June 29, 1943. J. M. LANCASTER 2,323,141

AIR CONTROLLED WORK CLAMPING MACHINE

Filed Jan. 23, 1941 3 Sheets-Sheet 1

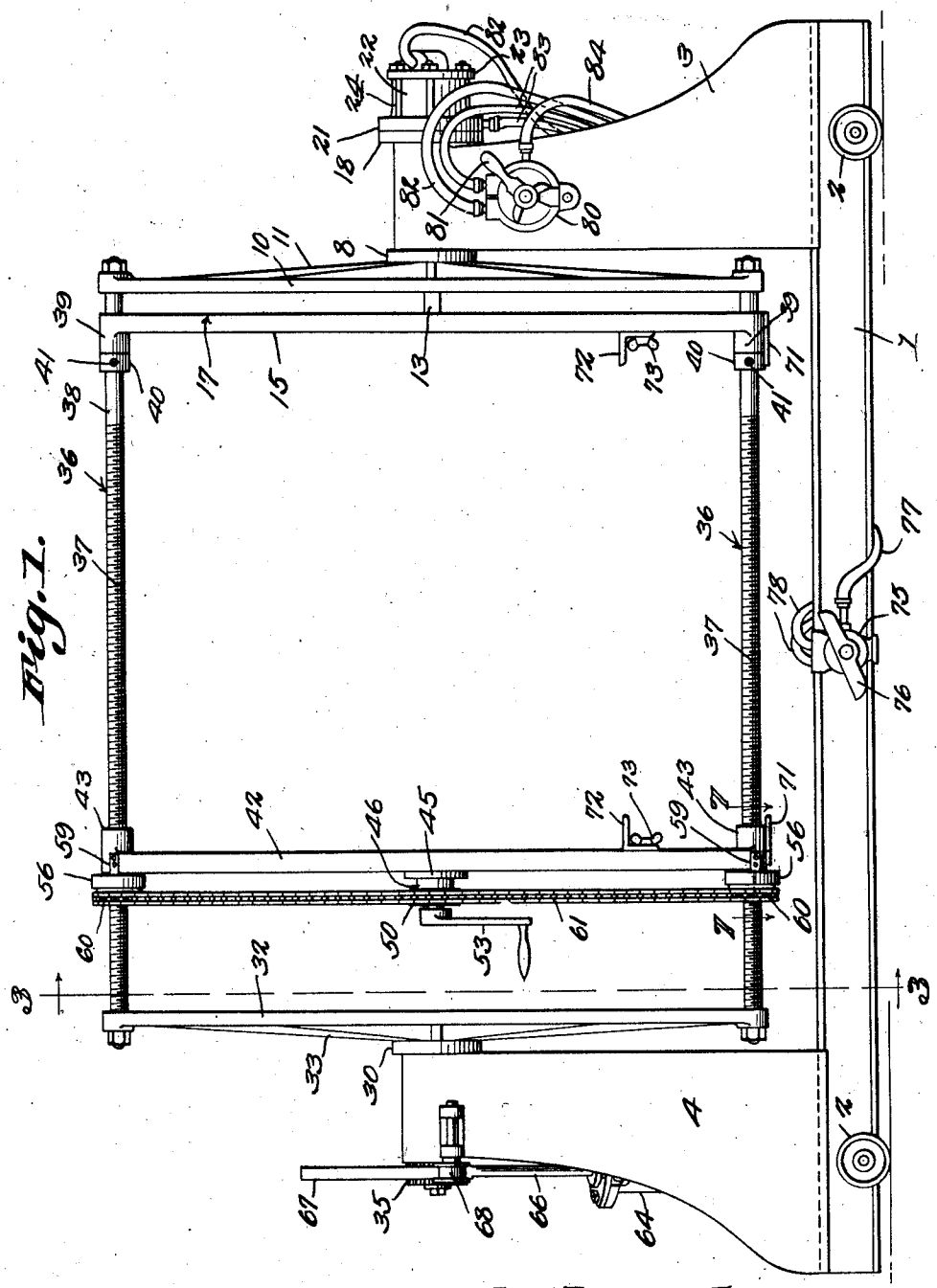


Fig. 1.

