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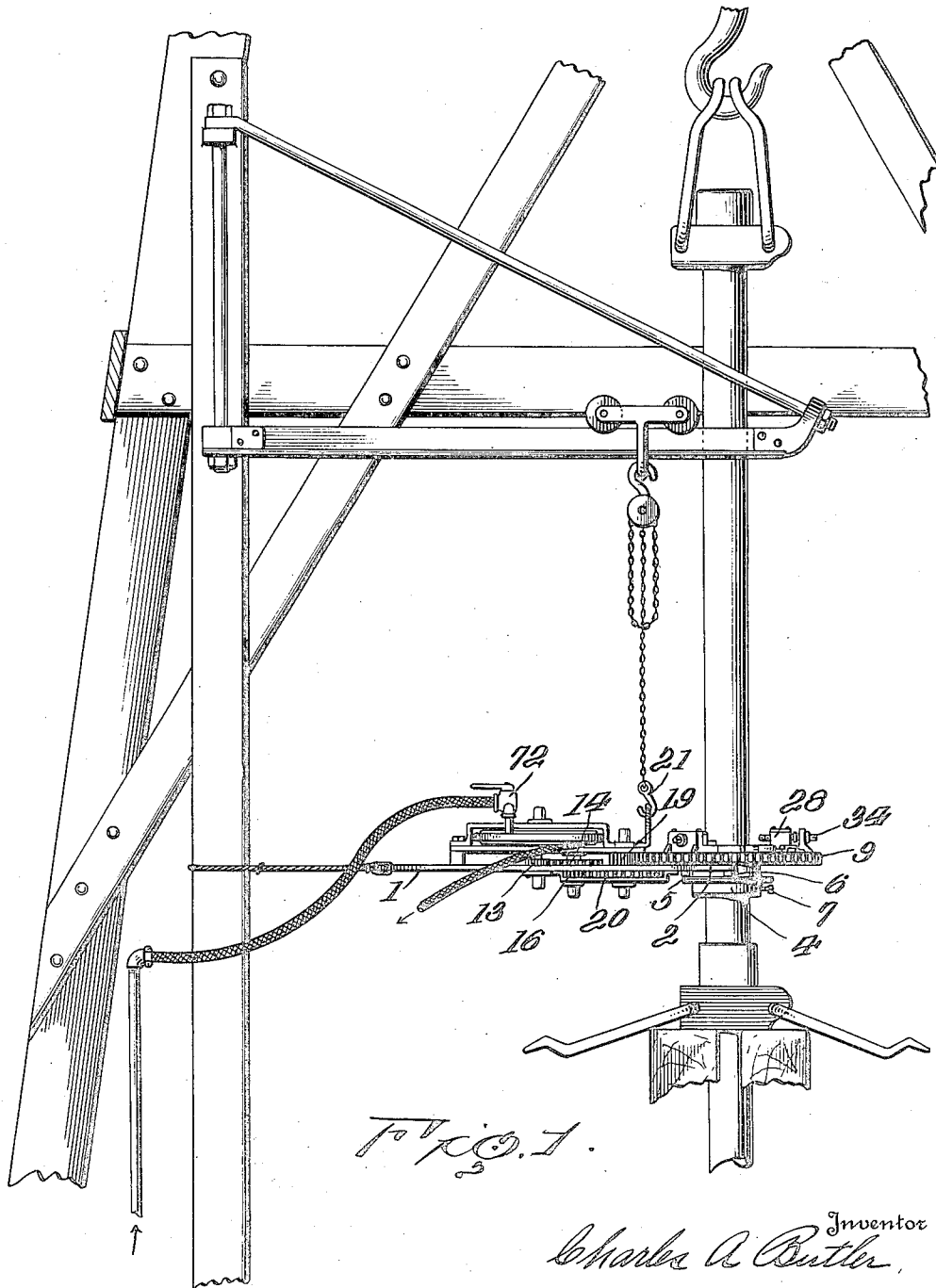
1,478,020

C. A. BUTLER

WRENCH FOR OIL WELL CASINGS

Filed May 2, 1921

4 Sheets-Sheet 1



By

Sturtevant & Mason, Attorneys

Dec. 18, 1923.

