Aug. 30, 1960 J. C. MASON 2,950,639

POWER OPERATED PIPE WRENCH

Filed Aug. 11, 1958 3 Sheets-Sheet 1

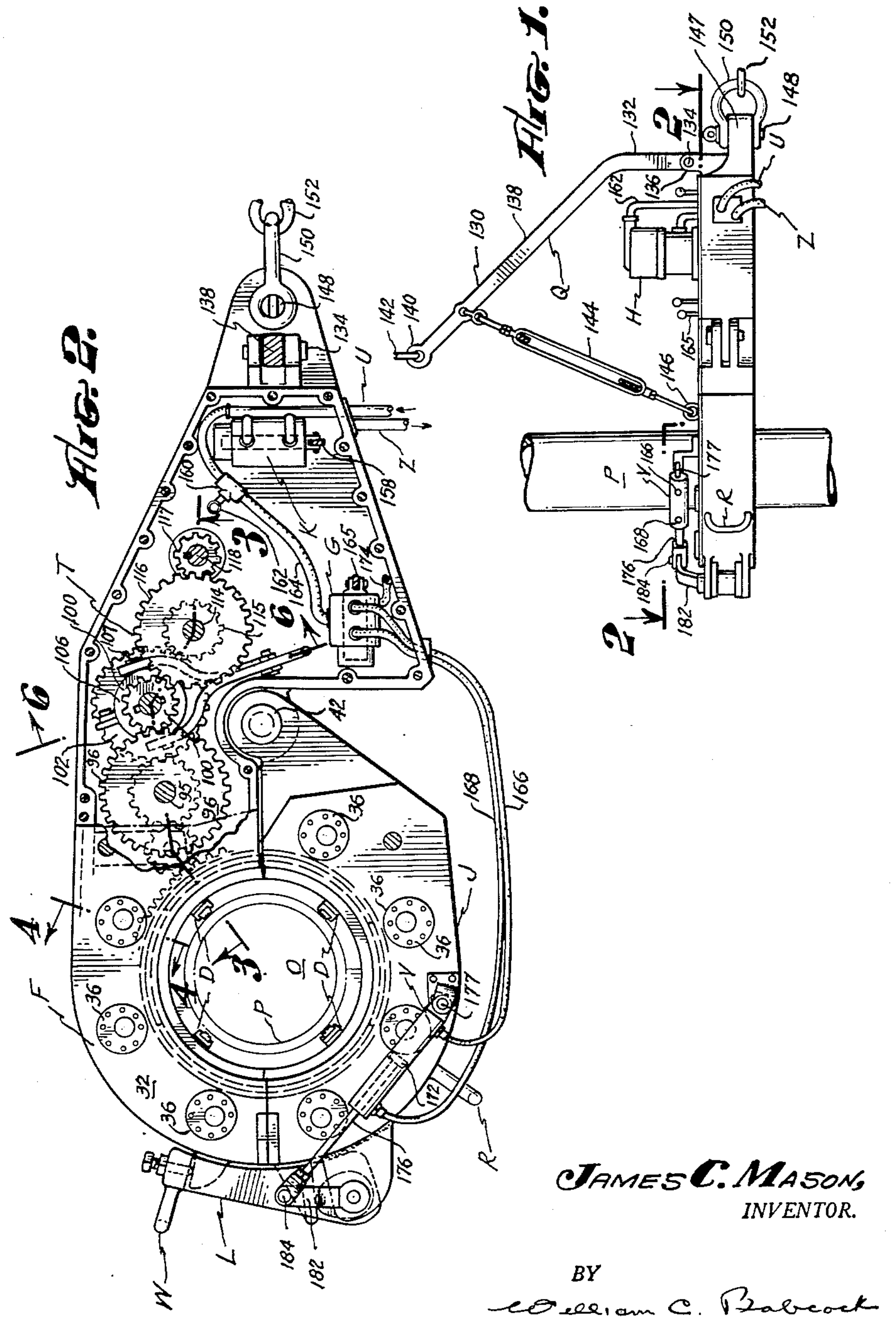

FIG. 1.

FIG. 2.

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FIG. 3.

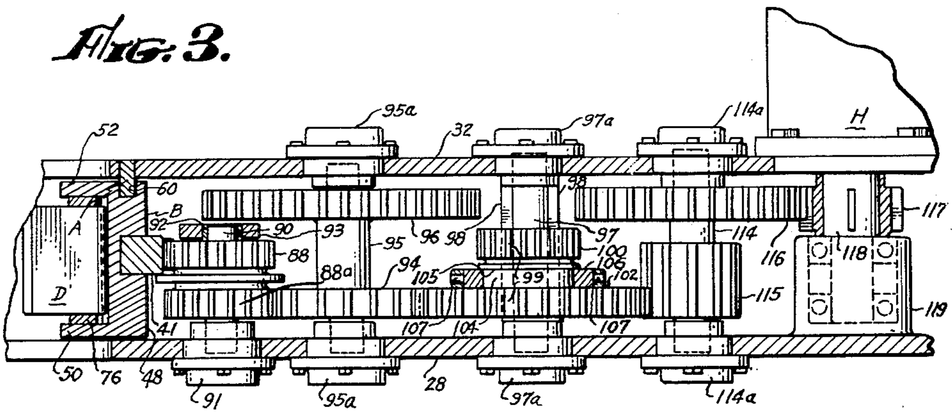


FIG. 4.

