Aug. 8, 1933. A. E. CARLSON 1,921,281

ADJUSTABLE LOCKING TUBING TONG

Filed Jan. 12, 1931 2 Sheets-Sheet 1

Fig. 1.

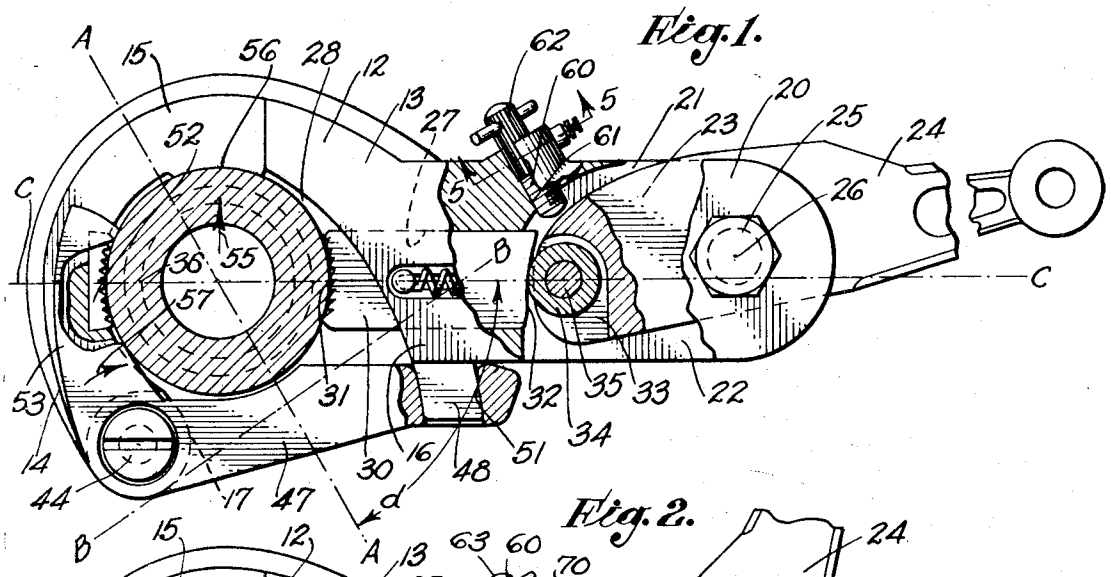


Fig. 2.