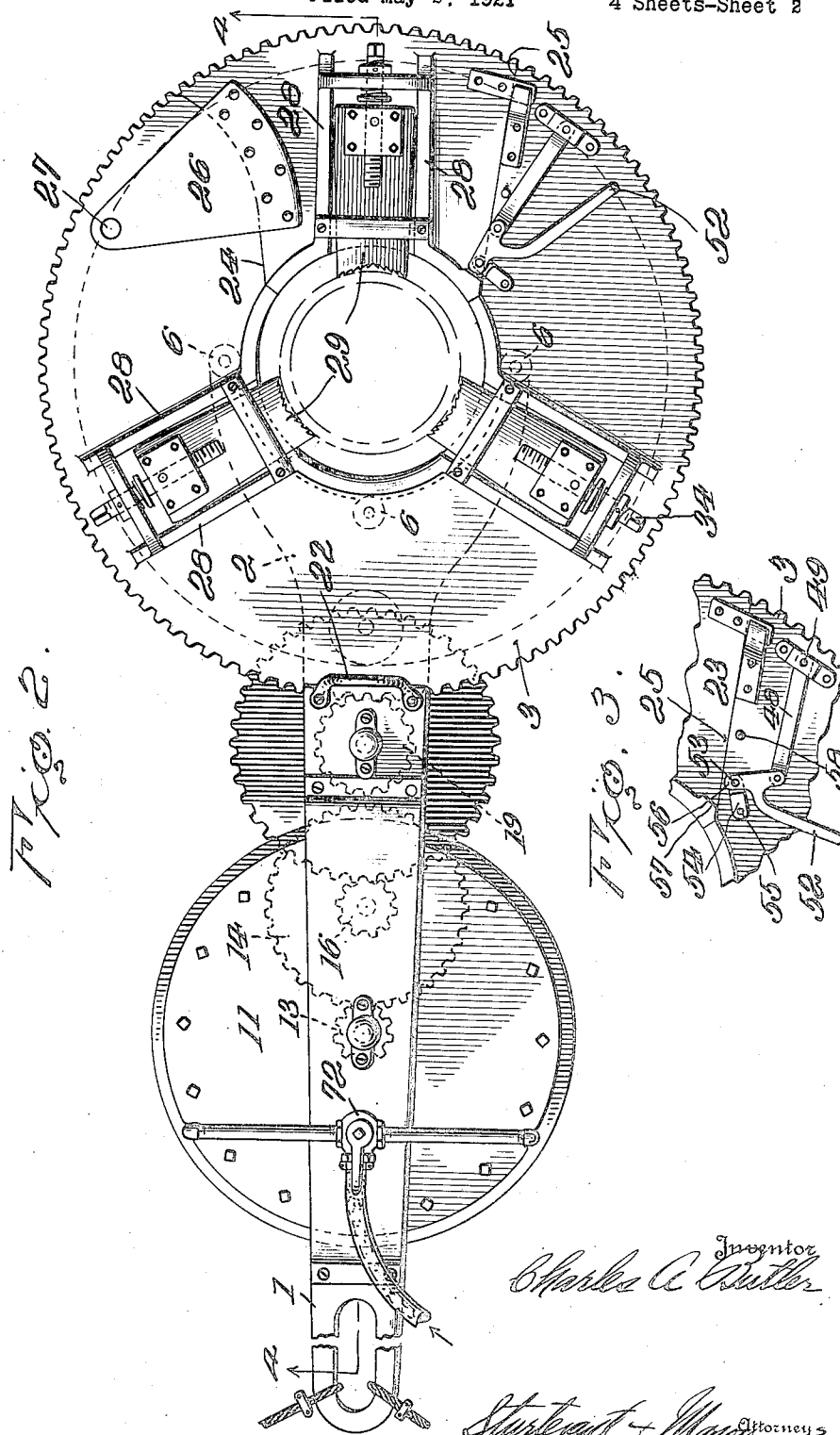
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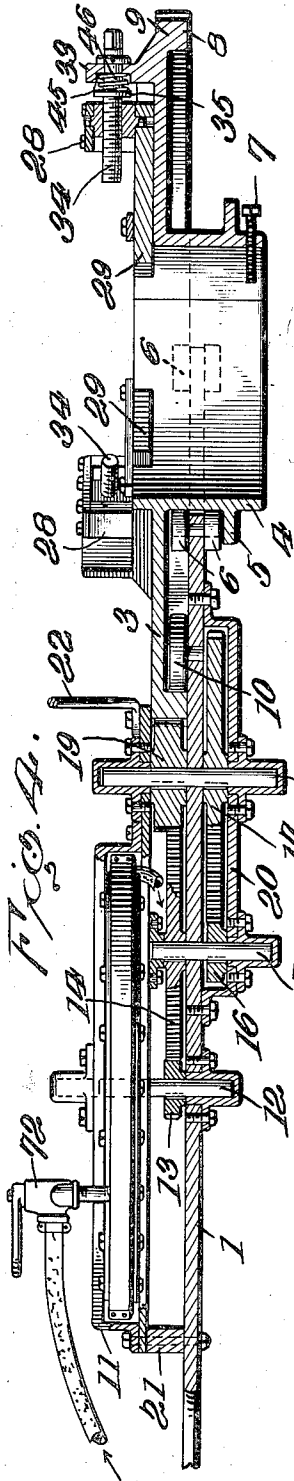


Fig. 5.