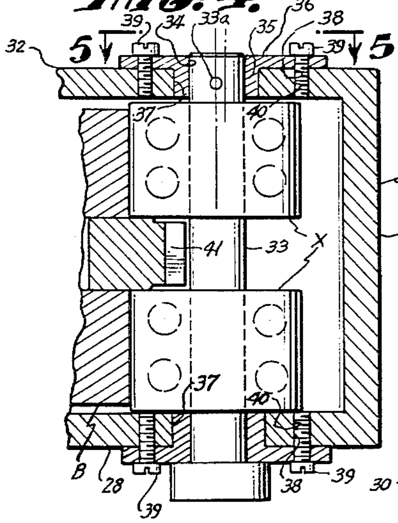
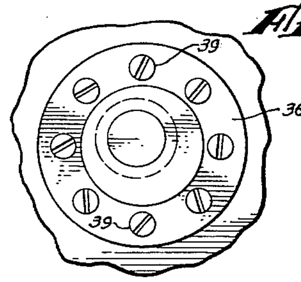


FIG. 5.



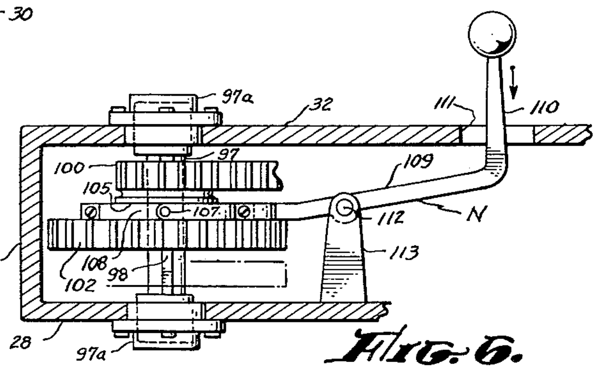


FIG. 6.

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FIG. 7.

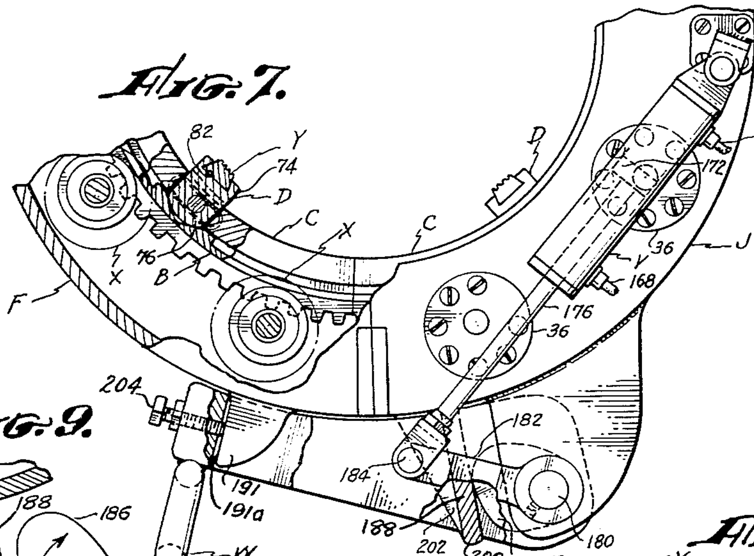


FIG. 9.

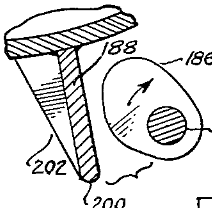


FIG. 8.

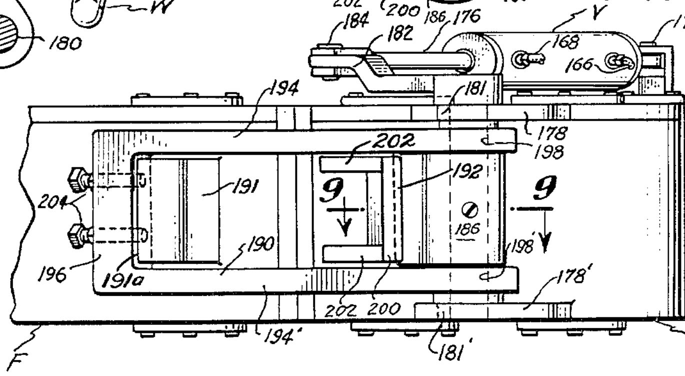
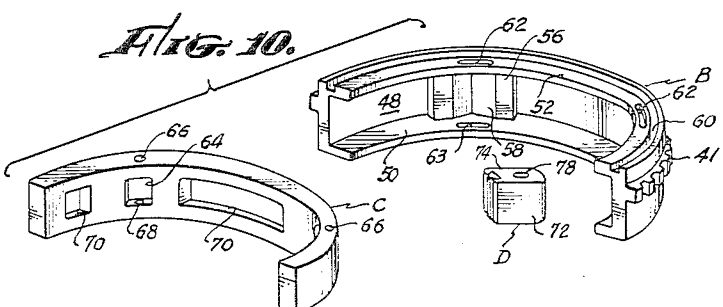


FIG. 10.



