

Aug. 15, 1933.

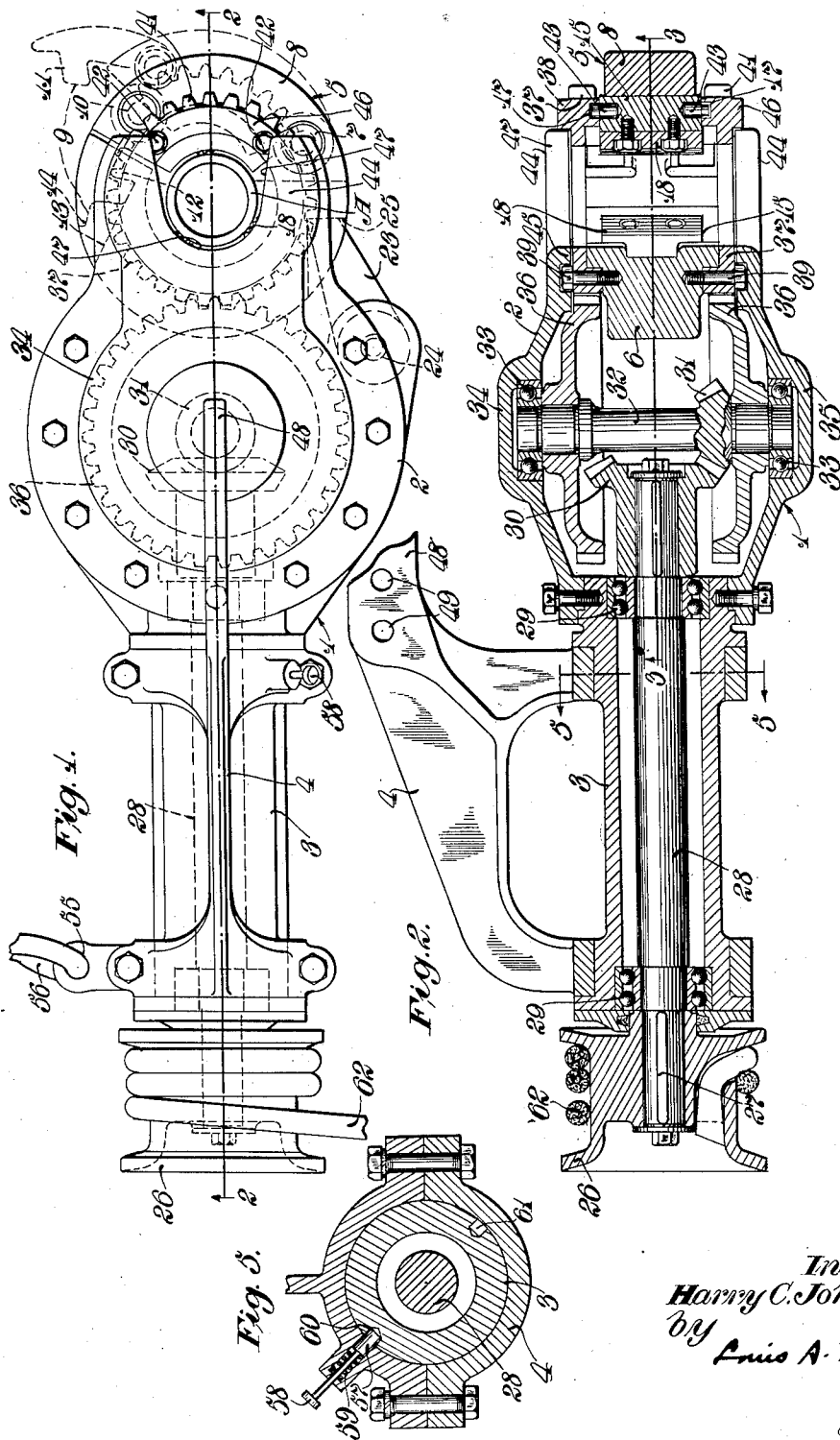
H. C. JOHANSEN

1,923,010

TONG

Filed March 31, 1931

2 Sheets-Sheet 1



Inventor:
Harry C. Johansen.
by
Erno A. Maxson.
Atty.

Aug. 15, 1933.