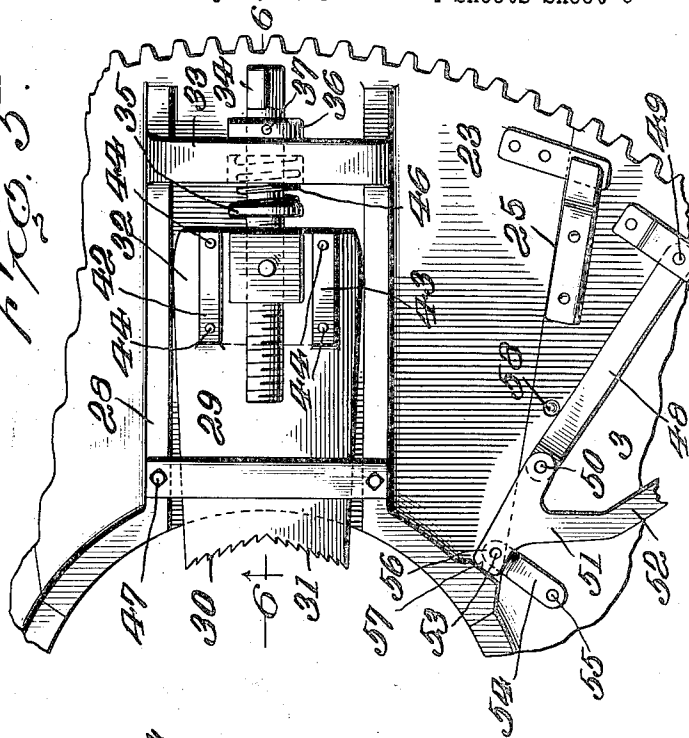
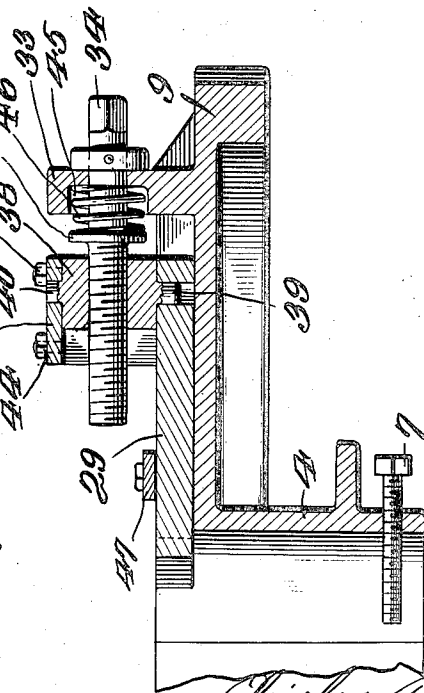


Fig. 6.



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Fig. 7.