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POWER OPERATED PIPE WRENCH

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Filed Aug. 11, 1958, Ser. No. 754,237

10 Claims. (Cl. 81—53)

The present invention relates generally to oil field equipment, and more particularly to an improved power-driven pipe tong. This application is continuation-in-part of co-pending application filed June 24, 1954, under Serial No. 439,061 for a Power-Driven Power Operated Pipe Wrench, which issued August 12, 1958, under Patent No. 2,846,909.

Power-driven pipe tongs are widely employed in oil well drilling and the production of oil. These tongs are particularly adapted for use in rapidly screwing and unscrewing the threaded ends of strings of casing, drill pipe and tubing utilized in the bore hold of an oil well, in that they permit considerable saving of time and money.

Additionally, these power tongs are far safer in actual use than conventional pipe tongs previously available, for they are power-operated and substantially eliminate the manual labor and physical hazards heretofore encountered in running a string of casing, drill pipe, or tubing into a well bore or in removing the same therefrom.

A major object of the present invention is to provide an improved power tong by means of which a more efficient and versatile transmission of power from the prime mover to the pipe-engaging elements thereof is effected, which rotatably and adjustably supports the pipe-engaging elements in a manner to compensate for wear thereof as well as to minimize transmission of sudden shock thereto when the dies assume a pipe-engaging position, and allows for selective variation in the latching force to that required for a particular job.

Another object of the present invention is to provide an improved power tong that is more compact, lighter in weight, simpler in construction, and more versatile in operation than the tong disclosed in my previously mentioned Patent No. 2,846,909.

These and other objects and advantages of the present invention over the device disclosed in my previously mentioned Patent No. 2,846,909, will become apparent from the following description of a preferred embodiment thereof, and from the accompanying drawings, wherein:

Figure 1 is a side elevational view of the improved power tong of the present invention;

Figure 2 is a top plan view of the tong shown in Figure 1, taken on line 2—2 thereof;

Figure 3 is a fragmentary vertical cross-sectional view of the transmission gear train and reversible fluid motor forming a part of the invention, taken on line 3—3 of Figure 2;

Figure 4 is a fragmentary vertical cross-sectional view of one of the pairs of rollers which rotatably support the half rings on which the die carriers are mounted, taken on line 4—4 of Figure 2;

Figure 5 is a top plan view of one of the adjustable roller support indexing plates, taken on line 5—5 of Figure 4;

Figure 6 is a fragmentary, vertical cross-sectional view

of a portion of the transmission and manually operated gear shift taken on line 6—6 of Figure 2;

Figure 7 is a fragmentary top plan view of a frame member and jaw member adapted to be held in rigid abutment by the power-actuated latch as shown, with portions of the frame and jaw being broken away to disclose portions of the half rings, die carrier and dies, and the manner in which they are supported on the frame and jaw by the rollers shown in Figures 4 and 5;

Figure 8 is a fragmentary elevational view of the latch in a position to maintain the frame and jaw in the closed position of Figure 7;

Figure 9 is a fragmentary horizontal cross-sectional view of the power-operated cam and cam-engageable member shown in Figure 7; and

Figure 10 is an exploded perspective view of a half ring, die carrier and die block.

With further reference to the drawings for the general arrangement of the invention, and particularly Figures 1 and 2 thereof, it will be seen to include a frame member F which pivotally supports a jaw J that is adapted to be secured in a closed position relative thereto by means of a power-operated latch L. Frame member F and jaw J are so constructed as to define a circular pipe-receiving opening O in which a tubular member P can be inserted or from which it may be removed when jaw J is in an open position relative to frame member F.

It will be understood that member P may comprise either casing, drill pipe, or tubing normally inserted in the bore hole of an oil well. Frame member F and jaw J, as can best be seen in Figures 3, 4, and 6, are of hollow construction. Two identical semi-circular half rings B are provided, one of which is shown in Figure 10. These half rings are rotatably supported within the confines of frame member F and jaw J, respectively, to encircle opening O (Figures 3 and 7).

Two identical semi-circular die carriers C are also provided, one of which is shown in Figure 10 and partially in Figure 3. Carriers C support a number of circumferentially spaced die blocks D, and in turn carriers C are supported by half rings B. The outermost end surfaces of blocks D relative to tubular member P are of curved convex configuration, and these curved ends slidably engage cam surfaces formed, or otherwise provided, on half rings B.

When half rings B are rotated relative to carriers C, the die blocks D are moved radially inward to engage the exterior surface of tubular member P and rotate the same. A fluid actuated motor H is mounted on the upper surface of frame member F (Figure 1) and is connected by means of a conduit U to a source of fluid under pressure (not shown). A first manually operable valve K directs fluid under pressure from conduit U to motor H and selectively actuates the same in either of two possible directions for reasons to be hereinafter explained. A second valve G selectively directs fluid from conduit U to a hydraulic cylinder V, as best seen in Figure 2, which cylinder actuates latch L to maintain frame F and jaw J in the closed position or release them therefrom.