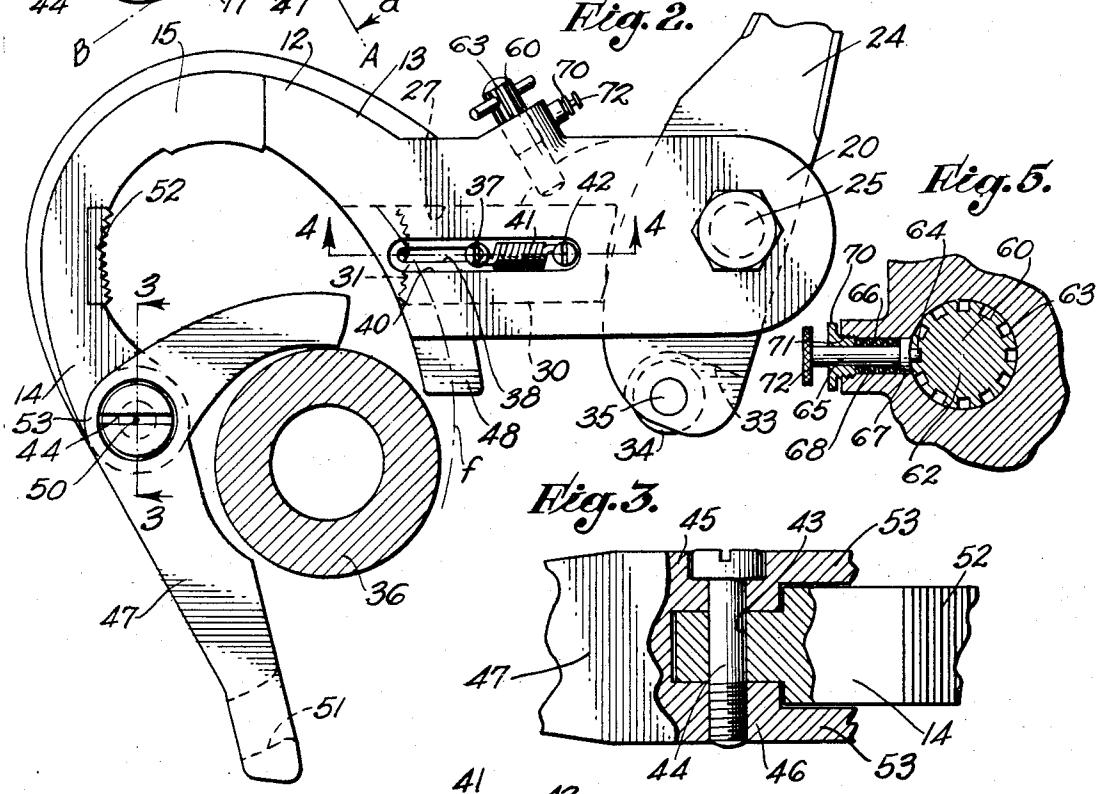
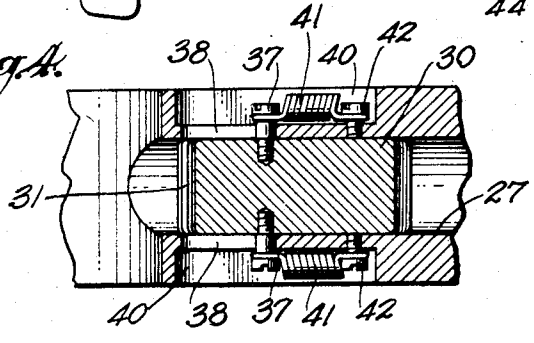


Fig. 5.

Fig. 3.

Fig. 4.



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Filed Jan. 12, 1931 2 Sheets-Sheet 2

Fig.6.

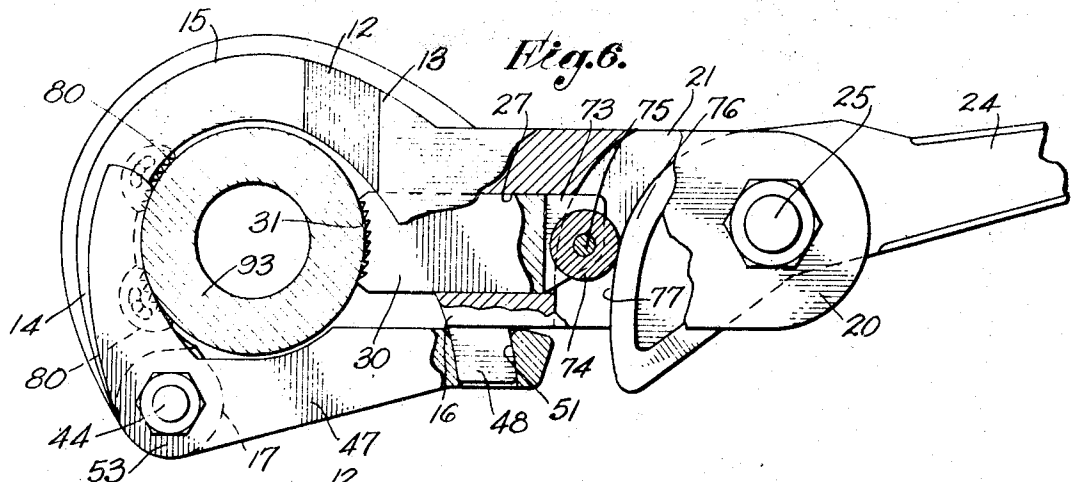


Fig.7.