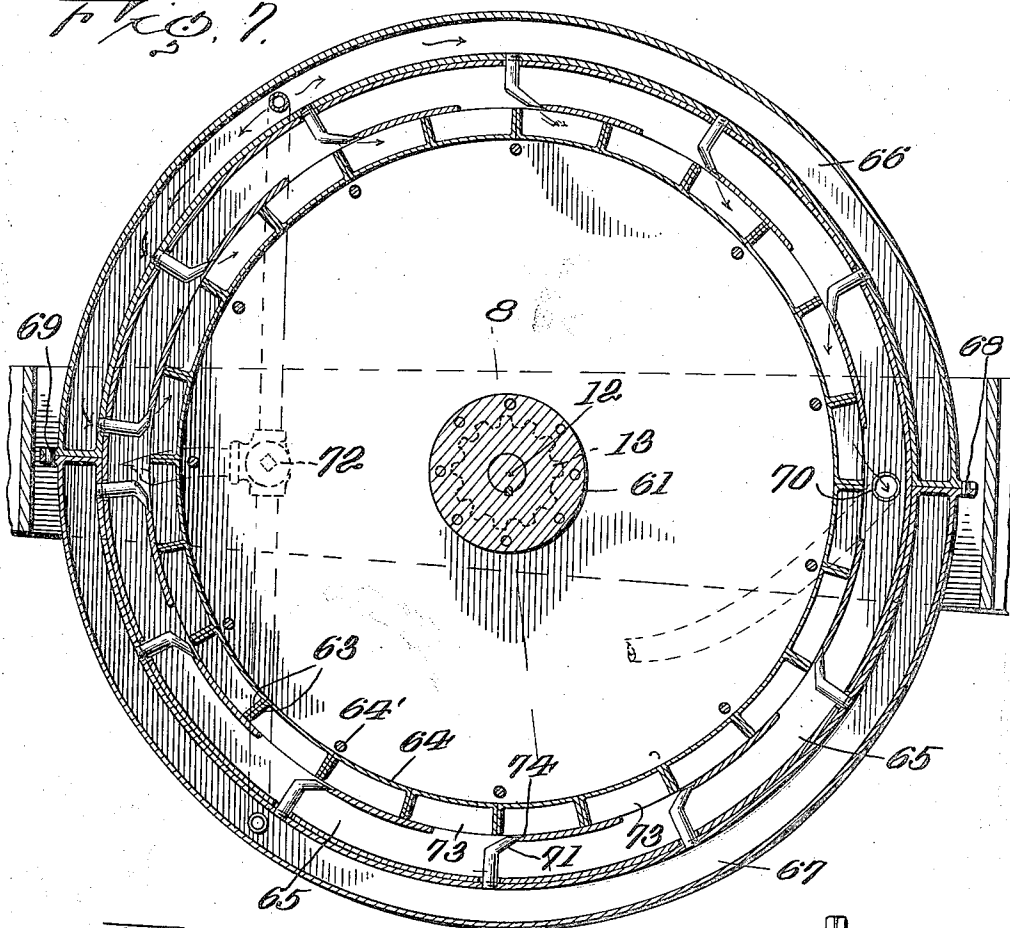


Fig. 8.

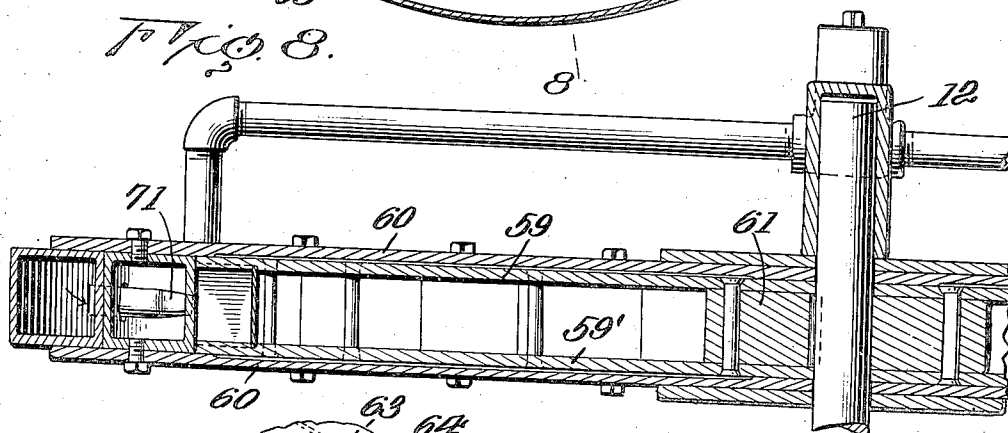
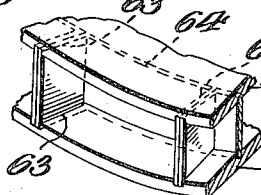


Fig. 9.



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Patented Dec. 18, 1923.

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UNITED STATES PATENT OFFICE.

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WRENCH FOR OIL-Well CASINGS.

Application filed May 2, 1921. Serial No. 466,341.

To all whom it may concern:

Be it known that I, CHARLES A. BUTLER, a citizen of the United States, residing at Okmulgee, in the county of Okmulgee, State of Oklahoma, have invented certain new and useful Improvements in Wrenches for Oil-Well Casings, of which the following is a description, reference being had to the accompanying drawing and to the figures of reference marked thereon.

This invention relates to wrenches for screwing together oil well casings and other pipe of large diameter, and more particularly to a portable power operated wrench for this purpose.

In drilling oil wells as they are now drilled, a great deal of casing is required. The casing generally comes in sections or joints about twenty-one feet in length and has to be screwed together at the mouth of the well and lowered into the well a joint at a time. The casing is secured together by gangs of men who walk round and round with a pole connected to the casing by means of a rope and hook. Some of these assembled casings are from two to four thousand feet in length and the labor and expense in assembling them is enormous.

One of the objects of the present invention is to do away with this great labor and expense by providing a portable power operated wrench which may be quickly and easily shifted into and out of place, and which, when operated, will quickly and effectively assemble the casing sections.

Another object of this invention is to provide a device of the above character in which the rotatable chuck is formed as a ring carrying the chuck jaws, which ring is provided with a movable sector so that the well casing may be introduced into the ring transversely thereof so as to be in position to be gripped by the chuck jaws.

Still another object of this invention is to combine with this movable sector a locking mechanism therefor, which is adapted to be held in locked position by the gripping contact of one of the chuck jaws carried thereon with the well casing.