Motor H drives a gear train T (Figures 2 and 3) to rotate half rings B. By means of the manually operable gear shift N shown in Figure 6, gear train T can be caused to rotate half rings B at either high speed, low torque, or high or low speed, high torque. A support Q for the invention above described is shown in Figure 1, which maintains frame member F and jaw J in a desired horizontal position relative to the tubular member P being rotated. A handle R is mounted on jaw J (Figures 1 and 2), by means of which the jaw may be pivoted outwardly away from the forward extremity of frame member F when latch L is manually pivoted out of engagement with member F. Latch L is also provided with a handle W which permits the latch to be placed in engagement with frame member F or pivoted outwardly to disengage the latch therefrom.

A number of pairs of rollers X rotatably support half rings B. Rollers X are adjustably supported from frame F and jaw J whereby they may be moved toward or away from half rings B, for reasons to be explained hereinafter. Frame member F (Figures 1, 2 and 3) includes a bottom wall **28**, a side wall **30**, and a top wall or cover **32**, the edges of which walls are integrally joined. Rollers X, as may be seen in Figure 4, are preferably of the ball or roller bearing type and mounted in pairs on shafts **33**. The end portions of each shaft are disposed in longitudinally extending, off-centered bores **34** formed in bosses **35** that are normally disposed and rigidly affixed relative to indexing plates **36**. The end portions of shafts **33** are affixed to at least one of the bosses **35** in which they are disposed by means of a pin **33***a*, or other fastening means. Should it be desired, commercially available stock bolts can be used in place of shafts **33** as shown in Figure 4. Pairs of vertically aligned openings **37** are formed in frame F and jaw J which are circumferentially spaced around opening O, and one of the bosses **35** is rotatably disposed in each opening **37**.

A plurality of circumferentially spaced bores **38** are formed in each indexing plate **36** through which bores screws **39** extend to engage a number of tapped bores formed in frame F and jaw J around openings **37**. Rotation of indexing plates **36** moves shaft **33** and rollers X toward or away from half rings B whereby the pressure contact between the rollers and half rings can be controlled. Movement of rollers X toward half rings B by rotation of indexing plates **36** is also highly desirable in order to compensate for wear on the half rings after prolonged use. Engagement of screws **39** with aligned bores **38** and tapped bores **40** rigidly maintains shafts **33** and rollers X at the desired position relative to half rings B. One-half of a ring gear **41** is affixed to the central exterior surface of each half ring B (Figure 10), and this gear maintains rollers X in the spaced relationship shown in Figure 3.

The rear portion of jaw J is pivotally secured to frame member F by a vertical pivot pin **42**. Structurally, jaw J is generally similar to the front portion of frame F, and has similar bottom, side and top walls. Rollers X may be adjustably supported in jaw J by the same type of mounting assemblies employed with jaw J, as shown in detail in Figure 4.

Each half ring B includes a vertical wall **48** from which lower and upper flanges **50** and **52** respectively, project radially inward. Ring gear **41** can be either rigidly affixed to, or formed as an integral part of half ring B. The exterior surfaces of walls **48** are in rolling contact with rollers X, as may be seen in Figure 7. A number of circumferentially spaced wedging members **56** are formed on the interior surfaces of walls **48**, and each wall defines a wedge-shaped pocket **58** which receives an end portion of one of the die blocks D. Arcuate grooves **60** are formed in the upper flanges **52** that slidably receive and rotatably engage track A (Figure 3). Upper and lower flanges **52** and **50** also have a number of pairs of vertically aligned slots **62** and **63** respectively, formed therein, the centers of which are in alignment with the centers of pockets **58**.

Die carriers C are positioned between the lower and upper flanges **50** and **52**, as shown in Figures 2, 3 and 7. Each carrier C is formed with a number of generally rectangular, radially extending openings **64** adapted to be aligned with the wedging member pockets **58**. Vertically aligned bores **66** and **68** are formed in each die carrier C that communicate with openings **64**. Lightening holes **70** may also be formed in each half ring B, as shown in Figure 10.

The die blocks D are identical in structure and shape, and each includes a main portion **72** and a die mounting portion **74**. Portion **72** is slidably disposed within one of the openings **64** of the support half rings B, and these main portions **72** are retained within openings **64** by means of vertically extending bolt elements **76** positioned within vertical, radially directed slots **78** formed in each of the main portions. A vertically extending wedge-shaped slot **82** is formed in die mounting portion **74** of each block D for receiving one of a number of pipe-engaging dies Y, preferably formed with a serrated or otherwise roughened exterior pipe-engaging face. Dies Y are fabricated from a hard, tough material that is resistant to abrasion and are of such transverse cross section as to be slidably insertable or removable in slots **82**. Dies Y are rigidly maintained within the confines of slots **82** by means of screws, or other conventional means (not shown).

Referring to Figures 3 and 7, it will be seen that engagement of ring gear **41** with a toothed driving roller **88** causes half rings B to rotate relative to frame element F and jaw J when they are in the closed position. Driving roller **88** is rigidly mounted on a first shaft **90** that is rotatably supported by two vertically spaced bearings **91** and **92**. Bearing **91** is mounted on wall **28** of frame F and bearing **92** on a bracket **93** affixed to wall **28** that projects upwardly therefrom and is situated within the confines of the frame.