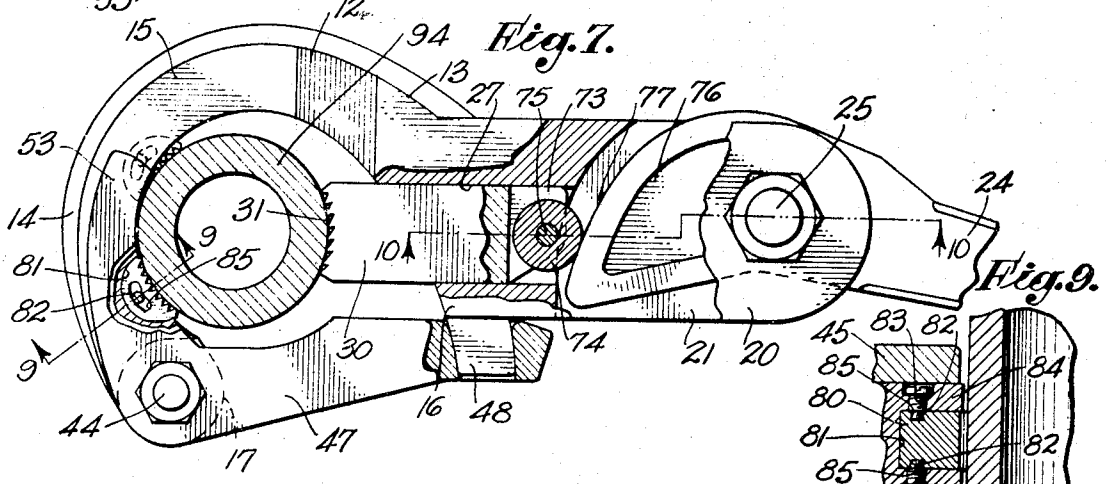


Fig.9.

Fig.8.

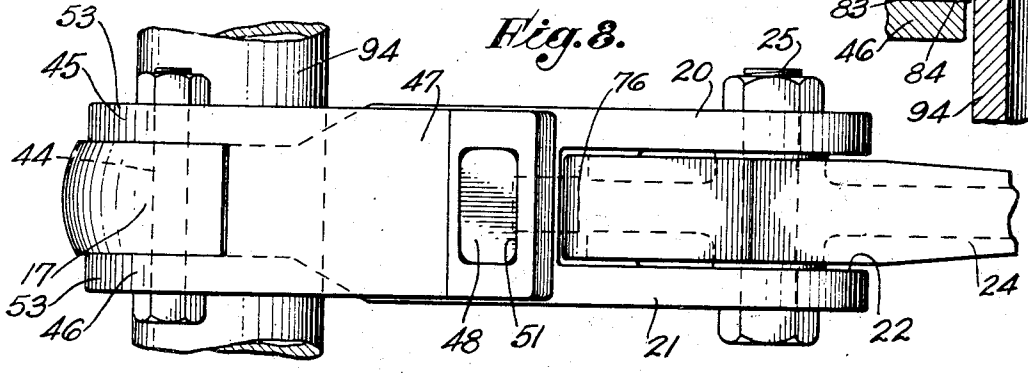
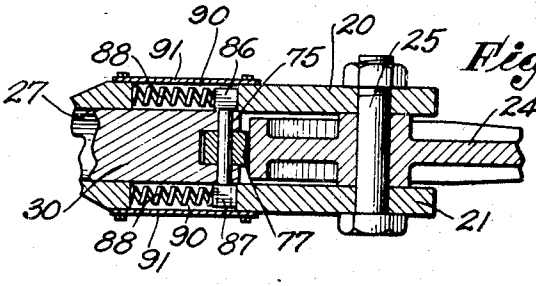


Fig.10.



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ADJUSTABLE LOCKING TUBING TONG

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15 Claims. (Cl. 81—128)

My invention relates to tubing or pipe tongs of the type employed in oil well drilling for the purpose of making up or breaking out strings of pipe or tubing.

It is an object of the invention to provide a tubing tong of sturdy and simple construction having a minimum number of parts and yet being dependable in operation.

It is an object of the invention to provide a tong of this character which is automatically adjustable to use on pipes varying within certain limits, thereby making a tong of a single size usable on oversize, full size, or undersize fittings without the necessity of making any change in the tong.