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BY C. A. Snow & Co

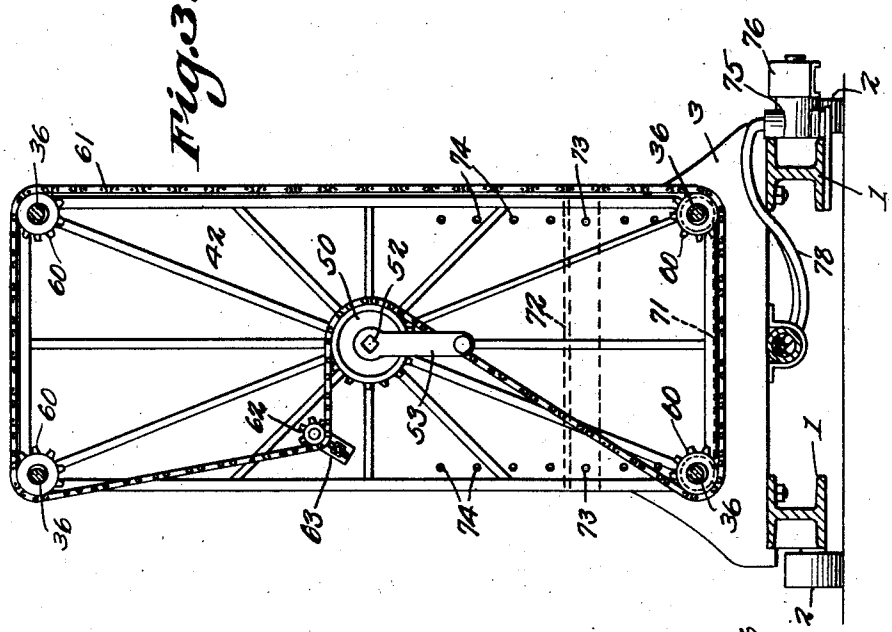
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Fig. 3.



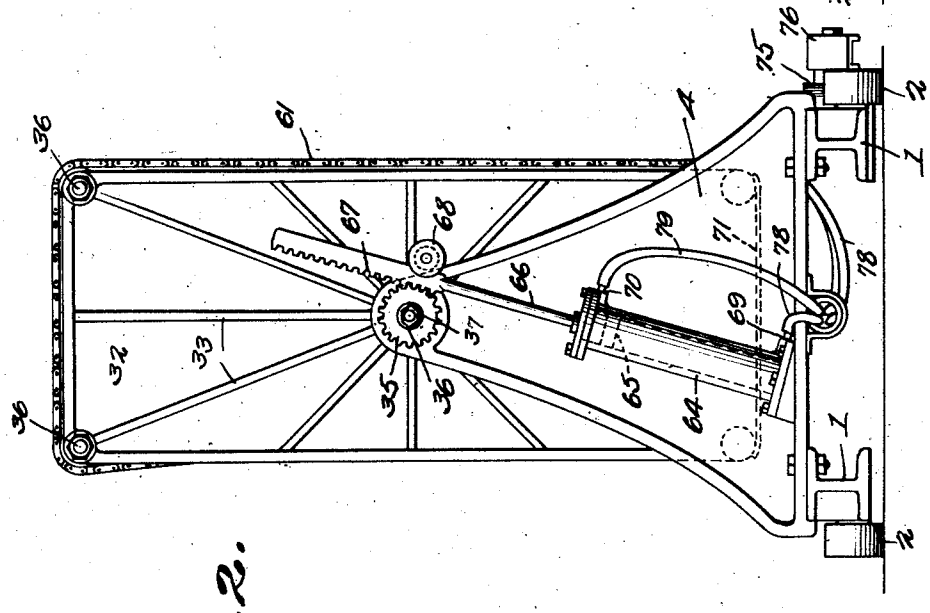


Fig. 2.