A driven roller **88***a* is also rigidly affixed to first shaft **90** and at all times engages a first pinion **94** which is rigidly mounted on a second vertical shaft **95**, the end portions of which are rotatably mounted in a pair of bearings **95***a* supported by frame F. A second pinion **96**, considerably larger in diameter than pinion **94**, is also rigidly affixed to shaft **95**, above pinion **94**.

A third shaft **97** that is parallel to second shaft **95** is rotatably supported by a pair of bearings **97***a* from frame F. The gear shift mechanism N, as best seen in Figure 6, permits selective rotation of die blocks D at low speed, high torque, or high speed, low torque. Splines **98** are formed on shaft **97** that slidably engage keyways **99** provided in an upper gear **100** and a lower gear **102**. Gears **100** and **102** are slidably supported on shaft **97**, but rotate concurrently therewith. Gear **100** is considerably smaller in diameter than gear **102**, and an intermediately disposed tubular member **104** having a circumferentially extending groove **105** formed therein rigidly connects these gears.

A rigid ring-shaped member **106** is slidably supported in groove **105**, and two pins **107** project outwardly from opposite sides thereof. A bifurcated member **108** engages pins **107** that is in turn pivotally connected to one end of a generally horizontal lever **109** which terminates in an upwardly extending handle **110** that projects through an opening **111** formed in frame cover **32**. Lever **109** is pivotally mounted on a horizontal shaft **112** affixed to the upper end portions of two laterally separated arms **113** which project upwardly into frame F from wall **28** thereof.

A fourth vertical shaft **114** is rotatably supported by a pair of bearings **114***a* mounted on walls **32** and **28**, as shown in Figure 3. A lower toothed member **115** and upper toothed member **116** somewhat larger in diameter are rigidly affixed to shaft **114**. Member **116** is at all times in engagement with a driving gear **117** mounted on a vertical drive shaft **118** that extends upwardly to fluid actuated motor H. The lower end of shaft **118** is journalled in a bearing **119** that is supported on wall **28**.

Manual manipulation of handle **110** moves lever **109** and bifurcated member **108** to place gears **100** and **102** in the first position shown in Figure 3 where gear **102** engages first pinion **94** and toothed member **115**. Gears **100** and **102** can also be moved by use of gear shift N to a second position in which gear **100** engages second pinion **96**, while gear **102** remains in engagement with toothed member 115, but out of engagement with first pinion 94. Gear shift N also permits gears 100 and 102 to be moved to a third, or neutral position, wherein gear 100 does not engage any toothed member, and gear 102 is in engagement with toothed member 115 but out of engagement with first pinion 94. Thus, by manipulation of handle 110, the gear shift mechanism N causes motor H to rotate half rings B, die carriers C, and die blocks D at either high speed, low torque, or low speed, high torque.

The support Q (Figure 1) includes a rigid bar 130 that is bent, or otherwise formed, to define a first downwardly extending leg 132 that is pivotally connected on the lower end portion thereof by a pin 134 to a lug 136 which projects upwardly from frame F. Bar 130 also defines a second upwardly extending leg 138 that is angularly positioned relative to leg 132. The upper extremity of leg 138 terminates in an eye 140, which by means of a cable 142 affixed thereto, supports the tong from a convenient portion of the derrick structure (not shown). A manually adjustable turnbuckle 144 is pivotally connected to the upper portion of leg 138, and to a suitable fastener 146 affixed to top wall 32 a considerable distance inwardly from lug 136. By manipulation of turnbuckle 144, frame F and jaw J may be pivoted relative to support Q to place the tong in a true horizontal plane. The rear end of frame F terminates in a heavy, horizontally positioned lug 147 in which a vertical bore is formed that receives a pin 148 and pivotally supports an eye-defining member 150. A dead line 152 is connected to member 150 and a portion of the derrick (not shown) to restrain rotation of the tong during a pipe screwing operation.

Conduit U conducts fluid from a source under pressure (not shown) to first valve K, and upon manipulation of a handle 158 provided on the valve, fluid can be discharged into the motor to cause selective rotation thereof in either of two possible directions. After actuation or motor H, fluid is directed back to its source through a second conduit Z for recirculation through conduit U.

In detail, conduit U (Figures 1 and 2) includes a T connection 160 from which a tubular lateral 162 extends to the inlet side of motor H, and an extension 164 of conduit U continues from T 160 to the inlet side of second valve G.

Valve G, by means of a control handle 165 associated therewith, is capable of discharging fluid through either of two conduits 166 or 168 extending to opposite ends of the hydraulic cylinder V. When handle 165 is placed in a first position, fluid is discharged through conduit 166 to enter cylinder V and move a piston 172 disposed therein to the left, as shown in Figure 2. Fluid on the side of piston 172 opposite that contacted by the incoming fluid is discharged through conduit 168 to return to second valve G. Fluid so returning to second valve G is discharged therefrom through a conduit 174, which by conventional means, is connected to conduit Z and returned to its source for recirculation. When handle 165 is placed in a second position, fluid entering the valve from conduit U is discharged from the valve to conduit extension 168 to enter cylinder 170 and force piston 172 to the right (Figure 2) with the fluid on the side of the pistons communicating with conduit 166 being discharged therethrough to return to valve G and thereafter discharged through conduit 174 to conduit Z.

