A. B. CLARK.

BOLTING UP MACHINE.

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1,371,861.

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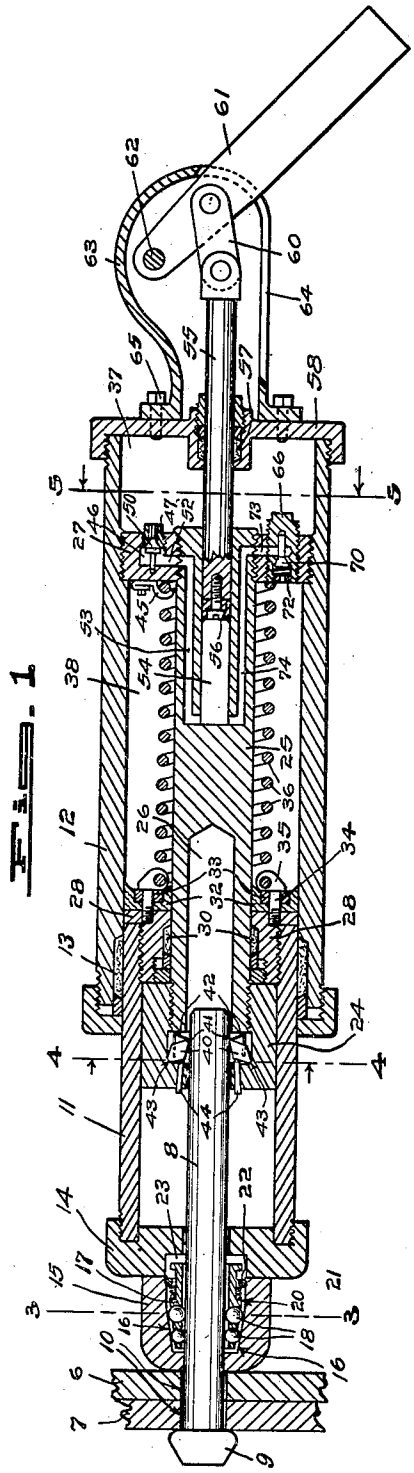


Fig. 1

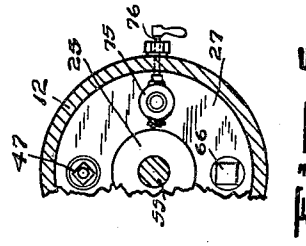


Fig. 5

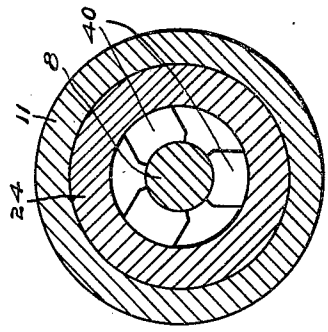


Fig. 4

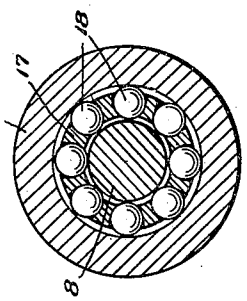


Fig. 3

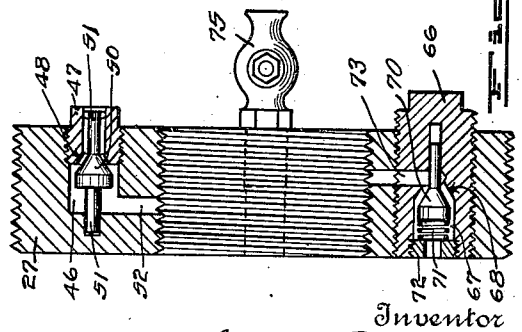


Fig. 2

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BOLTING-UP MACHINE.

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To all whom it may concern:

Be it known that I, ARCHER B. CLARK, a citizen of the United States, and resident of Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Bolting-Up Machines, of which the following is a clear and exact specification.

This invention relates to improvements in hydraulic bolting up machines of the type that may be used for drawing together and holding together a plurality of plates and the object of this improvement is to provide a hydraulic device of this nature that is strong and simple in construction, rapid and efficient in operation and that is capable of exerting a powerful force on the opposite sides of two or more plates to draw such plates together.

A further object is to provide means within a tool of this nature for gripping and holding the end of a draw bolt by which the plates are drawn together and to provide simple and efficient means separable from the tool for engaging with the draw bolt to hold the plates together after the force exerted by the hydraulic device is released.

A still further object is to provide quickly releasable draw bolts and locking collars that may be used with my hydraulic machine and by which two or more plates may be drawn together and held in position for riveting without the use of threaded bolts and nuts.

This device is especially adapted for use in drawing together and holding together the steel plates of a ship's hull preparatory to the riveting of such plates.