H. C. JOHANSEN

1,923,010

TONG

Filed March 31, 1931

2 Sheets-Sheet 2

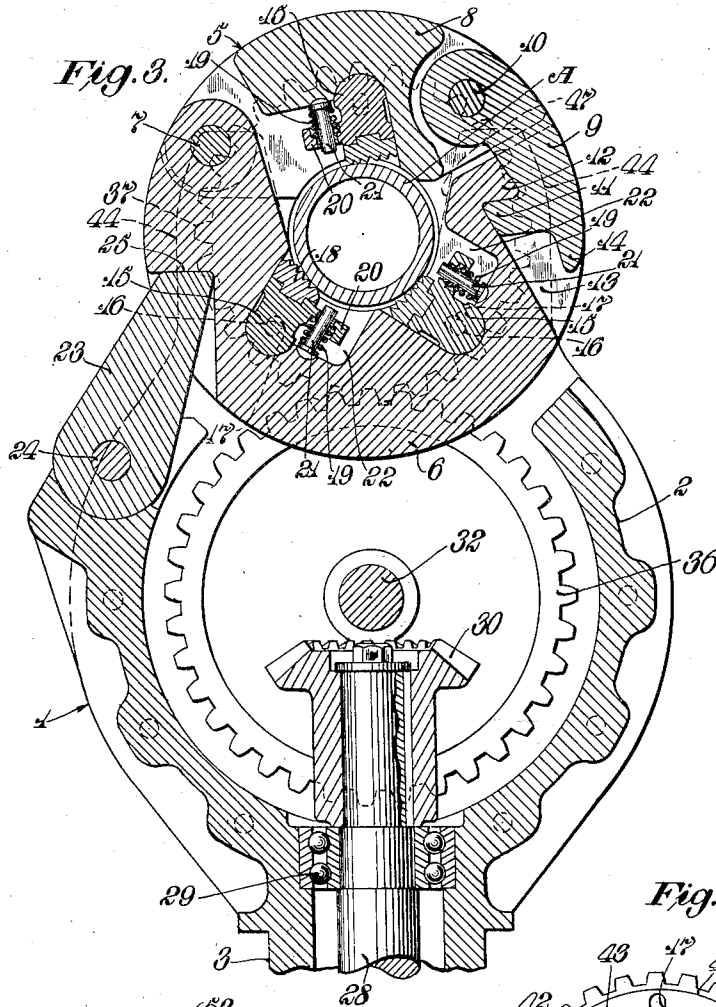


Fig. 6.

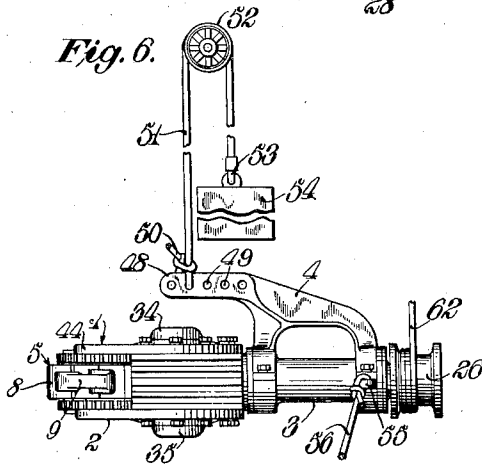
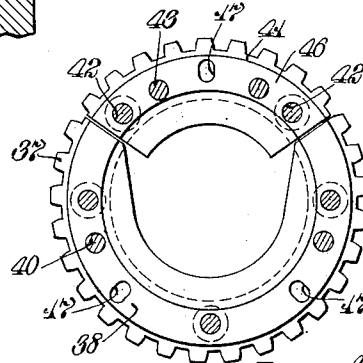


Fig. 4.



Inventor:
Harry C. Johansen.
by
Louis A. Norton

Att'y.

UNITED STATES PATENT OFFICE

1,923,010

TONG

Harry C. Johansen, Michigan City, Ind.,
 assignor to Sullivan Machinery Company, a
 Corporation of Massachusetts

Application March 31, 1931. Serial No. 526,633

19 Claims. (Cl. 81—57)

This invention relates to tongs and more particularly to improvements in tongs for breaking and uncoupling tool joints.

An object of this invention is to provide an improved tong. Another object is to provide an improved tong for breaking and uncoupling tool joints. A further object of this invention is to provide an improved tong whereby a tool joint may be broken, and the tool thereafter given a spinning or rapid rotative movement to uncouple completely the joint. Yet another object of this invention is to provide an improved tong for breaking and uncoupling the joints of a drill rod or pipe, and provided with improved means for gripping the drill rod or pipe and for imparting a rapid spinning movement of the rod or pipe to release completely the joint. Still another object of this invention is to provide an improved breaking and spinning tong which is suspended from the drill derrick and operated by the catline wound upon the power driven cathead of a drilling apparatus. Another object is to provide in a tong of the character set forth improved means for making or coupling tool joints. These and other objects of this invention will, however, hereinafter more fully appear.