Piston 172 has a piston rod 176 affixed thereto, which extends forwardly to a position above the latch mechanism L. The end of cylinder V opposite that from which piston rod 176 projects is pivotally connected by a pin 177 to jaw J. Latch mechanism L includes two horizontal, vertically spaced supporting plates 178 and 178′ which are welded or otherwise affixed to the forwardly disposed, vertically extending side walls of jaw J, as best seen in Figures 2, 7 and 8. A heavy vertical shaft 180 is journaled in vertically aligned, longitudinally extending slots 181, 181′ formed in plates 178, 178′ respectively, and an outwardly projecting arm 182 is rigidly affixed to shaft 180. The outer extremity of arm 182 is pivotally connected by a pin 184 to the outer extremity of the piston rod 174.

An intermediately positioned cam or eccentric 186 is rigidly affixed to shaft 180 by conventional fastening means. When shaft 180 is rotated in a counter clockwise direction (Figures 7 and 9), cam 186 is brought into rotatable sliding contact with a heavy rigid cam-engageable member 188 that projects outwardly from jaw J. This rotatable contact between cam 186 and member 188 forces shaft 180 to the right in slots 181, 181′.

Latch mechanism L also includes an engaging member 190 and an engageable member 191. Member 190 comprises two parallel, laterally spaced legs 194, 194′ that are connected by a web 196 extending between the end portions thereof, as best seen in Figure 8. Two aligned bores 198, 198′ are formed in the end portions of legs 194, 194′ opposite those joined by web 196, and these bores rotatably engage shaft 180. With engaging member 190 supported as described above, an end portion of leg 194 is disposed between the lower face of plate 178 and upper face of cam 186, and an end portion of leg 194′ is located between the lower face of cam 186 and the upper face of plate 178′.

Engageable member 188 preferably includes a vertical plate 200, the inner edge of which is welded or otherwise affixed to the forward portion of jaw side wall 30. To strengthen plate 200 against stress and strain, it is preferably reinforced by two parallel vertically spaced ribs 202 that are rigidly affixed to wall 30. Two set screws 204 are threaded into tapped bores formed in web 196, and the end portions thereof are capable of being adjusted to a desired distance inwardly from web 196. A handle W is mounted on the latch engaging member 190 that permits pivotal movement of the engaging member to a position where it may be placed in engagement with engageable member 191 (Figure 7), or to a position where it is out of engagement therewith, whereby jaw J may be swung away from frame F, which is necessary when pipe P is placed in or removed from opening O. The further the set screws 204 project to the right from web 196 as seen in Figure 7, the less movement the piston rod 176 will be required to make to bring the ends of the set screws 204 into pressure contact with a flat face 191a of engageable member 191.

The use of the invention is extremely simple. When it is desired to place a tubular member P within the confines of opening O, the latch L is disengaged and handle R is employed to swing jaw J outwardly away from frame member F. The tubular member to be screwed or unscrewed from a corresponding section thereof is placed inside frame member F and jaw J and the jaw then swung toward member F by means of handle R until latch L can be placed in an engaging position. Initial engagement of latch L brings the free ends of jaw J and frame member F into juxtaposition, but not in abutment. Likewise, when latch L is in an engaging position, the half rings B are supported by rollers X, as can best be seen in Figure 4, but without these rollers exerting any substantial radial force on the outer surface of wall 48 thereof. After initial pressure contact of set screws 204 with face 191a is effected as shown in Figure 7, the handle 165 of second valve G is manipulated to cause fluid flow to the hydraulic cylinder V, with resultant movement of piston 172, piston rod 176, arm 182 and rotation of cam 186 to slidably contact cam plate 200, whereby jaw J and frame member F are drawn together and the ends thereof are placed in pressure abutment. As jaw J and frame member F are so drawn together, due to previous adjustment of the indexing plates 36, rollers X are so radially disposed relative to half rings B that the rollers X pressure contact the exterior surface of the half ring walls 48, as can best be seen in Figure 4. The magnitude of the force exerted by rollers X in this manner is dependent upon the positioning of the roller-supporting shafts 33, as well as the magnitude of the fluid pressure being supplied to the apparatus through conduit U.

First valve K is then manually manipulated to cause rotation of driving gear 117 and resultant rotation of half rings B, die carries C, and dies D. Prior to rotation, dies D move radially inward as previously explained, to engage tubular member P and thereafter cause rotation thereof.

The magnitude of the torque provided by rotation of dies D can be controlled by the gear shift N shown in Figure 6. When handle 110 of the gear shift is manipulated to place gear 102 in meshing engagement with first pinion 94 and lower toothed member 115, the dies D are rotated at high speed and low torque. However, by movement of handle 110, gears 100 and 102 can be raised to a second position where gear 100 meshes with second pinion 96 and gear 102 remains in meshed engagement with the lower toothed member, but is out of engagement with first pinion 94. Handle 110 can also be used in vertically placing gears 100 and 102 in a third and neutral position in which gear 100 is entirely disengaged and gear 102 is only in engagement with lower toothed member 115.

