Sept. 9, 1930. E. E. GREVE 1,775,343

BREAK-OUT TONGS

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Fig. 1.

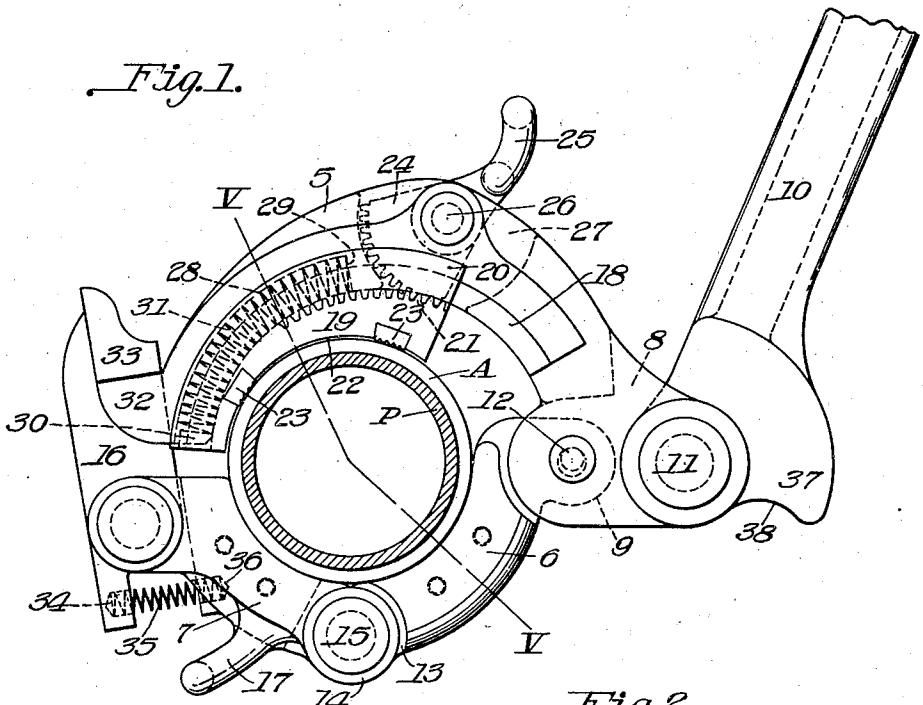
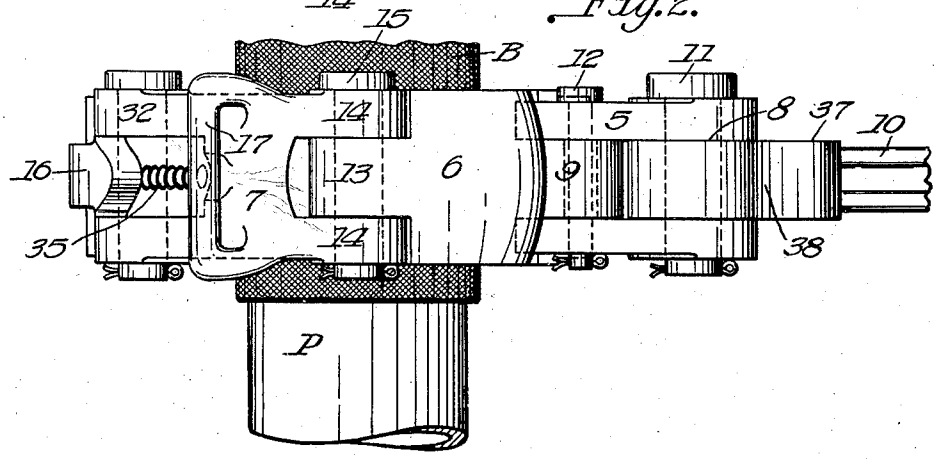


Fig. 2.



INVENTOR

E. E. Greve

by W. F. Doolittle

Attorney

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Fig. 3.