Another object of this invention is to provide a device of the character described in which the rotatable chuck is provided with gripping jaws, which jaws are constructed to automatically grip the pipe on rotation of the chuck in either direction.

Another object of this invention resides

in constructing a device of the character described with a light portable support, and mounting thereon a rotatable chuck and the prime mover having geared driving connections with the rotatable chuck.

Still another object of this invention is to provide a prime mover and geared connections on the support with a suitable enclosing casing whereby to provide a light compact device of the character described.

These and other objects will in part be obvious and will in part be hereinafter more fully described.

Referring more particularly to the accompanying drawings:—

Figure 1 represents a perspective view of the device shown as suspended from a derrick in operative position;

Fig. 2 is a plan view of the device;

Fig. 3 is a detail view of the locking mechanism in open position;

Fig. 4 is a sectional view of the device;

Fig. 5 is an enlarged plan view of the chuck jaw and locking device;

Fig. 6 is a sectional view of the chuck jaw and tubular guide for the casing, and

Figures 7, 8 and 9 are views of one form of prime mover, in this instance being a steam turbine.

In general, the device comprises a substantially light flat support having an intermediate hook for attachment to the hook of the derrick crane, and with additional means whereby said support may be non-rotatably held as by means of ropes or cables. At one extreme end the support is provided with a journal for a rotatable chuck ring which is adapted to centrally receive the well casing. This ring is provided on its upper face with a plurality of chuck jaws which project inwardly to grip the casing passing through the chuck ring. There is also mounted on this support a prime mover, preferably in the form of a motor or steam turbine having geared connections to a toothed portion of the chuck ring. The chuck ring is provided with a removable sector preferably pivotally arranged to swing outwardly so that the well casing can be introduced transversely into the ring. This swinging sector carries one of the chuck jaws, and while various means for locking the swinging sector in closed position may be used, there is especially provided a device which is so constructed that when the sector is swung to inner position, the chuck jaw

thereon will grippingly contact with the well casing and form a re-active pressure, which acts to retain the locking mechanism in locked position. The chuck jaws themselves are pivotally mounted in radial guideways on the ring and are constructed to have lateral play whereby on rotation of the ring, the chuck jaws will automatically shift and will be forced more firmly into gripping engagement with the well casing.

The invention is preferably embodied in a light portable device weighing about three hundred and fifty pounds and comprises a support or handle 1 preferably long and narrow, and provided at one extremity with a crescent-like bearing or journal 2 for the rotatable chuck or head 3. This chuck or head 3 is arranged in the form of a ring and is provided with a tubular guide 4 having an outstanding flange 5 peripherally of the tube. This flange supports and makes a runway for the friction rollers 6, 6 journaled on the inner periphery of the crescent-shaped bearing 2. The lower part of the tubular guide 4 is provided with set screws 7 which act as guides in keeping the chuck level and are adjustable to different sizes of casing. In the preferred form, the outer periphery of the chuck is flanged laterally as at 8 and provided with teeth 9. The flange 8 being thus formed comprises an inside runway for the roller 10 journaled on the upper face of the support 1.

In order to rotate the chuck head 3, the prime mover is mounted directly on the handle. In the present instance, this prime mover is illustrated as a steam turbine, but it may be understood that any other source of power, such as a motor, may be used.

This turbine, which will be described later, in detail, is enclosed in a casing 11 mounted in any suitable manner directly on the handle 1 and is directed to drive the shaft 12 also journaled in any suitable manner on the support 1. This shaft 12 drives a gear 13 which in turn drives a gear 14 fixed on a shaft 15, journaled on the support. This shaft 15 has a small gear 16 driving a larger gear 17 fixed to a shaft 18 likewise mounted on the support, and this shaft 18 is provided with a gear 19 meshing with the teeth 9 on the periphery of the chuck. It is desirable that the gearing be suitably encased, and to this end, the gears 16 and 17 on the under side of the support 1 are enclosed in a casing 20, while gears 14 and 19 are enclosed on the upper side of the support 1 between the support and the casing 11 for the turbine, the casing 11 being held in spaced relation by means of posts 21. These two casings 20 and 11 form journals for the shafts 15 and 18. At the intermediate part of the support 1 there is arranged a small handle 22 whereby the device can be attached to the hook of a derrick

or crane for swinging the device into position as shown in Fig. 1 of the drawings.

The upper face of the chuck 3 is preferably provided with radial guideways for the chuck jaws hereinafter described. These jaws project into the center of the chuck ring to engage the well casing. In order to permit the well casing to be introduced into the center of the ring, the chuck 3 has the sector 23 cut out of it along lines 24, 25, and this sector is riveted to a hinged plate 26 which in turn is pivoted as at 27 to the main body of the chuck, thus making a hinge on which the sector may swing outwardly to provide an opening in the chuck by means of which it may be placed around the casing. The sector can then be swung into inward position and locked.