In the accompanying drawings Figure 1 is a view in longitudinal midsection of a device constructed in accordance with this invention, certain parts being shown in elevation; Fig. 2 is an enlarged view in cross section illustrating the valves in the partition wall that divides the main cylinder of the machine into two compartments; Figs. 3 and 4 are enlarged views in cross section on broken lines 3—3 and 4—4 respectively, of Fig. 1; and Fig. 5 is a fragmentary view in cross section substantially on broken line 5—5 of Fig. 1.

At the present time it is common practice to draw the steel plates that form the sides of a ship together and hold them temporarily in place by inserting bolts through the rivet holes in the plates at intervals and screwing nuts on the bolts. This process consumes a great deal of time and labor and it is the object of the present invention to provide a device for performing this work that will do away with the necessity of screwing up and unscrewing the nuts on the bolts and thereby save a great deal of time and labor.

Referring to the drawings, throughout which like reference numerals designate like parts, the numerals 6 and 7 designate two plates that are to be drawn together and 8 designates a draw bolt that is provided with a head 9 and is adapted to be passed through perforations 10 in the plates 6 and 7 to draw the plates together.

The hydraulic apparatus proper comprises a smaller cylinder 11 and a larger cylinder 12 that is open at one end and is adapted to slide telescopically over the outside of the smaller cylinder, a packing gland 13 being provided in the interior wall of the larger cylinder adjacent the end thereof to insure an absolutely leak proof fit between the two cylinders 11 and 12.

The outer end of the smaller cylinder 11 is adapted to have a cap 14 screwed thereon, the cap 14 being provided with an axial bore through which the draw bolt 8 may pass and being adapted to abut against the end of a sleeve 15 and press the sleeve against the inner plate 6.

The sleeve 15 is provided with a tapered recess 16 that is adapted for the reception of a ball bearing cage 17 wherein are disposed balls 18 that are arranged to wedge between the inner tapered wall of the recess 16 and the outer cylindrical wall of the pin 8 in such manner as to lock the sleeve in any position on the pin. The ball bearing cage 17 is of reduced diameter near the inner end to form a shoulder 20 against which one end of a relatively light compression spring 21 may engage, the other end of the spring 21 being arranged to abut against a ring 22 which is slightly embedded in and fixedly secured to the inner peripheral wall of the sleeve 15. The end of the cap 14 is recessed as at 23 to afford clearance for the end of the ball bearing cage 17 which projects from the end of the sleeve 15 and is shaped so that it may be engaged by a tool to pry it outwardly and cause the balls to release the draw bolt.

The inner end of the draw bolt 8 is ar-

ranged to project through an axially disposed opening in a cylindrical block or member 24 that is screwed onto one end of a shank 25, the shank 25 being recessed as at 26 to permit the draw bolt to work therein. The other end of the shank 25 is externally threaded and is screwed into a relatively thick cylinder head or partition wall 27 which is screwed into the larger cylinder 12 at a point a short distance from the outer end thereof, the arrangement being such that the block 24, shank 25 partition wall 27 and larger cylinder 12 are all rigid with respect to each other.

The end of the smaller cylinder 11 that projects into the larger cylinder 12 has a bushing 28 screwed therein that is adapted to fit the shank 25 and is provided with a packing gland 30 to insure a leak proof joint between it and such shank 25.

The bushing 28 which in effect forms the end wall of the smaller cylinder 11 has an annular cup shaped packing ring 32 secured thereto by a washer 33. The washer 33 is secured to the bushing 28 by screws 34 the heads 35 of which are shaped as shown in Fig. 1 and are perforated for the reception of the end coil of a tension spring 36. The annular packing ring 32 makes a close fit with the inner walls of the larger cylinder 12 and the outer walls of the shank 25 and serves to withstand the hydraulic pressure of liquid, as oil, that may be pumped from the outer end compartment 37 of the cylinder 12 into the annular compartment 38 that surrounds the shank 25.

The cylindrical block 24 is recessed for the reception of bolt engaging dogs 40 that are provided with relatively sharp edges 41 which are held in engagement with the bolt 8 by springs 42 the upper rounded corners 43 of the dogs being adapted to bear against the walls of the block 24 in such a manner that the sharp edges 41 wedge with a cam like effect against the bolt 8. The front sides of the dogs 40 are engaged, adjacent the bolt 8, by pins 44 that project a short distance outwardly from the front wall of the block 24 and are arranged so that they will strike against the wall of the cap 14 and effect the release of the dogs 40 when the smaller cylinder 11 has been withdrawn by the contraction of the spring 36 to the limit of its movement into the larger cylinder 12.