A further object of the invention is to provide a tong having a U-shaped frame adapted to fit around a pipe or other cylindrical member, there being pipe engaging jaws at one side of the U-shaped frame and an engager slidably mounted at the other side of the frame, together with a pivoted handle on the frame so equipped that movement of the handle in forward direction will produce an inward movement of the engager against the pipe held in the frame.

A further object of the invention is to provide a tong of the above character having a gate adapted to close the opening of the U-shaped frame, this gate when in closed position engaging both legs of the U-shaped frame so as to prevent separation of the legs when the tong is clamped on a pipe.

A further object of the invention is to provide a tong of the above character having means for automatically moving the gate into closed position when the U-shaped frame is placed around a pipe or similar cylindrical object.

A further object of the invention is to provide a tubing tong having a U-shaped member provided with a gate and being so formed that a pipe cannot be removed from the U-shaped frame when the movable engager is held in engagement with the pipe in response to forward movement of the handle of the tong.

A further object of the invention is to provide a tong of the above character having a U-shaped frame member, a radially slidable engager, and a swingable handle pivoted to the frame member adjacent the outer end of the engager, the inner end of the handle being provided with a cam for engaging the engager in such a manner that the angle of pressure between the cam and the outer end of the engager will remain substantially constant regardless of the position of the cam.

Further objects and advantages of the invention will be made evident throughout the following part of the specification.

Referring to the drawings, which are for illustrative purposes only,

Fig. 1 is a partly sectioned plan view of a preferred form of my invention with the parts thereof in closed position.

Fig. 2 shows the tubing tong in open position.

Fig. 3 is a fragmentary cross section on a plane represented by the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary cross section on a plane represented by the line 4—4 of Fig. 2.

Fig. 5 is an enlarged fragmentary section on a plane represented by the line 5—5 of Fig. 1.

Fig. 6 is a partly sectioned plan view of a form of my tubing tong having automatic adjustment through a wide range of pipe diameters, with the parts thereof disposed in the positions they assume when the tong is placed on a large diameter pipe.

Fig. 7 is a plan view similar to Fig. 6, showing the tong in use on a pipe of smaller diameter.

Fig. 8 is a front elevation corresponding to Fig. 7.

Fig. 9 is a fragmentary section on a plane represented by the line 9—9 of Fig. 7.

Fig. 10 is a fragmentary section on a plane represented by the line 10—10 of Fig. 7.

In the form of my invention shown in Fig. 1, I employ a U-shaped frame 12 having an inner leg 13 and an outer leg 14 connected by a curved portion 15. The legs 13 and 14 are disposed on opposite sides of a center line A—A, and by reference to a crossing line B—B it will be perceived that the front end 16 of the inner leg 13 extends further forward than the end 17 of the outer leg 14. At an angle d of less than 90° to the line A—A and preferably of 60°, a center line C—C is extended through the center of the frame 12, and extending from the inner leg 13 parallel to this center line C—C and approximately centralized relative thereto are upper and lower plates 20 and 21 spaced apart so as to provide an intervening space 22 for receiving the inner end 23 of a handle 24 which is pivoted on a pin 25 which extends vertically through the ends of the upper and lower plates 20 and 21, the center 26 of the pin 25 being situated to the rear of the center line C—C, as shown in Figs. 1 and 2. On the center line C—C an opening 27 of circular cross section is bored through the inner leg 13 from the

space 22 between the plates 20 and 21 to the interior space 28 of the frame 12, and in this bore or opening 27 is placed an engager or block 30 of cylindrical form, having inwardly faced ridges or teeth 31 on the inner end thereof and having the outer end thereof provided with a cam face 32. The inner end 23 of the handle 24 has a horizontal groove 33 in which a roller 34 is mounted on a vertical pin 35 in such position that the roller will engage the cam face 32 of the engager 30 and force the engager 30 inwardly against a pipe 36 in the frame 12. As best shown in Fig. 4, screws 37 extend outwardly from the engager 30 through slots 38 which communicate with grooves 40 in the inner leg 13 of the frame 12, the slots 38 and the grooves 40 being aligned with the center line C—C. Tension springs 41 are extended from the outer ends of the screws 37 to screws 42 mounted at the rightward ends of the grooves 40, these springs yieldingly urging the engager 30 from the inward position in which it is shown in Fig. 1 to the outward position in which it is shown in Fig. 2.