The chuck 3 is provided with a flat top having raised flanges 28 which as before described, are radially arranged about the center of the chuck. These raised recesses receive the jaws or dies which are three or more in number, and are made in such a way that they will take hold of the pipe or casing without being forced against it with screw power as in other chucks. These jaws are also arranged so that the casing may be either screwed up or unscrewed without changing the chuck on the casing by simply reversing the rotation of the chuck ring as hereinafter described.

These chucks or dies 29 extend longitudinally of the guideways and are provided on their inner ends with teeth 30 and 31 which incline inwardly about a central portion and are arranged oppositely so that the jaws will grip in either direction. The rear of the jaws or dies as at 32 are slightly less in width than the width of the guideways, but these dies taper inwardly toward the front thereof so as to provide a perceptible amount of lateral play in either direction. This side play is necessary to force the teeth of the jaws into the pipe. At the rear, the guideways are closed by a cross piece 33 through which a screw 34 of the chuck jaw passes. This screw is made of one piece with a collar 35 turned upon it. A second collar 36 is slipped over this screw shank and fastened by means of a pin 37. The die 29 is mounted on the screw 34 by means of a hinge block 38 having upper and lower pivots 39 and 40 held in position by a plate 41 which rests on side plates 42, 43, and is held rigidly by bolts 44, thus making a hinge connection between the die 29 and the screw 34 so that the die has a free side movement as far as the side 28 of the guide recess. The cross member 33 is bored out at 45 to seat a spring 46 between it and the collar 35. The forward part of the radial guideways formed by the upstanding flanges 28 is provided with a cross piece 47 to prevent any upward movement of the dies.

The locking device for holding the sector in closed position is especially arranged to cooperate with one of the chuck jaws mounted on the sector. This locking device comprises a lever 48 pivoted as at 49 to the upper portion of the chuck ring 3. To the other end of this lever 48 is pivoted as at 50, a second lever 51 having an integral handle 52 and a pivotal connection 53 with a second lever 54 also pivoted as at 55 to the upper face of the ring 3. These sections of the locking device are so arranged that when the sector is closed, and the handle 52 is forced in one direction, the levers 48 and 51 will lie substantially in a straight line with the portion of lever 51 overlying the joint between the ring 3 and the sector 23. It will also be noticed that the end 56 of lever 51 will lie directly opposite the abutment 57 formed as a continuation of one of the upstanding flanges 28 of the guideway on the sector 23. By turning the handle 52 a little further, the lever 48 will be thrown out of alinement with the lever 51, and will be brought against the pin or stop 58 projecting upwardly from the face of the ring 3. In this position, the levers 48 and 51 will be locked and cannot be accidentally moved except by a positive operation of handle 52. As shown clearly in Fig. 3, when the handle 52 is turned to the left, the lever 51 clears the dividing line between the ring and the sector, thus allowing the sector to swing outwardly. When the sector is closed, it does not go entirely up to its seat on account of the springs 46 holding the dieplates out, so that they come in contact with the casing before the sector is entirely seated. When the sector is entirely closed, handle 52 is swung back to the right and end 56 on lever 51 is brought into contact with abutment 57 on the sector so that when the handle is additionally swung to the right, to force the sector about its seat, the lever 48 will be brought against the stop pin 58 which brings the pivotal pin 50 a little past the center, so that the end pressure of the abutment 57 on the end 56 of the lever will have a tendency to hold the levers, and especially the lever 48, in its position against pin 58 until the handle is again moved toward the left.

When the sector is first forced to its seat to close the chuck around the pipe, the teeth of the dies come in contact with the pipe and are forced against it by the springs 46. These springs hold the dies out as far as the space between the collar 35 and the cross member 33. After this, when the chuck is closed, the locking device catches it and forces it on to its seat, compressing spring 46 until the collar 35 comes in contact with cross member 33 so that the teeth of the die plates are pressed against the pipe. At this time, the engine is started,

and when the chuck begins to revolve, and as soon as the pipe begins to tighten, and resists the power to turn it, the dies pressing against the pipe by means of springs 46 will have a side strain forced on them, and as they are hung on pivots 39 and 40 and have nothing to keep them from moving sidewise but their contact with the pipe, they will thus be forced sidewise until their sides come in contact with the sides of the recesses and this lateral movement will force the teeth of the dies into the pipe or casing and hold it securely. If it be desired to unscrew the pipe, it is not necessary to re-adjust the dies or jaws to the pipe casing as in prior devices, all that is necessary is to reverse the engine which changes the rotation of the chuck ring to automatically shift the jaws to the opposite sides of their guideways and thereby cause the oppositely formed teeth of the jaws to grip the pipe.