In the accompanying drawings there is shown for purposes of illustration one form which the invention may assume in practice.

In these drawings,

Fig. 1 is a top plan view of the illustrative embodiment of the improved tong.

Fig. 2 is a central vertical longitudinally extending view taken substantially on line 2—2 of Fig. 1.

Fig. 3 is a detail horizontal sectional view taken substantially on line 3—3 of Fig. 2.

Fig. 4 is a detail view illustrating a portion of the improved rod or pipe spinning means.

Fig. 5 is a detail sectional view taken substantially on line 5—5 of Fig. 2.

Fig. 6 is a somewhat diagrammatic view showing the means for supporting and operating the tong.

In this illustrative construction there is shown a breaking and spinning tong generally designated 1 of an improved design, and comprising a body or casing 2 having a hollow lever or arm-like portion or so-called handle 3 supported by a hanger 4, the tong being normally held in the horizontal position as shown in Fig. 2 by the hanger which is suspended, as hereinafter described, from the drill derrick. The inner or rod gripping end of the

tong carries an improved rod gripping device 5 which works on the drill pipe or grips the pipe when unscrewing the joint, and consists of a jaw block 6 having pivotally mounted thereon about a vertical axis at 7 a swinging jaw 8. This swinging jaw is held in its inner closed position by a latch 9 pivotally connected at 10 to the swinging jaw and having a projection 11 in the form of a catch engageable with a locking projection 12 formed on the jaw block, the jaw block being cut away at 13 to permit swinging thereof into locking position and grasping of a projection 14 which is in the form of a handle to enable release of the dog. Pivotal mounted within the jaw block 6 and the swinging jaw 8 are gripping jaws 15 mounted for horizontal swinging movement about the axes of vertical pivot pins 16, the pins being secured to the jaws and mounted in slots 17 formed in elements of the rotating device 5, as shown in Fig. 3, to permit inward bodily movement of the jaws 15 when released from the drill pipe. Attached to the inner faces of the gripping jaws are toothed members 18 having teeth for gripping the drill rod or pipe, the drill rod or pipe being shown in cross section as indicated at A in Fig. 3. These gripping jaws 15 are normally held in their inner gripping position by means of springs 19 engaging lateral projections 20 on the jaws and the heads of guide pins 21 which project loosely through openings formed in the jaw projections. Each of the heads of the guide pins is rounded for engagement with correspondingly shaped bearing surfaces formed on the jaw block and swinging jaw. The portions supporting the gripping jaws 15 are cut away at 22 to permit free swinging of the jaws into their gripping position.

In the present construction, the rod gripping device 5 is rotatably mounted on the inner or rod gripping end of the tong and means is provided for preventing relative rotation thereof in one direction, and herein comprises a dog 23 pivoted at 24 on the tong casing and engageable with a notch 25 formed in the jaw block 6, as clearly shown in Fig. 3. Rotation of the gripping device 5 is effected through a pulley 26 arranged at the opposite end of the tong casing from the gripping device, and herein carried by the lever or so-called handle portion 3 of the tong, and this pulley is keyed at 27 to a shaft 28 extending through the handle portion 3 of the casing and journaled therein within suitable antifriction bearings 29, 29. Keyed to