As shown in Fig. 3, a bore 43 is formed vertically in the forward end 17 of the outer leg 14 to receive a hinge pin 44 which extends through upper and lower forks 45 and 46 formed at the leftward end of a gate 47 so as to swingably support the gate in such a manner that it will swing between the closed and open positions shown respectively in Figs. 1 and 2. Projecting forwardly from the inner leg 13 is a projection or lug 48 which is centralized on an arc *f* described about the center 50 of the hinge pin 44, and this projection 48 is circularly curved in such a manner that the inner and outer faces thereof are parallel to the arc *f*. An opening 51 in the rightward end of the gate 47 receives the projection 48 when the gate is in the closed position shown in Fig. 1. In the outer leg 14 and in a position opposite to the engager 30 is a replaceable or insert jaw member 52 having serrations or teeth adapted to engage the pipe, coupling, or tool joint indicated at 36.

Extending from the forks 45 and 46 at the leftward end of the gate 47 are arms 53 which are disposed in such position that they will extend above and below the outer leg 14 when the gate is swung into closed position, as shown in Fig. 1, and are slightly curved so as to substantially coincide with the curvature of the pipe member 36; therefore, the movement of the pipe member 36 from the position in which it is shown in Fig. 2 to the position in which it is shown in Fig. 1 causes the gate 47 to swing from open to closed position. Then, when the handle or lever arm 24 is swung from its position of Fig. 2 to its position of Fig. 1, the engager is forced inwardly against the pipe member 36 so as to hold it tightly against the jaw member 52 carried by the outer leg 14. At this time the pipe member cannot move rightwardly due to the fact that the engager 30 is held in leftward or forward position by the roller 34 carried in the end of the handle 24, and also it cannot move rearwardly or in the direction indicated by the arrow 55 due to the abutment 56 provided on the curved portion 15 of the frame 12. In addition to this, the pipe member 36 cannot move forwardly in the direction of the arrow 57 due to the presence of the gate 47, and in order to swing the gate open, it is necessary to move the pipe in the diagonal direction indicated by the center line A—A in order to permit the arms 53 to swing in the direction indicated by the arrow 57, which cannot be done due to the presence of the engager 30. The result of this construction is that the swinging of the arm 24 from folded position, as shown in Fig. 2, to extended position, as shown in Fig. 1, locks the entire frame structure, including the U-shaped frame 12 and the gate 47, around the pipe and assures that the gate will remain in closed position in engagement with the projection 48. The pressure of the engager 30 tends to spread the legs 13 and 14 of the U-shaped frame 12 apart, but the gate serves as a means for tying across the ends of the U-shaped frame so as to prevent separation of the legs thereof.

The cam face 32 on the rightward end of the engager 30 slopes rightwardly as it progresses rearwardly so as to provide an incline on which the roller 34 may roll. The point to which the roller 34 may move on the cam face 32 is controlled by the point at which the engager 30 engages the pipe member 36, and the face of the cam is so formed relative to the arcuate path through which the roller 34 moves that the pressure exerted on the engager 30 will be substantially the same for the various positions which the engager 30 must occupy in engaging pipe members of different diameters. It often occurs that a coupling or tool joint will become worn by repeated use in a well to such an extent that the ordinary type of tong will not properly grip same, this making it necessary to use a chain pipe wrench for the purpose of unscrewing the tool joint or coupling and to replace the tool joint or coupling by another of full diameter. My wrench being capable of operation for a reasonably wide range of diameters makes it possible to use the single tong even though the coupling or tool joint may be considerably reduced in diameter.