It will also be noticed that by providing the guideways with positive side abutments or upstanding flanges 28, the lateral play of the jaws is limited, that is, just enough play is allowed to give the jaws a substantial hold on the pipe and also prevent it from forcing its teeth into the pipe deep enough to flatten the pipe.

The preferred form of prime mover is shown in Figures 7, 8 and 9, wherein is shown a light reversible steam turbine consisting of a wheel made of two disks 59 and 59' enclosed in suitable casing plates 60 and 60'. The disks 59 and 59' are riveted to the hub 61 which is keyed upon shaft 12. Near the outer edge of the disks on the sides thereof facing each other, are cut concentric grooves 62 (see Fig. 9), and from these grooves radially outwardly, are cut other grooves 63 which connect with grooves 62 to make U-shaped grooves in which are set correspondingly U-shaped buckets 64, which are held in place in the grooves by suitable rivets which in addition hold the disks firmly together. Concentrically surrounding this peripheral row of buckets is arranged a compartment in the form of an annular tube 65 which is adapted to conduct the steam exhaust discharging from the buckets, conveying it to an exhaust outlet 70 (see Fig. 7) connected to any suitable point of discharge as by a pipe or conduit. Concentrically surrounding the exhaust tube 65 is arranged an inlet compartment herein shown as two semicircular shaped tubes 66 and 67 clamped together at diametrically opposite points of the turbine as at 68 and 69. This clamping device also secures these inlet compartments 66 and 67 securely around the exhaust compartment 65. At a plurality of points around the periphery of the inlet compartments are arranged the steam injector nozzles 71, which, in the present instance, are preferably screwed in

through corresponding holes in the inlet in the exhaust compartments. These jets or nozzles 71 are bent near their inner ends so as to direct the steam against the buckets 5 of the wheel at the proper angle. The nozzles in tube or compartment 66 are set with their jets to the left, while the nozzles in tube 67 are set with their jets to the right, which gives the jets in compartment 66 10 power to drive the wheel in one direction, and the jets in tube 67 power to drive the wheel in the opposite direction. This construction makes the turbine reversible.

The steam inlet is connected to the compartments 66 and 67 by means of a three-way valve 72. This valve is constructed with one inlet and two outlets and is capable of opening either outlet and closing the other as desired so that when the steam is 20 turned into compartment 66, the turbine will turn one way, and when the steam is turned into compartment 67, the turbine will turn the other way.

The exhaust compartment 65 is provided 25 with openings 73 at spaced intervals about its inner periphery. The intermediate walls of the compartment 58 between these openings are made with inclined faces as shown at 74 (Fig. 7), which faces are located directly at the mouth of the jets 71, so that 30 the steam is directed down these inclined planes striking the buckets, which run very close to the walls of the compartment 65. In this manner, the steam drives these 35 buckets forwardly, the steam escaping through the openings 73 as the bucket moves onwardly. By means of this construction, the separate buckets have separate steam discharges so that the objectionable backing up 40 of the steam from the various buckets is avoided. It is also obvious that the number of buckets may be increased or diminished, if desired.

It will be obvious that minor changes in 45 the details of construction and the arrangement of the parts may be made without departing from the spirit of the invention as set forth in the appended claims.

Having thus described the invention, what 50 I claim as new and desire to secure by Letters-Patent, is:—

1. A portable oil well casing wrench comprising a support, a chuck rotatably mounted on said support and provided with a central opening and surrounding chuck jaws 55 for the reception of said well casing, and a prime mover mounted on said support and connected to said chuck for rotating the same, said jaws having both a pivotal and 60 a radially shifting movement on said chuck whereby to grip said casing.

2. A portable oil well casing wrench comprising a support, a prime mover mounted on said support, a chuck geared to said 65 prime mover and provided with a central

opening, a plurality of jaws surrounding said opening, said jaws having a lateral shifting movement on rotation of said chuck for gripping said casing, and means for limiting said shifting movements to prevent 70 excessive gripping of said casing by the jaws.

3. A device of the class described comprising a support, a prime mover thereon, a chuck mounted on said support rotatably 75 connected to said prime mover, said chuck having a plurality of jaws for gripping said casing, means for supporting said jaws on said chuck whereby said jaws will automatically grip said casing on rotation of said chuck in either direction. 80

4. A device of the class described comprising a support, a prime mover thereon, a chuck mounted on said support rotatably 85 connected to said prime mover, said chuck having a central opening and a plurality of jaws mounted thereon about said opening, means whereby said jaws have lateral shifting movement so that on rotation of said 90 chuck in either direction said jaws will automatically grip said well casing and means for limiting said shifting movement to restrict the bite of said jaws into said casing.