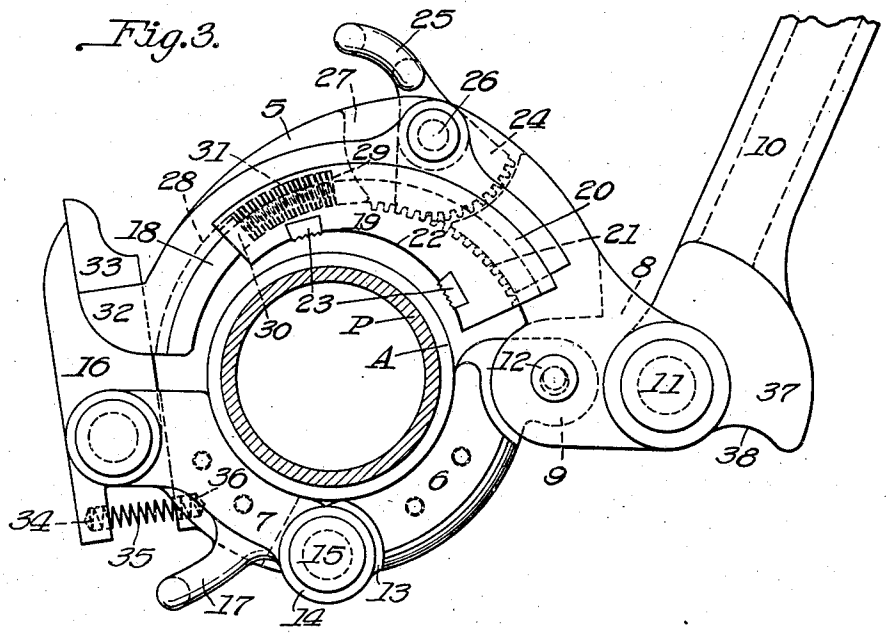
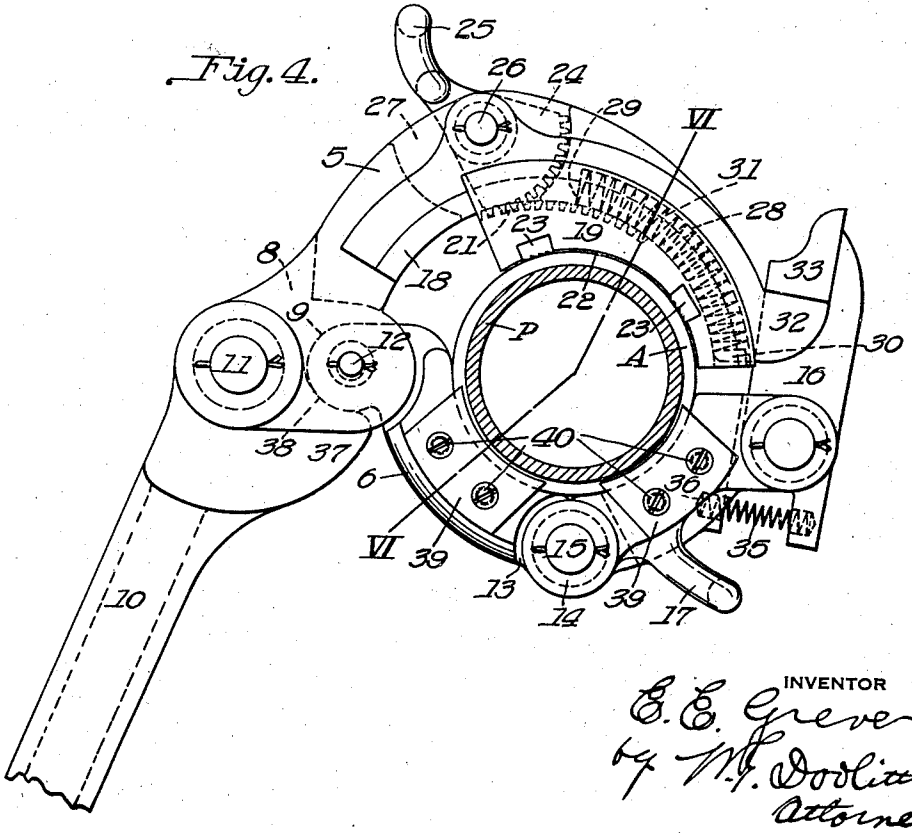


Fig. 4.