As shown in Figs. 1 and 3, my invention provides a stop screw 60 which threads through a threaded opening 61 in such position that the inner end thereof will be engaged by the inner end 23 of the handle 24 when the desired limit of movement has been reached. The outer portion of the screw consists of a shank 62 of increased diameter having longitudinal grooves 63 therein adapted to be engaged by a locking pin 64 formed on the inner end of a stem 65 which projects through a lateral bore 66. The stem 65 has a flange or shoulder 67 near the inner end thereof, and a spring 68 is forced inwardly against this flange 67 by a bushing 70 which engages threads 71 at the outer end of the bore 66. To permit adjustment of the screw 60, a handle 72 at the outer end of the stem 65 is pulled outwardly so as to remove the pin 64 from engagement wtih a groove 63 so that the screw may be rotated into a new position of adjustment, the handle 72 then being released to cause a new locking engagement of the pin 64 with a groove 63 in the enlarged shank 62 of the screw 60.

In the alternative form of my invention shown in Figs. 6 to 10, I employ parts which are substantially identical with the parts employed in my preferred form and therefore have identified these parts by the same numbers. This alternative form of my invention is adapted for a wider range of pipe sizes but operates on substantially the same principle

as the preferred form. Instead of forming a cam on the outer end of the engager 30 and engaging this cam by a roller held in the handle or lever arm 24, I cut a slot 73 across the rightward end of the engager 30 in which to mount a follower roller 74 by means of a vertical pin 75, and on the inner end 76 of the handle 24 I form a cam 77 which is so designed that it will exert substantially the same pressure against the engager 30 regardless of the position of the cam. This form of cam means for operating the engager 30 permits a greater movement of the engager 30 than does the cam means disclosed in Figs. 1 and 2. Instead of a single jaw member 52, I employ a pair of adjustable jaw members 80 consisting of nearly semi-cylindrical blocks and which are received in partly cylindrical sockets 81 formed in the inner face of the outer leg 14. As shown in Fig. 9, the adjustable jaws 80 are held in the sockets 81 by the dog ends 82 of screws 83 which are threaded through the end walls 84 of the sockets 81 into arcuate grooves 85.

The pin 75, as shown in Fig. 10, has a head 86 which rests in an upper slot 90, and on the lower end of the pin 75 is threaded a nut 87 which projects into a lower slot 90, these slots 90 being formed in the inner leg 13 of the U-shaped frame member 12. Compression springs 88 held in the slots 90 by cover plates 91 force the pin 75 and the engager 30 into rightward or retracted position.

In Fig. 6 I show the positions assumed by the parts of the tong when used on a pipe member 93 of large diameter, and in Fig. 7 I show the tong in use on a pipe member 94 of smaller diameter, showing how the engager 30 is moved inwardly into engagement with the pipe member by the cam 77. The jaw members 80 rotate in the sockets 81 so as to adjust themselves to the curvature of the pipe member on which the tong is being used, thus producing ample gripping of the pipe. By use of suitable suspension cables, the tong may be swung in the derrick in the customary manner, but I have found that by pivoting the handle 24, it may be readily swung into an out-of-the-way position so as not to interfere with activities on the floor of the derrick. The parts of the tong are simple and rugged in form, but the results obtained by the use thereof are of a superior character.

I claim as my invention:

1. A tong of the character described, including: a rigid frame adapted to fit around a pipe, said frame having an opening in the front end thereof through which said pipe may pass into said frame; pipe engaging jaw means secured at one side of said frame; an engager movably mounted at the other side of said frame so as to move in and out relative to said pipe; a handle pivoted to said frame; and cam means operated by said handle for forcing said engager inwardly toward said pipe, said cam means being so formed as to produce a constant pressure of said engager against said pipe regardless of the position of said handle relative to said frame.

2. A tong of the character described, including: a rigid frame adapted to fit around a pipe; pipe engaging jaw means secured at one side of said frame, there being a radially directed slide formed at the opposite side of said frame; an engager comprising a jaw slidably mounted in said slide and having its inner end adapted to engage said pipe; a handle pivoted to said frame and cam means operated by said handle for forcing said engager inwardly toward said pipe, said cam means being so formed as to produce a constant pressure of said engager against said pipe regardless of the position of said handle relative to said frame.

3. A tong of the character described, including: a rigid frame adapted to fit around a pipe; pipe engaging jaw means secured at one side of said frame, there being a radially directed slide formed at the opposite side of said frame; an engager comprising a jaw slidably mounted in said slide and having its inner end adapted to engage said pipe; a handle pivoted to said frame; and a cam operated by said handle for forcing said engager inwardly toward said pipe, said cam being so formed as to produce a constant pressure of said engager against said pipe regardless of the position of said handle relative to said frame.