One end of the tension spring 36 is secured to the cylinder head 27 by clip members 45 so that the spring will ordinarily exert a pull that tends to telescope the two cylinders 11 and 12.

The side of the partition wall 27 facing the chamber 37 is recessed as at 46 for the reception of a plug 47 having a conical valve seat 48 on its inner end within which a valve 50 is adapted to seat the valve 50 being guided by a valve stem 51 that is reciprocable within suitable passageways in the plug 47 and wall 27.

The recess 46 is connected by passageways 52 and 53 with the inner end of a cylindrical chamber 54 in the shank 25, the chamber 54 being adapted for the reception of a reciprocable piston rod 55 upon the end of which is secured a cup shaped packing washer 56.

The piston rod 55 projects outwardly through a gland 57 in the end wall 58 of the cylindrical member 12 and is pivotally connected with one end of a link 60, the other end of the link 60 being pivoted to a lever arm 61, one end of which is fulcrumed on a pin 62 that is rigid with a housing 63 and the other end of which projects outwardly through a slot 64 in such housing. The housing 63 is rigidly secured to the end wall of the outer cylinder 12 by screws 65 and if desired may have a handhold provided thereon.

The partition wall 27 is provided at a point removed from the recess 46 with a threaded passageway that extends entirely through such wall and wherein may be inserted a valve plug 66 having a valve chamber 67 provided with a seat 68 for a valve 70, the valve 70 normally being held in a closed position by a spring 71 that is held in contact with the valve 70 by a small perforated plug 72 which is screwed into the end of the valve plug 66. The valve chamber 67 is connected by passageways 73 and 74 with the inner end of the cylindrical pump chamber 54.

The partition wall 27 may have a valve 75 in the form of a pet cock provided therein which valve has a stem 76 that projects outwardly through the side wall of the cylinder 12 so that it may be turned to open and close the valve and permit the return flow of oil from the pressure chamber 38 to the chamber 37.

The lever arm 61 shown in the drawings is adapted to be worked by an extension handle, not shown, having a socket that fits over the outer end of such arm 61.

In the operation of this bolting up machine one of the bolts 8 is inserted through the plates that are to be drawn together, a collar 15 containing the ball bearing clamping device is then placed over the bolt 8, and the bolting up machine with the inner cylinder 11 telescoped as far as possible into the outer cylinder 12, is placed over the bolt, the end of the bolt projecting into the recess in the block 24 and being engaged and held by the dogs 40.

The lever arm 61 is then moved back and forth to reciprocate the piston rod 55 and cause liquid to be drawn from the chamber 37, past the valve 50 through the passageways 52 and 53 into the pump chamber

54 and then to be forced out of the pump chamber 54 through the passageways 73 and 74 and past the valve 70 into the chamber 38 thus creating a pressure in the chamber 38 that tends to move the telescoped cylinders 11 and 12 in opposite directions thereby exerting a pressure against the collar 15 and a pull on the bolt 8 and tending to draw the two plates 6 and 7 together.

When the two cylinders 11 and 12 have reached the limit of their movement of extension so that they occupy substantially the relative positions shown in Fig. 1, the relief valve 75 may be opened thereby permitting the spring 36 to contract and telescope the cylinder 11 into the cylinder 12, the liquid flowing from the compartment 38 into the compartment 37. As the inner cylinder 11 approaches the limit of its movement into the cylinder 12 the wall of the cap 14 will strike against the pins 44 and release the dogs 40 thereby permitting the bolting up machine to be removed from the draw bolt 8, leaving the collar 15 securely clamped on such bolt and holding the plates 6 and 7 together. The collar 15 may remain on the bolt 8 until the plates 6 and 7 have been riveted together after which such collar may be loosened and removed from the draw bolt, the draw bolt removed from the holes in the plates and a rivet inserted in its place.

The bolt gripping mechanism employing the balls as arranged in the collar 15 and the bolt gripping mechanism employing the dogs 40 as arranged in the cylindrical block 24 have both been found efficient in operation and may be interchanged.

Obviously changes in the precise form of construction and arrangement of the various parts of this device may be resorted to within the scope of the claims.

What I claim is—

1. Bolting up mechanism comprising a draw bolt, a locking collar movable on said bolt and arranged to grip the same and means for simultaneously exerting a pull on said bolt and a pressure on said collar.

2. Bolting up apparatus comprising a draw bolt adapted to be passed through holes in plates, a locking collar arranged to fit over said draw bolt and automatically grip said bolt and means for simultaneously exerting a pull on said bolt and a pressure on said collar to force said plates together.

3. Apparatus of the class described comprising a draw bolt having a head on one end and adapted to be inserted through perforations in plates, means arranged to be placed over said draw bolt on the side of said plates opposite said draw bolt head for gripping and holding said draw bolt, and mechanism for exerting a pull on said draw bolt and a pressure on said bolt gripping means.