INVENTOR

E. E. Greve

by W. F. Doolittle

Attorney

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Fig.5.

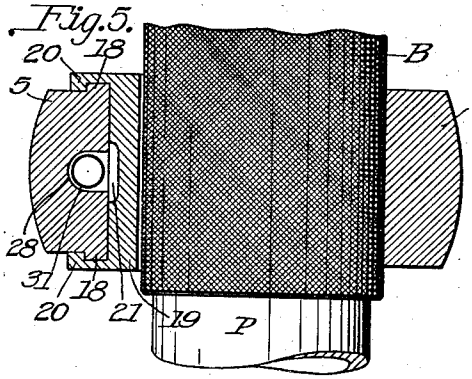
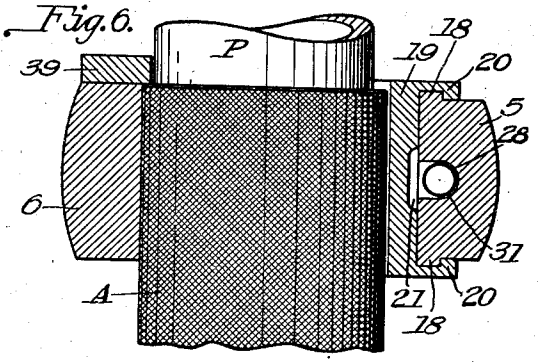


Fig.6.



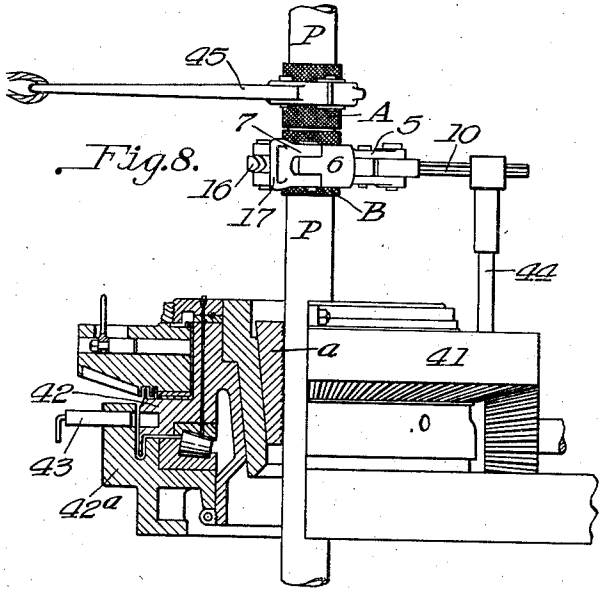
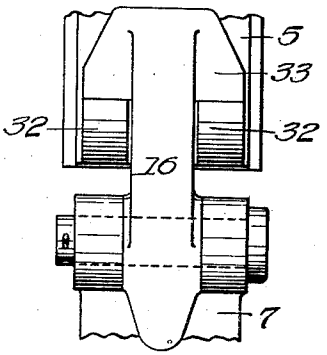


Fig.8.

Fig.7.



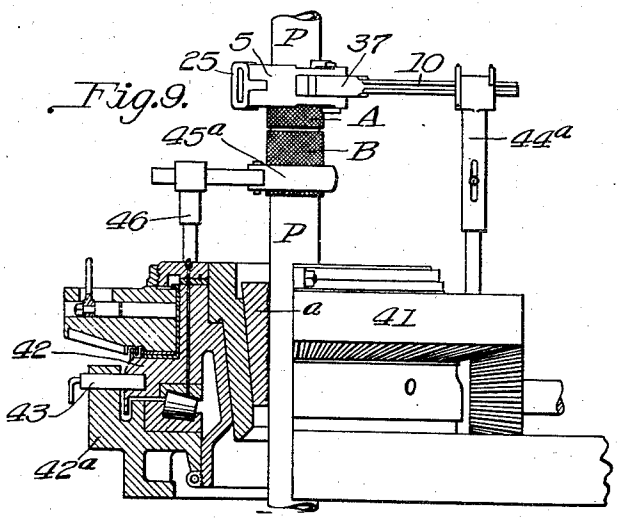


Fig.9.