the opposite end of this shaft is a bevel gear 30 meshing with a bevel gear 31 herein formed integral with a vertical shaft 32 herein journaled at its opposite ends within antifriction bearings 33, 33 and carried by cover and bottom plates 34 and 35 respectively of the tong casing. Keyed to the vertical shaft 32 adjacent the opposite ends thereof and housed within the tong casing are large spur gears 36, 36 meshing respectively with segmental gears 37, 37 attached as hereinafter described to the rotating gripping device structure. These segmental gears 37 each consist of a segmental portion 38, as shown in Fig. 4, secured as by screws 39 and suitable dowel pins 40 to the jaw block 6, while secured to the swinging jaw 8 is a segmental gear portion 41 which cooperates with the segmental gear portion 38 to form a complete gear. The segmental gear portion 41 is secured as by screws 42 and suitable dowel pins 43 to the swinging jaw 8. As shown in Figs. 1 and 2 the cover and bottom plates 34 and 35 of the tong casing are provided with outwardly projecting U-shaped portions 44 which project over and beneath the rotatable gripping device 5 and are provided with projections 45 cooperating with annular projections 46 on the segmental gears 37 and herein forming bearing supports for the rotatable gripping device. The projections 44 are laterally open at 47 at one side to permit the passage of the drill rod or pipe through the gripping device, and to enable the tong, when the swinging jaw 8 is swung outwardly, to be removed from or attached to the drill rod or pipe. Referring to Fig. 1 of the drawings, it will be noted that the dog 23 normally prevents rotation of the rod gripping device 5 in a clockwise direction, but upon rotation of the rod gripping device through the pulley, shaft 28, and the gearing 30, 31, 36, 37 in the proper direction the gripping device may be rapidly rotated in a counter-clockwise direction, the dog at that time being automatically thrown out into its released position. As shown in Figs. 2 and 6 the hanger 4 is provided with a lateral projection 48 having a series of openings 49 adapted for connection to a suitable attachment device 50 carried at the lower end of a cable 51, which, as shown in Fig. 5, passes upwardly around a pulley 52 carried by the drill derrick and is connected at 53 at its lower end to a suitable counter-balancing weight 54, so that the tong is suspended from the drill derrick by the cable and counter-balancing weight, and as a result the tong is balanced or hung in a substantially horizontal position as shown. Also formed on the hanger 4 is a lateral projection or eye portion 55 to which is connected one end of a length of rope or cable 56, the other end of the rope being suitably attached as by an eye-bolt or otherwise to the derrick floor.

The improved spinning tong may also be utilized for making or coupling tool joints simply by releasing a plunger lock and turning the tong relative to the hanger 4 through 180° from the position shown in Fig. 2, so that the jaws 18 will, upon rotation of the pulley 26 in the proper direction, grip the pipe A and rotate the same threadedly to connect the pipe sections together. The plunger lock is indicated at 57 in Fig. 5 and is mounted in a radial bore formed in the hanger bracket 4. This lock is provided with a handle 58 and is held in its

operative locking position by a spring 59. The tong casing is provided with a pair of apertures 60 and 61 for locking the casing within the hanger in its two positions.

During operation of the tong, the latch 9 is released and the swinging jaw 8 swung outwardly thereby permitting the tong to be placed into gripping position with respect to the drill pipe, the jaw 8 thereafter being swung closed and locked in position by the latch. The catline 62 wound upon the usual cathead or capstan of the drilling apparatus is then wrapped around the pulley 26 and the free end of the catline is suitably attached to the pulley or held by the operator. As the catline is wound in by the drill cathead, the tong is swung causing the jaws 18 to grip the drill pipe, and upon continued swinging movement of the tong the threaded rod joint is broken. The catline 62 during breaking of the rod joint acts to swing the tong without rotation of the pulley 26 but as soon as the joint is broken and the cable 56 becomes taut, further swinging of the tong is prevented and as a result the pulley 26 is rapidly rotated by the drill catline 62, the latter as it is wound in by the drill cathead effecting rotation of the pulley. This pulley rotation is transmitted through the shafting and gearing to the rod gripping device 5 causing the dog 23 automatically to release, and imparting through the gripping device 5 a rapid spinning movement to the rod thereby quickly uncoupling the joint. During swinging of the tong during breaking of the joint, the gripping device 5 is held against rotation relative to the tong body by means of the dog 23, but this dog automatically releases as soon as the joint is broken and the cable 56 becomes taut. Upon completion of the uncoupling of the joint, the latch 9 is released and the swinging jaw is swung outwardly thereby permitting the tong to be moved away from the drill pipe. It will thus be evident that the drill rod is initially gripped and relatively slowly rotated to break the joint by the swinging movement of the tong, and thereafter the joint is completely uncoupled by the relatively rapid spinning action automatically imparted to the tong independently of further swinging movement of the tong lever.