4. A tong of the character described, including: a frame adapted to fit around a pipe, said frame forming a rigid U having an inner leg and an outer leg, said legs forming the sides of said frame; a plurality of jaws mounted on said outer leg of said frame so as to adjust themselves to the surface of a pipe; an engager movably mounted on said inner leg of said frame so as to move in and out relative to said pipe; a handle pivoted to said inner leg of said frame; and means operated by said handle for forcing said engager inwardly toward said pipe.

5. A tong of the character described, including: a rigid U-shaped frame adapted to fit around a pipe, said frame having a pair of laterally directed legs providing an opening at one side thereof so as to permit passage of the pipe in and out of the frame; relatively stationary jaw means mounted on one of said legs of said frame; a gate for closing said opening, said gate being swingably secured to said frame; means operative in response to engagement by said pipe for closing said gate as said pipe moves into said frame; walls forming a slide in conjunction with one of said legs and directed toward the other of said legs; a block movable inwardly and outwardly in said slide in such a manner that the inner end of said block will engage said pipe and force said pipe toward said stationary jaw means; and a handle member pivoted to said frame adjacent the outer end of said block, said handle member having means for engaging the outer end of said block and forcing said block inwardly into forcible engagement with said pipe.

6. A tong of the character described, including: a rigid U-shaped frame having an inner leg and an outer leg and being adapted to fit around a pipe, said legs defining a laterally directed opening of a size to permit passage of the pipe in and out of the frame; relatively stationary jaw means mounted on one of said legs of said frame; a gate pivoted to said outer leg, said gate being adapted to close said opening; means operative in response to engagement by said pipe for closing said gate as said pipe moves into said frame; walls forming a radial slide in said inner leg of said frame at approximately a right angle to the direction of extension of said legs; a block movable inwardly and outwardly in said slide in such a manner that the inner end of said block will engage said pipe; and a handle member pivoted to said frame adjacent the outer end of said block, said handle member having means for engaging the outer

end of said block and forcing said block inwardly into forcible engagement with said pipe and toward said stationary jaw means.

7. A tong of the character described, including: a rigid U-shaped frame having an inner leg and an outer leg and being adapted to fit around a pipe, said legs defining a laterally directed opening of a size to permit passage of the pipe in and out of the frame; relatively stationary jaw means mounted on one of said legs of said frame; a gate pivoted to said outer leg, said gate being adapted to close said opening; means operative in response to engagement by said pipe for closing said gate as said pipe moves into said frame; engagement means cooperating between the ends of said inner leg and said gate capable of transmitting tensional forces to said gate when said gate is in closed position; walls forming a radial slide in said inner leg of said frame, said slide being disposed on an axis forming an acute angle with the direction of extension of said legs; a block movable inwardly and outwardly in said slide in such a manner that the inner end of said block will engage said pipe; and a handle member pivoted to said frame adjacent the outer end of said block, said handle member having means for engaging the outer end of said block and forcing said block inwardly into forcible engagement with said pipe and toward said stationary jaw means.

8. A tong of the character described, including: a rigid U-shaped frame having an inner leg and an outer leg and being adapted to fit around a pipe, said legs defining a laterally directed opening of a size to permit passage of the pipe in and out of the frame; relatively stationary jaw means mounted on one of said legs of said frame; a gate pivoted to said outer leg, said gate being adapted to close said opening; means operative in response to engagement by said pipe for closing said gate as said pipe moves into said frame; a projection on said inner leg, there being an opening in the end of said gate adapted to receive said projection when said gate is in closed position; walls forming a radial slide in said inner leg of said frame, said slide being disposed on an axis forming an acute angle with the direction of extension of said legs; a block movable inwardly and outwardly in said slide in such a manner that the inner end of said block will engage said pipe; and a handle member pivoted to said frame adjacent the outer end of said block, said handle member having means for engaging the outer end of said block and forcing said block inwardly into forcible engagement with said pipe and toward said stationary jaw means.