INVENTOR

E. E. Greve

by W. P. Woodruff

Attorney

Patented Sept. 9, 1930 1,775,343

UNITED STATES PATENT OFFICE

EDGAR E. GREVE, OF BELLEVUE, PENNSYLVANIA, ASSIGNOR TO OIL WELL SUPPLY COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

BREAK-OUT TONGS

Application filed July 26, 1928. Serial No. 295,425.

This invention relates to improvements in tongs, and particularly to tongs of the character employed in the oil and gas fields in connection with rotary drilling apparatus for unscrewing sections of drill pipe or the tool joints employed for connecting the pipe sections together; these tongs being commercially known as break-out tongs.

In rotary drilling, the drill stem or drill tool employed includes a number of pipe sections suitably joined together by tool joints. In making up the stem or in adding new sections as the drilling progresses, it is the practice to hold the inserted stem stationary by suitable means cooperating with a temporarily fixed part of the rotary drilling machine, and revolve the section and its threaded connection to be added by applying a pipe tong to the said section and rotating the tong and section by means of a rotating part of the rotary drilling machine to which the tong is also connected.

In disconnecting or breaking-out these joints, tongs are also employed in connection with the rotary, but, owing to the tightness thereof considerable trouble has been encountered and various awkward and laborious methods followed in order to accomplish the end sought, for example, the employment of cathead lines connected up with the tong and manipulated by operators in an endeavor to start the unscrewing operation.

The prime object of the present invention is, to provide a new and improved tong construction of such a character that it may be employed in connection with the rotary for effectively breaking the joints without the employment of any extra means, notwithstanding the degree of tightness the joints have been screwed together.

Further objects of the present invention are, to provide a simple, strong and durable tong having means for effectively locking the tong to a tool joint without manipulating the main tong handle or lever; a tong having its main handle movable independently of the jaws of the tong and provided with means cooperating with the tong to deliver, upon rotation of the handle, a blow sufficient to start the turning of a tool joint member; a tong having an eccentrically disposed movable joint engaging member manually operable to disengage the joint member and automatically operable to engage the said member; and new and improved locking means for the jaws.

Further objects and advantages of the present invention will be hereinafter specifically referred to or become apparent from a consideration of the following specification taken in connection with the accompanying drawing.

In the accompanying drawings which illustrate applications of my invention:

Fig. 1 is a top plan view of a tong embodying my invention showing it applied to one section of a tool joint;

Fig. 2, a side elevational view of the same;

Fig. 3, a view similar to Fig. 1 showing the position of the parts of the tong when first applied to the tool joints;

Fig. 4, a top plan view showing a tong embodying my invention applied to the upper member of a tool joint instead of to the bottom member of the joint as in Fig. 1;

Fig. 5, a sectional view taken on the line V—V of Fig. 1;

Fig. 6, a similar view taken on line VI—VI of Fig. 4;

Fig. 7, a detail view of a portion of the latching means;

Fig. 8, an elevational view partly in section showing a portion of a rotary drilling apparatus showing the break-out tong applied to the lower tool joint section and a back-up tong applied to the upper tool joint section; and

Fig. 9, a view similar to Fig. 8 showing the break-out tong embodying my invention carried on a tong post carrier and applied to the upper tool section with a back-up tong carried by the drive bushing of the rotary applied to the lower section of the tool joint.

Referring to the drawings and as preferred, the tong includes three jaw members comprising a large eccentric carrying member 5, a small hinge jaw 6 and a small latch carrying jaw 7; said members are connected and are assembled to provide the tong with a tool joint or pipe receiving opening of the desired size to receive therein the tool joint