As a result of this invention, it will be noted that an improved tong is provided by means of which the breaking and spinning of the tool joints may be facilitated, and the time consumed reduced to a minimum. It will further be noted that an improved breaking and spinning tong is provided which may be used in the same manner as an ordinary breaking tong without the improved spinning feature and which may be subjected to the same hard usage in drilling work. It will further be noted that the improved breaking tong is of a comparatively simple and rugged construction, the tong being substantially no larger than the usual break and make tong which has no spinning function. It will still further be noted that by simply turning the tong upside down relative to the hanger the tong may be used as a joint making or coupling device. These and other uses and advantages will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified

and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. A break and spinning tong for uncoupling drill rod joints including a casing, rod gripping means rotatably mounted on said casing, means for locking said gripping means against rotation relative to said casing in one direction, said locking means always permitting free rotation of said gripping means relative to the casing in the opposite direction, means for rotating said casing together with said gripping means, means for limiting rotation of said casing, and means for rotating said gripping means relative to said casing in aforesaid opposite direction and when said casing is held against rotation by said limiting means to uncouple the rod joint, said locking means releasing automatically upon rotation of said gripping means relative to the casing in aforesaid opposite direction.

2. A break and spinning tong for uncoupling drill rod joints including a casing having a lever portion, rod gripping means rotatably mounted on the inner end of the tong casing, means for swinging said lever portion to rotate said gripping means with said casing in a direction to rotate the rod to break the rod joint, means for locking said gripping means against rotation relative to said casing during swinging of the tong, means secured to said casing for positively holding said lever portion against swinging movement after said lever portion has swung a predetermined distance, and means operative on a predetermined swinging movement of said lever portion for rapidly rotating said gripping means relative to said casing in a direction to uncouple the joint and including rotatable transmission connections operatively connected to said gripping means and extending longitudinally through said lever portion, said locking means always permitting free rotation of said gripping means relative to said casing in a direction to uncouple the joint.

3. A break and spinning tong for uncoupling drill rod joints including a casing having a lever portion, drill rod gripping means rotatably mounted on said casing, means for swinging said lever portion to move said gripping means with said casing, and means associated with said swinging means for rotating said gripping means relative to said casing including a rotatable power driven drive member carried at the outer extremity of said lever portion, operative driving connections between said power driven member and said gripping means including rotatable transmission means extending longitudinally through said lever portion and power operated means for rotating said drive member, swinging movement of said lever portion also being effected by said power operated means and swinging movement being transmitted to said lever portion by said power operated means through said drive member.

4. A break and spinning tong for uncoupling drill rod joints including means for gripping a drill rod and including a lever adapted to be swung to rotate said gripping means to rotate the rod to break the joint, and means for rotating the rod independently of further swinging movement of said lever including a power driven rotatable element carried at the outer extremity of said lever, driving connections between said rotatable element and said gripping means and

driven by said rotatable element, said connections including transmission means extending longitudinally through said lever portion and power operated means for rotating said element to effect drive of said driving connections, swinging movement of said lever also being effected by said power operated means, swinging movement being transmitted to said lever by said power operated means through said rotatable element.

5. A break and spinning tong for uncoupling drill rod joints including rotatable means for gripping a drill rod and including a lever for swinging the tong to cause said means to grip the rod to rotate the rod to break the joint, and means automatically operative upon a predetermined swinging movement of the lever to rotate said gripping means relative to said lever to impart a rapid spinning movement to the rod independently of further swinging movement of said lever and including a power rotatable element carried at the outer extremity of said lever, driving connections between said power rotatable element and said gripping means including rotatable transmission means extending longitudinally of and journaled on said lever and power operated means for rotating said element, swinging movement of said lever also being effected by said power operated means, swinging movement being transmitted to said lever by said power operated means through said rotatable element.

6. A break and spinning tong for uncoupling drill rod joints including a casing having a lever portion, rod gripping means rotatably mounted on said casing, means for locking said gripping means against rotation relative to said casing during swinging of said lever portion, said locking means always permitting free rotation of said gripping means relative to said casing in a direction to uncouple the rod joint, and means for rotating said gripping means relative to said casing including a power driven driving pulley carried at the outer extremity of said lever portion and operative driving connections between said pulley and said rotatable gripping means and a flexible power operated element engaging said pulley, said flexible element effecting both swinging of said lever portion and rotation of said gripping means relative to said casing, swinging movement being transmitted to said lever portion through said pulley.

7. A break and spinning tong for uncoupling drill rod joints including a casing having a lever portion, rod gripping means rotatably mounted on said casing, means for locking said gripping means against rotation relative to said casing during swinging of said lever portion, said locking means always permitting free rotation of said gripping means relative to said casing in a direction to uncouple the rod joint, and means for rotating said gripping means relative to said casing including a power driven driving pulley carried at the outer extremity of said lever portion and operative driving connections between said pulley and said rotatable gripping means including intermeshing gearing, and a flexible power operated element engaging said pulley, said flexible element effecting both swinging of said lever portion and rotation of said gripping means relative to said casing, swinging movement being transmitted to said lever portion through said pulley.