4. Mechanism for drawing and clamping plates together comprising a smooth cylindrical bolt having a head on one end and adapted to be inserted through holes in plates, a collar arranged to fit over said bolt on the side of said plates opposite said bolt head, means in said collar for automatically gripping said bolt to prevent said collar from being removed from said bolt and means for simultaneously exerting a pull on said bolt and a pressure on said collar to draw said plates together.

5. Mechanism for holding plates together comprising a smooth cylindrical bolt having a head on one end, a sleeve movable lengthwise on said bolt, said sleeve having an internal recess of larger diameter than said bolt and formed with converging walls, a ball bearing cage in said recess and arranged to project outwardly from the end thereof, and balls in said ball bearing cage arranged to wedge between the converging walls of said sleeve and the periphery of said bolt to lock said sleeve on said bolt.

6. Mechanism for holding plates together comprising a smooth cylindrical bolt having a head on one end, a sleeve movable lengthwise on said bolt said sleeve having an internal recess of larger diameter than said bolt and formed with converging walls, balls arranged to wedge between the periphery of said bolt and the converging walls of said sleeve, means for guiding and supporting said balls and spring mechanism for yieldingly holding said balls in engagement with said bolt and said converging walls.

7. A bolting up device comprising a draw bolt, a locking collar movable on said draw bolt and arranged to automatically grip the same, a piston member arranged to abut against said locking collar, a cylinder within which said piston member is slidably mounted, means secured to said cylinder for gripping the end of said draw bolt, and hydraulic means for creating a pressure within said cylinder to exert a pull on said bolt and a pressure on said collar.

8. A bolting up device comprising a draw bolt, a locking collar movable on said draw bolt and arranged to automatically grip the same, a piston member arranged to abut against said locking collar, a cylinder within which said piston member is slidably mounted, means secured to said cylinder for gripping the end of said draw bolt, devices for automatically releasing said draw bolt gripping means as said piston member approaches the limit of its movement into said cylinder, and hydraulic means for creating a pressure within said cylinder to exert a pull on said bolt and a pressure on said collar.

9. A bolting up device comprising a draw bolt, a locking collar movable on said draw

bolt and arranged to automatically grip the same, a cylinder having a liquid reservoir and a pressure chamber, means for pumping liquid from said reservoir into said pressure chamber, a piston member movable within said cylinder and arranged to abut against said locking collar, a shank secured to said cylinder and arranged to project into said piston member, and means within said piston member for gripping the end of said draw bolt whereby when liquid is pumped into said pressure chamber a pull will be exerted on said draw bolt and a pressure will be exerted against said locking collar.

10. A bolting up device comprising a cylinder, a head forming a closure for one end of said cylinder, a partition wall spaced from said head and rigid with said cylinder to divide said cylinder into a liquid reservoir and a pressure chamber, means for pumping liquid from said liquid reservoir into said pressure chamber, a shank secured to said partition and extending axially of said cylinder, a piston member arranged to fit within said cylinder and movable lengthwise thereof the end of said piston member forming one end of said pressure chamber and said shank extending into said piston member, a recessed cylindrical block secured to the end of said shank, gripping dogs disposed within the recesses in said cylindrical block, a draw bolt having a head on one end, and a locking collar movable on said draw bolt and arranged to automatically grip the same, the end of said draw bolt being arranged to be engaged and held by said gripping dogs.

11. A bolting up device comprising a cylinder, a head forming a closure for one end of said cylinder, a partition wall spaced from said head and rigid with said cylinder to divide said cylinder into a lquid reservoir and a pressure chamber, a shank secured to said partition and extending axially of said cylinder said shank being bored to form a pump chamber, a pump piston reciprocable in said pump chamber, valve mechanism in said partition wall, ports connecting said valve mechanism with said pump chamber whereby liquid may be pumped from said liquid reservoir into said pressure chamber, a piston member arranged to fit within said cylinder and movable lengthwise thereof the end of said piston member forming one end of said pressure chamber and said shank extending into said piston member, a spring for moving said piston member into said cylinder, a recessed cylindrical block secured to the end of said shank, gripping dogs disposed within the recesses of said cylindrical block, a draw bolt having a head on one end and adapted to be inserted through perforations in plates that are to be drawn together, and a locking collar movable on said draw bolt and arranged to automatically grip the same, the end of said draw bolt being arranged to be engaged and held by said gripping dogs, whereby when liquid is pumped into said pressure chamber said piston member will press against said locking collar and a pull will be exerted on said draw bolt.

Signed at Seattle, Washington, this 5th day of March, 1919.

ARCHER B. CLARK.