or a section of a pipe. The large jaw 5 has its inner face eccentrically disposed relatively to the inner faces of jaw members 6 and 7 and the length of the inner face of the large jaw is substantially equal to one-half of the circumference of the tong opening while the combined lengths of the inner faces of the members 6 and 7 are substantially equal to the other half of the said circumference. These three jaw members are assembled relatively to the tong lever to open at a point diametrically opposed to the point of connection with the said lever. By this construction I provide for an equal distribution of weight and effect a well balanced tong. The eccentric jaw 5 is provided at one end with a recess 8 adapted to receive a portion 9 of jaw 6 and an enlarged portion of a main handle or lever 10. The inner end of lever 10 is pivotally mounted on the bifurcated end portion of jaw 5 by a single point connection, as shown by a headed pin 11 and has a movement independent of the tong or the said jaw as will be more fully hereinafter described. Portion 9 of jaw 6 is formed with a vertically extending opening adapted to receive a headed pin 12 by which the jaw 6 is pivotally secured to the jaw 5. It will be seen that the opening through the portion 9 is of greater diameter than the diameter of the pivot pin 12, thereby allowing for a movement of the portion 9 of the jaw relative to the pin 12.

In addition to the portion 9, jaw 6 is provided with a projecting portion 13 by which it is pivotally secured to a bifurcated end 14 of the latch jaw member 7; this connection being made by means of a headed pin 15. The opposite end of jaw 7 is divided to receive a latch member 16 and is provided with a handle 17. The jaws 6 and 7 are formed with inner faces having substantially the curvature of the outer surface of the tool joint member to which the tong is applied.

Movably mounted and secured to the jaw 5 by curved raised portions or guides 18, the latter disposed eccentric to the center of the circle formed by the jaws when in closed position, I provide a manually and automatically operable eccentric wedge member 19, said wedge member 19 having flanged portions 20 adapted to engage the raised portions 18 of the jaw 5. Wedge member 19 is provided with centrally disposed gear teeth 21 on one face thereof, and on its inner curved face 22 I provide two or more bits or serrated blocks 23 for engaging the tool joint member to which the tong is applied.

24 designates a gear segment having a handle 25 integral therewith; this segment is pivotally mounted on a pin 26 located in a recess 27 of jaw 5, and is designed to cooperate with the gear teeth 21 of the eccentric wedge member 19. Member 19 is a spring-pressed member, and for this purpose I provide an arcuate recess or opening 28 in the jaw member 5; recess 28 terminates in a shoulder 29, and disposed between said shoulder and an abutment 30 of member 19 is a coil spring 31.

Jaw member 5 is bifurcated as shown at 32 to receive a portion of the T-shaped latch 16, its upper portion 33 is designed to engage faces of the divided end portions 32 of the jaw member 5 when in closed position. At its other end, the latch is provided with a socket 34 to receive an end of a spring 35, the opposite end of said spring seating in a recess 36 of jaw 7. Spring 35 functions to urge the latch member to latching engagement.

A characteristic and important feature of the present invention resides in the arrangement and combination of parts whereby a sharp blow may be imparted to the tong, and through the tong to the tool joint member to which it is applied, by the handle 10, in starting the breaking-out or unscrewing operation. For this purpose the pivotally mounted handle is connected with the tong or with the main jaw member 5 thereof in such a manner as to permit of an independent initial movement of said handle relatively to member 5 and is provided with a nose or portion 37 having a curved striking face 38 adapted when rotated by the rotary to strike the portion 9 of jaw member 6. I have found in practice that the blow given the tong in this manner will be sufficient to start the unscrewing operation regardless of the degree of tightness of the joint. Fig. 4 shows the striking member in contact with portion 9 of the jaw 6 and the parts in operative position to continue the unscrewing operation.

A and B respectively designate upper and lower tool joint members of the character usually employed for joining the adjacent ends of drill pipe sections, sections of the drill pipe being designated by the letter P. The tong may be applied to either the top joint member A or to the lower member B. When used in connection with the upper joint member, I provide inwardly projecting plates 39 secured to the upper faces of the jaw members 6 and 7 by screws 40. Said plates engage the upper edge of member A as particularly shown by Fig. 6, and function to carry the weight of the tong and prevent downward vertical movement.