The present invention, as can be seen from the foregoing description thereof, operates in much the same manner as my invention disclosed and claimed in my United States Letters Patent No. 2,846,909, entitled Power Driven Pipe Tong, that issued August 12, 1958. However, the locking mechanism of the previous device for interlocking the half rings together has been dispensed with whereby the annoyance and inconvenience of having to periodically replace the locking mechanism by use of the power-operated latch is avoided. In the present invention the power-operated latch has an initial makeup in which the frame and jaw are not completely closed, but are closed by actuation of hydraulic cylinder V to power move the jaw and frame into a completely closed position with concurrent application of pressure to the exterior surfaces of the half rings B to maintain them in a closed, circle-defining position during screwing or unscrewing of a tubular member. The transmission T and gear shift N provided in the present invention act positively to permit easy change of the gear ratios between ring gear 41 and driving gear 117 without recourse to the clutch mechanism disclosed in my previously mentioned Patent No. 2,846,909.

It will be obvious to those skilled in the art that various changes may be made in the invention without departing from the spirit and scope thereof, and therefore the invention is not limited by that which is shown in the drawing and described in the specification, but only as indicated in the appended claims.

I claim:

1. A power-driven pipe tong, comprising: a frame member; a jaw member pivotally secured to said frame member that cooperates therewith to define a pipe-receiving opening; track means formed on said members and encompassing said opening; a pair of support half rings rotatably mounted on said track means; two semi-circular die carriers rotatably mounted on said half rings; a plurality of circumferentially spaced, radially movable die blocks mounted on said die carriers; cam means disposed at fixed positions relative to said half rings, which cam means is slidably engaged by the exterior ends of said die blocks when said die carriers are rotated in either of two possible directions relative to said half rings, with said die blocks being moved inwardly when said slidable movement takes place; fluid actuated power means; variable speed transmission means that connect said power means to said half rings to rotate the same, said transmission means being capable of permitting said power means to suddenly rotate said half rings so as to cause initial relative movement between said half rings and said die carriers, due to the inertia of the latter, to the extent that before rotating with said die carriers and half rings said blocks are first moved inwardly to grip the exterior surface of a pipe disposed in said opening; fluid operated latch means for releasably locking said frame and jaw members together; first valve means; second valve means; first conduit means connectable to a source of fluid under pressure and extending to said first and second valve means and thence to said power means and latch means, said first valve means being adapted to selectively deliver said fluid to said power means in either of two possible directions, to permit rotation of said half rings, die carriers and dies in either of two possible directions, said second valve means being adapted to selectively deliver said fluid to said latching means to cause the same to assume either a latched or unlatched position, with the magnitude of the latching force holding said jaw and frame members together being directly proportional to the intensity of the fluid pressure supplied through said conduit to actuate said power means; and second conduit means capable of returning fluid to said source during actuation of said latching means.

2. A power-driven pipe tong as defined in claim 1 wherein said latching means includes an engageable member rigidly affixed to said frame member and an engaging member movably mounted on said jaw member, which engageable and engaging members are capable of being placed in an engaging position when the free ends of said frame and jaw members are adjacent but not in abutting contact, a cylinder supported from said jaw member, a piston slidably mounted in said cylinder, a piston rod rigidly connected to said piston, movement-imparting means that transmits motion of said piston rod to said engaging member to force said engaging and engageable members to draw said frame and jaw members together and place said free ends thereof in pressure abutment or permit said engaging and engageable members to assume relative positions where said free ends are out of abutment and said engaging member can be disengaged from said engageable member, and two tubular connectors on the ends of said cylinder and communicating with the interior thereof connected to said first conduit means, with said second valve means being capable of selectively delivering said fluid to either of said connectors to move said piston in a desired direction and actuate said movement-imparting means.

3. A power-driven pipe tong as defined in claim 2 wherein a plurality of rollers are provided that rotatably support said half rings in said frame and jaw members; and a plurality of circumferentially spaced shafts supported from said jaw and frame members around said opening, said rollers being rotatably mounted on said shafts, with said rollers being moved into pressure contact with said half rings when the free ends of said frame and jaw members are in pressure abutment.

4. A power-driven pipe tong as defined in claim 3 wherein said transmission means comprise two half ring gears affixed to the exterior surfaces of said half rings, a driven gear in engagement with said half ring gears, a driving gear rotated by said power means, two movable gears different in diameter, a gear shift for moving said two gears, and a plurality of gears capable of transmitting rotational motion from said driving gear to said driven gear through either of said movable two gears, with said shift when moved to dispose a first of said two gears in a first position causing said half ring gears to be driven at high speed, low torque, and said shift when moved to dispose a second of said two gears in a second position causing said half ring gears to be driven at low speed, high torque.

5. A power-driven pipe tong as defined in claim 1 wherein said latch means includes an engageable member

rigidly affixed to said frame member and an engaging member movably mounted on said jaw member, a cylinder supported from said jaw member, a piston slidably mounted in said cylinder, a piston rod rigidly connected to said piston, movement-imparting means that transmits motion of said piston rod to said engaging member to move the same into engagement with said engageable member and out of engagement therewith, and two tubular connectors on the ends of said cylinder, with said second valve means being capable of selectively delivering said fluid to either of said connectors to move said piston and piston rod in a desired direction to engage or disengage said engaging member from said engageable member.