8. A break and spinning tong for uncoupling drill rod joints including a casing having a lever portion, rod gripping means rotatably mounted

- on said casing, means for locking said gripping means against rotation relative to said casing during swinging of said lever portion, said locking means always permitting free rotation of said gripping means relative to said casing in a direction to uncouple the rod joint, and means for rotating said gripping means relative to said casing including a power driven driving pulley carried at the outer extremity of said lever portion and operative driving connections between said pulley and said rotatable gripping means including intermeshing gearing, said gearing including a gear element attached to a portion of said rotatable gripping means and a gear meshing therewith and a flexible power operated element engaging said pulley, said flexible element effecting both swinging of said lever portion and rotation of said gripping means relative to said casing, swinging movement being transmitted to said lever portion through said pulley.
9. A break and spinning tong for uncoupling drill rod joints including a casing having a lever portion, rod gripping means rotatably mounted on said casing, means for locking said gripping means against rotation relative to said casing during swinging of said lever portion, said locking means always permitting free rotation of said gripping means relative to said casing in a direction to uncouple the rod joint, and means for rotating said gripping means relative to said casing including a power driven driving pulley carried at the outer extremity of said lever portion and operative driving connections between said pulley and said rotatable gripping means including a shaft journaled in said lever portion and to which said pulley is secured and gearing between said shaft and said rotatable gripping means and a flexible power operated element engaging said pulley, said flexible element effecting both swinging of said lever portion and rotation of said gripping means relative to said casing, swinging movement being transmitted to said lever portion through said pulley.
10. A break and spinning tong including a casing having a lever portion, gripping means rotatably mounted on said casing, means for locking said gripping means against rotation relative to said casing during swinging of said lever portion, said locking means always permitting free rotation of said gripping means relative to said casing in a direction to uncouple the rod joint, and means for rotating said gripping means relative to said casing including a power driven driving pulley carried at the outer extremity of said lever portion, and operative driving connections between said pulley and said rotatable gripping means including a shaft extending longitudinally of and journaled in said lever portion and to which said pulley is secured, and transmission connections between said shaft and said rotatable gripping means including intermeshing bevel gears, and power operated means for rotating said pulley, swinging movement of said lever portion and rotation of said gripping means both being effected by said power operated means and swinging movement being transmitted to said lever portion through said pulley.
11. A break and spinning tong including a casing having a lever portion, gripping means rotatably mounted on said casing, means for swinging said lever portion to rotate the gripping means with said casing, and means associated with said swinging means for rotating said gripping means relative to said casing including a power driven pulley carried at the outer extremity of said lever portion, a flexible element engaging said pulley for rotating the latter, and operative connections between said pulley and said rotatable gripping means including a shaft extending longitudinally of and journaled in said lever portion and to which said pulley is secured, and gearing between said shaft and said rotatable gripping means including intermeshing bevel gears, a vertical shaft driven by said bevel gears and gearing driven by said shaft, and power operated means for rotating said pulley, swinging movement of said lever portion and rotation of said gripping means both being effected by said power operated means and swinging movement being transmitted to said lever portion through said pulley.
12. A break and spinning tong including a casing having a lever portion, gripping means rotatably mounted on said casing, means for swinging said lever portion to rotate the gripping means with said casing, and means associated with said swinging means for rotating said gripping means relative to said casing including a power driven pulley carried at the outer extremity of said lever portion, a flexible element engaging said pulley for rotating the latter, and operative connections between said pulley and said rotatable gripping means including a shaft extending longitudinally of and journaled in said lever portion and to which said pulley is secured, and gearing between said shaft and said rotatable gripping means including intermeshing bevel gears, a vertical shaft driven by said bevel gears and gearing driven by said shaft including a spur gear attached to a portion of said rotatable gripping means and a gear meshing therewith, and power operated means for rotating said pulley, swinging movement of said lever portion and rotation of said gripping means both being effected by said power operated means and swinging movement being transmitted to said lever portion through said pulley.
13. A break and spinning tong for uncoupling drill rod joints including a casing, rod gripping means rotatably mounted on said casing, means for locking said gripping means against rotation relative to the casing in one direction during swinging of the tong in a direction to break the rod joint, said locking means releasing automatically upon rotation of the gripping means relative to the casing in the opposite direction, means for limiting swinging movement of the tong, and means for rotating said gripping means relative to the casing in aforesaid opposite direction when the tong is held against swinging movement by said limiting means to uncouple the rod joint, the tong always remaining stationary as regards swinging movement during rotation of said gripping means relative to said casing.
14. A break and spinning tong for uncoupling drill rod joints including a casing, rod gripping means rotatably mounted on said casing, means for locking said gripping means against rotation relative to the casing during swinging of the tong in a direction to break the rod joint, said locking means always permitting free rotation of the gripping means and releasing automatically upon rotation of said gripping means relative to the casing in the opposite direction and including a pivoted dog mounted on the casing and engageable with an element of said gripping means, means for limiting swinging movement of the tong, and means for rotating said gripping means relative to said casing in aforesaid