My invention is designed to be used in conjunction with a rotary drilling apparatus and I have shown such apparatus in Figs. 8 and 9. Referring to these figures 41 designates a drive or gear ring of a rotary table, 42 a spider or drive bushing, *a* slips used in connection with the rotary for supporting that portion of the drill pipe in the well located below the rotary, and 43 lock means

for locking the drive bushing to the base 42ª of the table. 44 designates a tong-carrying post designed to be positioned on and be revolved with the rotating gear ring 41.

In connection with the unscrewing operation, a back-up tong is employed. In the form of Fig. 8 where the break-out tong is applied to the lower tool joint member B, the back-up tong indicated by 45 is applied to the upper tool joint member and has its outer end or handle portion latched to the framework of the derrick or other suitable support. In the form of Fig. 9 the break-out tong is shown applied to the upper tool joint member A and the back-up tong applied to the lower member. In this form the back-up tong 45ª is carried by a tong post 46 mounted on the drive bushing of the rotary, and the break-out tong carried in a tong post 44ª mounted in drive ring 41.

In the form of Fig. 8 it will be understood that upon rotation of the rotary in a clockwise direction the break-out tong turning therewith will cause the upper joint member A to be backed off of the threaded end of the tool joint member B. In practice, the upper section of the drill pipe being disconnected, is suspended from the derrick by suitable means, and the tool joint member A may be readily backed off from the lower joint member B by the rotation as aforesaid.

When the break-out tong is applied to the upper tool joint member A as shown in the form of Fig. 9, the rotary is moved in a counter-clockwise direction to break the joint.

Assuming that the latch member 16 is disconnected from the divided end 32 of the main jaw member 5 and the tong is in open position; the tong may be readily applied to a tool joint without the aid of lever 10 by grasping handles 17 and 25 and drawing them towards each other to the position shown by Fig. 3. This movement will carry the latch 16 into locking position and will move wedge member 19 to the position shown by Fig. 3, due to the coaction of the cooperating teeth of the segment 24 and the said member 19; at this time the movement of the abutment 30 will compress the spring 31 sufficiently, so that upon releasing handle 25, the member 19 and its bits 23 will be automatically forced into gripping engagement with the tool joint member.

It will be noted that when the coacting striking members of lever 10 and the portion 9 make contact, there will be an additional tightening of the jaw members on the tool joint.

What I claim is:

1. A tong including a plurality of jaw members, a lever pivotally mounted on one of the jaw members with a single point connection and movable independently of the said member for imparting a blow to the other jaw member upon rotation of the lever, and means for securing the tong to a joint member independently of the lever.

2. A tong including a plurality of jaw members, a lever pivotally mounted on one of the jaw members with a single point connection and movable independently of the said member for imparting a blow to the other jaw member upon rotation of the lever and movable with the last mentioned jaw member after striking the said member, and means for securing the tong to a joint member independently of the lever.

3. A tong including a plurality of jaw members, a lever pivotally mounted on one jaw member with a single point connection and movable independently of the said member for imparting a blow to the other jaw upon rotation of the lever, and means for securing the tong to a joint member independently of the lever including an eccentrically disposed member, and means associated therewith for manually moving it in one direction and automatically moving it in an opposite direction.

4. A tong including a plurality of jaw members, a lever pivotally mounted on one jaw member and having a striking portion carried thereby, a blow-receiving portion on another jaw member, said lever movable independently of the first jaw member for imparting a blow to the striking portion carried by the second jaw member upon rotation of the lever, and means for securing the tong to a joint member independently of the lever.

5. A tong including a plurality of jaw members, a lever pivotally mounted on one jaw member, and means for securing the tong to a joint member independently of the lever, said means including an eccentrically disposed movable wedge member having teeth thereon and a toothed segment having teeth cooperating with the teeth of the wedge member, said wedge member being spring-actuated.

6. A tong including a plurality of jaw members, one of said jaws having its inside face of a length substantially equal to one-half of the circumference of the tong opening, an eccentric element mounted and movable thereon, and the other jaw members having inner faces substantially equal to the other half of the said circumference, a lever pivotally mounted on the first jaw member and movable independently thereof for imparting a blow to one of the jaw members, and means for securing the tong to a joint member independently of the lever.

In testimony whereof I affix my signature.

EDGAR E. GREVE.