9. A tong of the character described, including: a rigid U-shaped frame having an inner leg and an outer leg, the interior of said U-shaped frame forming an open space to receive a pipe; pipe-engaging means on said outer leg of said U-shaped frame; an engager comprising a movable jaw on said inner leg substantially opposite to the pipe-engaging means on said outer leg; a handle pivoted to said frame; and means operated by said handle for forcing said movable jaw toward said pipe-engaging means and against a pipe held in said space.

10. A tong of the character described, including: a rigid U-shaped frame having an inner leg and an outer leg, the interior of said U-shaped frame forming an open space to receive a pipe; pipe-engaging means on said outer leg of said U-shaped frame; an engager comprising a movable jaw on said inner leg substantially opposite to the pipe-engaging means on said outer leg, said engager being adapted to move inwardly on a radius forming an acute angle with the direction of extension of said legs so that a pocket is formed opposite said engager; a handle pivoted to said frame; and means operated by said handle for forcing said movable jaw toward said pipe-engaging means and against a pipe held in said space.

11. A tong of the character described, including: a handle-receiving body; a rigid U-shaped member having the inner leg thereof secured to said body and forming a space in which a pipe may be received, the U-shaped member being laterally disposed relative to said body so as to provide an opening at one side of the tong structure through which a pipe may enter said space; an engager movable on said body in a direction radial with respect to said U-shaped member and in a direction transverse to said inner leg thereof; and a handle pivotally secured to said body and having means associated therewith for forcing said engager from said body and into said space as said handle is swung relative to said body.

12. A tong of the character described, including: a handle-receiving body; a rigid U-shaped member having the inner leg thereof secured to said body and forming a space in which a pipe may be received, the U-shaped member being laterally disposed relative to said body so as to provide an opening at one side of the tong structure through which a pipe may enter said space; an engager movable on said body in a direction radial with respect to said U-shaped member and in a direction transverse to said inner leg thereof; a handle pivotally secured to said body; and a cam on the inner end of said handle adapted to force said engager inwardly relative to said space when said handle is swung relative to said body, said cam being so formed as to produce a constant pressure of said engager relative to said pipe in all positions of said handle relative to said body.

13. A tong of the character described, including: a handle-receiving body; a U-shaped member having an inner leg and an outer leg, the inner leg being joined to said body, and said legs being laterally disposed relative to said body so as to form a side opening through which a pipe may enter the space within said U-shaped member; an engager movable on said body in a direction radial with respect to said U-shaped member and lateral with respect to said inner leg; a handle pivotally secured to said body; means on the inner end of said handle adapted to force said engager inwardly relative to said space when said handle is swung relative to said body; a gate hinged to the outer end of said outer leg so as to swing from an open position to a position closing the mouth of said opening; and a closing arm extending from said gate so as to extend across the mouth of said U-shaped member when said gate is in open position and to lie along said outer leg when said gate is in closed position.

14. A tong of the character described, including: a handle-receiving body; a U-shaped member having an inner leg and an outer leg joined to said body in such position that said legs will form an acute angle with the center line of said body and provide a side opening through

which a pipe may enter the space within said U-shaped member; an engager movable on said body in a direction radial with respect to said U-shaped member and lateral with respect to said inner leg; a handle pivotally secured to said body; means on the inner end of said handle adapted to force said engager inwardly relative to said space when said handle is swung relative to said body; a gate hinged to the outer end of said outer leg so as to swing from an open position to a position closing the mouth of said opening; and a closing arm extending from said gate so as to extend across the mouth of said U-shaped member when said gate is in open position and to lie along said outer leg when said gate is in closed position.

15. Tongs of the character described including, pipe encircling means, a handle rigidly connected with said means, a jaw slidably carried by said means operable to grip a pipe, and means for actuating the jaw including a rod connected with the jaw and slidable in an opening in the handle, a cam pivotally mounted on the outer end of the handle for operating the rod, means on the cam for receiving a line for turning the tongs, and means for limiting the movement of the rod and jaw whereby the force transmitted by the line may turn the tongs after actuation of the jaw.

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