opposite direction and when the tong is held against swinging movement by said limiting means to uncouple the rod joint, the tong always remaining stationary as regards swinging movement during rotation of said gripping means relative to said casing.

15. A break and spinning tong including a tong casing having an integral lever, rod gripping means rotatably mounted on said casing, means for locking said gripping means against rotation relative to said casing during swinging of said lever to effect rod rotation, means for swinging said lever to rotate said gripping means with said casing, means for limiting swinging movement of said lever, said locking means always permitting free rotation of said gripping means relative to said casing in the direction of swinging movement of the lever to effect rod rotation, and means for rotating said gripping means relative to said casing when swinging movement of said lever is prevented by said limiting means.

16. A rod coupling and uncoupling tong including a casing, rod gripping means carried by said casing and means supporting said tong during the rod coupling and uncoupling operation, said tong being rotatable bodily about its longitudinal axis relative to said supporting means into two different predetermined positions and while supported by the latter to reverse the position of said gripping means whereby said gripping means may operate in either of opposite directions, and means for locking the tong to said supporting means in its different operative positions.

17. A break and spinning tong for uncoupling drill rod joints including a casing having an integral lever arm, rod gripping means rotatably mounted on said casing, and power operated means for swinging said lever arm to rotate the gripping means with the casing and for rotating said gripping means relative to the casing while the latter remains stationary including a pulley carried at the outer extremity of said lever arm, a flexible driving element engaging said pulley for rotating the latter, and driving connections between said pulley and said gripping means and driven by said pulley whereby rotation of said pulley about its own axis effects rotation of said gripping means relative to said casing, said flexible element also effecting swinging of said lever arm, the swinging force being transmitted through said pulley to said lever arm.

18. A break and spinning tong for uncoupling drill rod joints including a casing having an integral lever arm, rod gripping means rotatably mounted on said casing, and power operated means for swinging said lever arm to rotate the gripping means with the casing and for rotating said gripping means relative to the casing while the latter remains stationary including a pulley carried at the outer extremity of said lever arm, a flexible driving element engaging said pulley for rotating the latter, and driving connections between said pulley and said gripping means and driven by said pulley whereby rotation of said pulley about its own axis effects rotation of said gripping means relative to said casing, said pulley remaining stationary as regards rotation about its own axis during swinging of said lever arm and the swinging force being transmitted by said flexible element to said lever arm through said pulley, said flexible element effecting both swinging of said lever arm and rotation of said gripping means relative to said casing.

19. A break and spinning tong for uncoupling drill rod joints including a casing having an integral lever arm, rod gripping means rotatably mounted on said casing, and power operated means for swinging said lever arm to rotate the gripping means with the casing and for rotating said gripping means relative to the casing while the latter remains stationary including a pulley carried at the outer extremity of said lever arm, a flexible driving element engaging said pulley for rotating the latter, driving connections between said pulley and said gripping means and driven by said pulley whereby rotation of said pulley about its own axis effects rotation of said gripping means relative to said casing, said pulley remaining stationary as regards rotation about its own axis during swinging of said lever arm, and means for limiting swinging movement of said lever arm, said pulley rotating relative to said casing to effect rotation of said gripping means relative to said casing when said lever arm reaches its extreme limit of swinging movement in one direction and the swinging force being transmitted by said flexible element to said lever arm through said pulley, said flexible element effecting both swinging of said lever arm and rotation of said gripping means relative to said casing.

HARRY C. JOHANSEN.

55 130

60 135

65 140

70 145

75 150