing the jaws over the tool joints or collars.

The operation of the tongs contemplated by this invention is best illustrated by Figs. 7 to 9 inclusive. In using the tongs in connection with oil well operations, the tongs are suspended by means of the arm 55 so as to swing in a substantially horizontal plane. The pipe to be engaged by the tongs is usually rigidly held in a substantially vertical position, and the tongs are opened as indicated in Fig. 7 and swung into engagement with the pipe in the general direction of the arrow D by an operator who grasps the arm 55 and the handle 36 on the jaw section 19. The final position of the tongs prior to closing and latching the jaws is indicated in Fig. 7 where it will be noted that the pipe 21 is positioned with the collar 20 engaging the inner surface of the shoe 45 and the pipe engaging surface of the jaw section 16. The next step is to close and latch the jaws about the collar. This is effected by the operator grasping the arm 34 and the handle 36, drawing the jaw sections 17 and 19 into the position shown in Fig. 8 and swinging the gate or latch plate 22 so that the tooth or projection 28 is received in the under cut recess 27. In the event the tongs are being brought into engagement with the pipe rather than the collar, the tooth 28 is received in the under cut recess 26.

After this operation has been completed, the handle 12 is swung in the direction of the arrow A which, as pointed out above, draws the jaws 13 and 14 into pressure engagement with the collar or pipe and, at the same time, presses the shoe 45 into pressure engagement with that portion of the collar which is not engaged by the jaws. The final position of the jaws and the pipe engaging shoe with respect to the collar during the application of torque to the handle 12, is shown in Fig. 9 where it will be noted that the inner surfaces of the jaw sections 17 and 19 are drawn back into firm engagement with the pipe collar and the inner surface of the jaw sections 16 and 18 are swung inwardly through the pivotal action of their connections with the handle, and the inner surface of the shoe 45 is pressed inwardly through the action of the cam nose 52 on the handle so that the five separate contact surfaces are in the same pressure engagement with the collar or the pipe.

It will be apparent from the foregoing description that during the application of turning force to the handle while a pipe is being engaged thereby, the jaw sections 16 and 18 are under tension, and the shoe 45 is under compression. The movement of the handle in the direction opposed to the arrow A is of course effective to loosen the jaws so that such movement may be used to obtain a new bite on the pipe, and is effective to place the jaws in a position such that the latch 22 may be released.

It is to be understood that while I have herein described and illustrated one preferred form of my invention, the invention is not limited to the precise construction described above, but includes within its scope whatever changes fairly come within the spirit of the appended claims.

I claim as my invention:

1. Pipe tongs embodying: a handle; a plurality of gripping jaws pivotally attached to said handle in spaced relation with each other; and a floating shoe mounted on the pivot of one of said jaws and adapted to have pivotal and longitudinal movement relative to said handle.

2. Pipe tongs embodying: a handle; a plurality of gripping jaws pivotally attached to said handle in spaced relation with each other; and a floating shoe mounted on the pivot of one of said jaws and adapted to have pivotal and longitudinal movement relative to said handle, said handle and said shoe having cam engaging surfaces for imparting longitudinal movement to said shoe during swinging movement of said handle.

3. Pipe tongs embodying: a handle; a plurality of gripping jaws pivotally attached to said handle in spaced relation with each other; and a floating shoe mounted on the pivot of one of said jaws and adapted to have pivotal and longitudinal movement relative to said handle, said handle having a cam nose adapted to engage the back of said shoe for causing longitudinal movement of said shoe during swinging movement of said handle.

4. Pipe tongs embodying: a handle; a plurality of sectional gripping jaws having their sections pivotally connected, and each of said jaws being pivotally attached to the end of said handle in spaced relation with each other; a latch at the outer end of said jaws for holding said jaws in closed relation about a pipe; and a floating shoe pivotally and slidably mounted on the handle pivot of one of said jaws.

5. Pipe tongs embodying: a handle; a plurality of sectional gripping jaws having their sections pivotally connected, and each of said jaws being pivotally attached to the end of said handle in spaced relation with each other; a latch at the outer end of said jaws for holding said jaws in closed relation about a pipe; a floating shoe pivotally and

slidably mounted on the handle pivot of one of said jaws; and a cam nose on the end of said handle engaging the back of said floating shoe for causing longitudinal movement of said shoe during swinging movement of said handle.

6. Pipe tongs embodying: a handle; jaws pivotally mounted on said handle; a shoe pivotally mounted on the pivot of one of said jaws, said shoe being adapted for longitudinal movement relative to said pivot; and a cam nose on the end of said handle engaging said shoe for moving said shoe longitudinally during swinging movement of said handle.

7. Pipe tongs embodying: a handle; jaws pivotally mounted on said handle; a shoe provided with slotted cheeks positioned on the end of said handle; a pivot pin extending through the slots in said cheeks and through said handle for slidably and pivotally securing said shoe to said handle, said pivot pin also forming a pivot for one of said jaws; and a cam nose on said handle engaging a surface of said shoe for moving said shoe longitudinally during swinging movement of said handle.

8. Pipe tongs embodying: a handle; jaws spacedly pivoted on said handle; a shoe pivotally mounted on the pivot of one of said jaws; and a stop on said shoe extending below said pivot and adapted to engage one of said jaws for limiting the swinging movement of said shoe.

9. Pipe tongs embodying: a handle; a pair of sectional jaws having their sections pivotally connected, and each of said jaws being pivotally mounted on said handle; a latch for holding said jaws in encircling relation with a pipe; and a shoe mounted on said handle between said jaws, said jaws and said shoe being so connected with said handle as to be pressed into equalized pressure engagement with said pipe during a swinging movement of said handle.

10. Pipe tongs embodying: a handle; pipe encircling jaws mounted on one end of said handle; and an eye positioned at the other end of said handle with its axis in a plane common to the movement of said handle during operation of said tongs.

11. Pipe tongs embodying: a handle; pipe encircling jaws mounted on one end of said handle; and means for attaching a line to the other end of said handle, said last mentioned means comprising a loop having an elongated portion adapted to receive said handle and an enlarged portion adapted to be turned about said handle and a swivel connection in the enlarged portion.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 29th day of November, 1930.

ALFRED W. POSEY.