6. A power-driven pipe tong as defined in claim 5 wherein a shaft is provided; two parallel vertically spaced plates are rigidly affixed to said jaw member, with said plates having vertically aligned slots formed therein in which the end portions of said shaft are rotatably and slidably mounted; a cam rigidly affixed to said shaft; a cam plate rigidly affixed to said jaw member that is rotatably engageable by said cam, with said plate when so engaged by rotation of said cam in one direction causing movement of said shaft away from said engageable member; an arm rigidly affixed to said shaft and pivotally connected to said piston rod; and said engaging member comprising two parallel legs, the first ends of which pivotally engage said shaft, a web that extends between the second ends of said legs and is rigidly connected thereto, with said web being adapted to be moved into engagement with said engageable member by rotation of said shaft in said one direction.

7. A power-driven pipe tong as defined in claim 6 wherein at least one set screw is provided that is threadedly mounted in a tapped bore extending through said web and normally disposed relative thereto, said screw having an end portion that projects into the space between said legs and engages said engageable member, which screw upon manual adjustment thereof in said bore varies the length of said end portion to control the distance of travel of said piston in said cylinder before said engaging member is placed in or moved out of engagement with said engageable member.

8. A power-driven pipe tong as defined in claim 7 wherein a pivot support is provided that pivotally supports said cylinder from said jaw member, and a handle is affixed to said web to permit placement of said engaging member in a first position from where it can be subsequently moved to engage said engageable member prior to said frame and jaw members assuming a closed position, and in any one of a number of second positions where said engaging member is out of engagement with said engageable member, and said jaw and frame members can be pivoted to an open position.

9. A power-driven pipe tong, comprising: a hollow horizontally disposed frame member; a hollow horizontally disposed jaw member pivotally secured to said frame member that cooperates therewith to define a pipe-receiving opening, said frame and jaw members having a plurality of pairs of aligned circular openings formed in the upper and lower portions thereof that are circumferentially spaced about said pipe-receiving opening; a plurality of shafts; a plurality of rollers rotatably mounted on said shafts; a plurality of circular supports for said shaft, which supports are rotatably mounted in said circular openings and eccentrically supports said shafts relatively to the longitudinal axis of said pairs of aligned circular openings; indexing means that maintain each of said shaft supports at any one of a plurality of positions relative to the longitudinal axis of one of said pairs of circular openings; a pair of support half rings rotatably mounted in said frame and jaw members and encompassing said pipe-receiving opening, said half rings being rotatably supported by said rollers, which upon adjustment of said indexing means are capable of pressure contacting said half rings with a desired compressive force when said frame and jaw members are closed; two semi-circular die carriers rotatably mounted on said half rings; a plurality of circumferentially spaced, radially movable die blocks mounted on said die carriers; cam means disposed at fixed positions relative to said half rings, which cam means are slidably engaged by the exterior ends of said die blocks when said die carriers are rotated in either of two possible directions relative to said half rings, with said die blocks being moved inwardly when said slidable movement takes place; fluid operated latch means that force said frame and jaw members into a closed position and so maintain the same until the actuating pressure on said fluid is released; power means; and variable speed transmission means connecting said power means to said half rings to rotate the same, said transmission means being capable of permitting said power means to suddenly rotate said half rings so as to cause initial relative movement between said half rings and said die carriers, due to the inertia of the latter, to the extent that before rotating with said die carriers and half rings said blocks are first moved inwardly to grip the exterior surface of a pipe disposed in said opening.

10. A power-driven pipe tong, comprising: a hollow horizontally disposed frame member; a hollow horizontally disposed jaw member pivotally secured to said frame member that cooperates therewith to define a pipe-receiving opening, said frame and jaw members having a plurality of pairs of aligned circular openings formed in the upper and lower portions thereof circumferentially spaced about said pipe-receiving opening; a plurality of shafts; a plurality of rollers rotatably mounted on said shafts, which supports are rotatably mounted in said circular openings and eccentrically support said shafts relative to the longitudinal axis of said pairs of aligned openings; indexing means that maintain each of said shaft supports at any one of a plurality of positions relative to the longitudinal axis of one of said pairs of circular openings; a pair of support half rings rotatably mounted in said frame and jaw members and encompassing said pipe-receiving opening, said half rings being rotatably supported by said rollers, which upon adjustment of said indexing means are capable of contacting said half rings with a desired compressive force when said frame and jaw members are closed; two semicircular die carriers rotatably mounted on said half rings; a plurality of circumferentially spaced, radially movable die blocks mounted on said die carriers; cam means disposed at fixed positions relative to said half rings, which cam means is slidably engaged by the exterior ends of said die blocks when said die carriers are rotated in either of two possible directions relative to said half rings, with said die blocks being moved inwardly when said slidable movement takes place; fluid actuated latch means for releasably locking said frame and jaw members together; fluid actuated power means for rotating said half rings; and fluid conducting means capable of supplying fluid under substantially the same pressure to both said latch means and said power means.

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