5. A device of the class described comprising a relatively flat support terminating in a concave hemi-spherical journal, a plurality 95 of rolls mounted on the periphery of said journal, a relatively flat circular chuck mounted for rotation in said journal and formed with a transverse tubular guide and a plurality of jaws about one end of said 100 guide, said guide having a spaced peripheral flange adapted to seat said rolls between it and said chuck, said chuck having a toothed peripheral flange extending laterally toward said guide flange, a roll journaled on said 105 support and engaging the inner periphery of said chuck flange, and a prime mover mounted on said support and having driving connection with the teeth of said 110 chuck.

6. A device of the class described comprising a support, a prime mover mounted thereon, a chuck ring mounted on said support, and rotated by said prime mover, a plurality of jaws on said ring adapted to 115 grip a well casing within said ring, said ring having a movable sector to permit the insertion of said well casing transversely of said chuck ring, a yieldable jaw on said sector adapted to contact with said casing 120 and to be moved thereby on the closing of said sector, and a locking device cooperating with said sector to hold said sector and locking device in closed positions.

7. A device of the class described comprising a support, a prime mover mounted thereon, a chuck ring mounted on said support and rotated by said prime mover, a plurality 125 of chuck jaws mounted on said ring and projecting inwardly to engage the well casing 130

within said ring, said ring having a sector thereof movable relatively to said ring to form an opening for the insertion of said well casing, said sector carrying at least one of said jaws.

8. A device of the class described comprising a support, a prime mover mounted thereon, a chuck ring mounted on said support and rotated by said prime mover, a plurality of chuck jaws mounted on said ring and projecting inwardly to engage the well casing within said ring, said ring having a sector swingable outwardly from said ring to form an opening for the insertion of said well casing, said sector having at least one of said jaws mounted thereon, means for locking said sector to said ring in closed position, said means being constructed and arranged to be secured in such locked position by contact of the jaw carried by said sector with the well casing.

9. A device of the class described comprising a support, a prime mover mounted thereon, a chuck ring mounted on said support and rotated by said prime mover, a plurality of chuck jaws mounted on said ring and projecting inwardly to engage the well casing within said ring, said ring having a sector swingable outwardly from said ring to form an opening for the insertion of said well casing, said sector having at least one of said jaws mounted thereon, a toggle lever pivotally mounted at its ends to said chuck ring and adapted to overlie the joint between said ring and said sector when in inner position and to swing clear of said joint when in outer position, a stop to limit the inner position of said lever, one of the ends of said lever engaging a portion of said sector when the latter is in closed position whereby said lever is held in inner position against said stop by the outward pressure of the chuck jaw.

10. A device of the class described comprising a support, a prime mover and a chuck ring mounted thereon, means for rotating the latter from the former, a plurality of radial guideways on said ring, a plurality of jaws pivotally mounted in said guideways with their gripping portions projecting into the central opening of said ring, a plurality of jaws pivotally mounted in said guideways, and resilient means for projecting the gripping portion of said jaws into the central opening of said ring to contact said well casing, said jaws being tapered at their in-

ner ends to form lateral play between the inner ends of said jaws and said guideway, whereby on rotation of said chuck ring in either direction said jaws will automatically shift laterally to firmly grip said well casing.

11. A device of the class described comprising a support, a prime mover and a chuck ring mounted thereon, means for rotating the latter from the former, a plurality of radial guideways on said ring, a plurality of jaws pivotally mounted in said guideways with their gripping portions projecting into the central opening of said ring, a plurality of jaws pivotally mounted in said guideways and resilient means for projecting the gripping portion of said jaws into the central opening of said ring to contact said well casing, said jaws being tapered at their inner ends to form lateral play between the inner ends of said jaws and said guideway, whereby on rotation of said chuck ring in either direction, said jaws will automatically shift laterally to firmly grip said well casing, and means to adjust said jaws radially in said guideways.

12. A device of the class described comprising a support, a prime mover and a chuck ring mounted thereon, means for rotating the latter from the former, a plurality of radial guideways on said ring having parallel sides and closed at their rear ends, a jaw arranged in each guideway, said jaw having a rear width slightly less than the width of said guideways and narrowing to the front, a hinge block pivotally mounted on said jaw and an adjusting screw journaled in the rear wall of said guideway and threadedly engaging said hinge block, and a spring adapted to press said jaws inwardly toward the central opening in said chuck ring.

13. A device of the class described comprising a substantially flat handle, a prime mover rotatably journaled thereon, an enclosing casing for said prime mover, a chuck ring journaled on said handle, a train of gearing between said prime mover and said chuck ring, an enclosing casing for said gearing and a plurality of jaws mounted on said chuck ring for gripping the well casing on rotation of said chuck ring.

In testimony whereof, I affix my signature.

CHARLES AUGUSTUS BUTLER.