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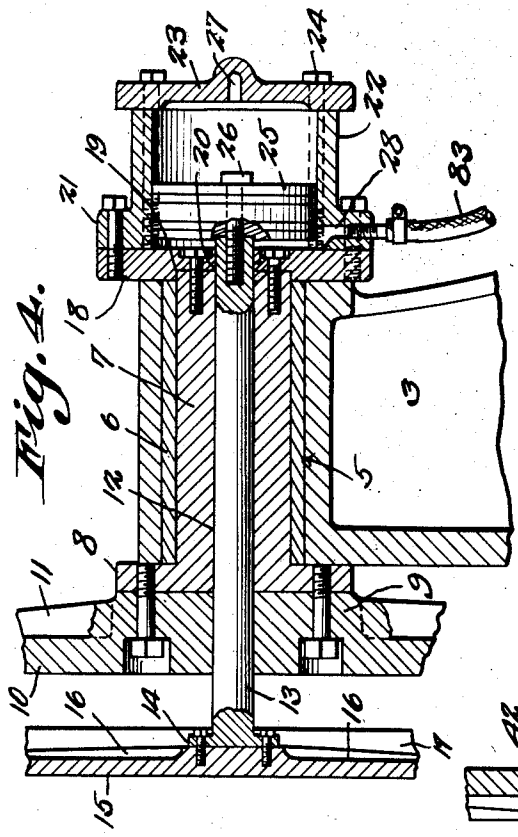


Fig. 4.

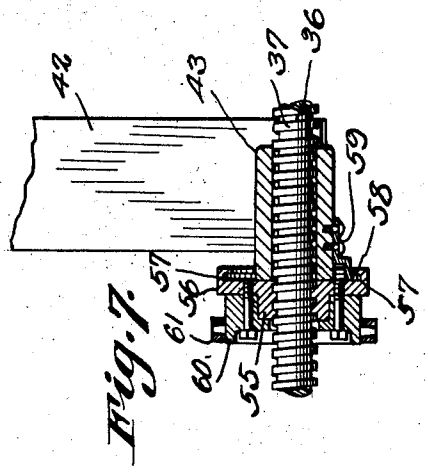


Fig. 7.

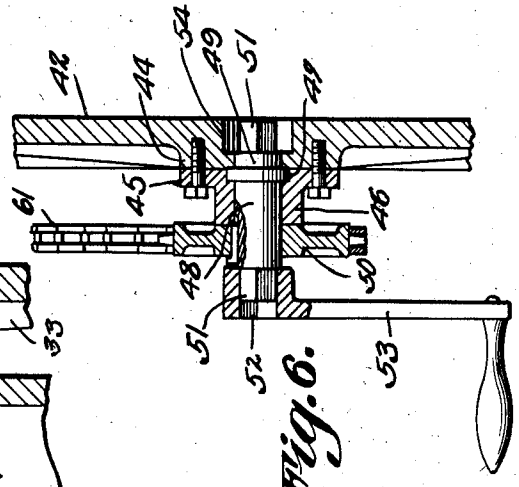


Fig. 6.

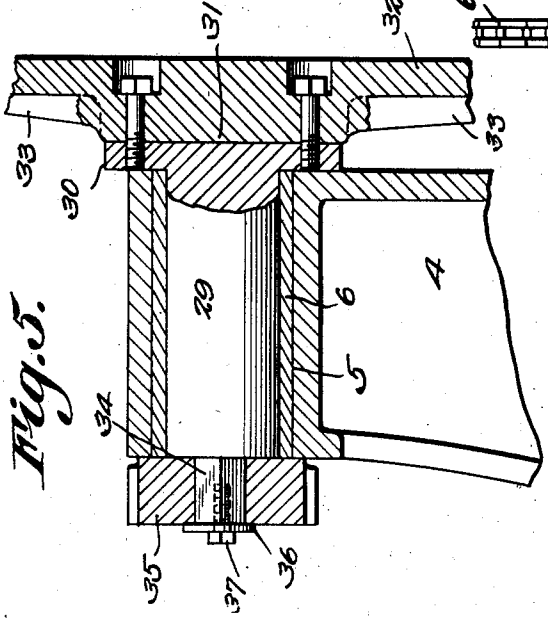


Fig. 5.

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2,323,141

UNITED STATES PATENT OFFICE

2,323,141

AIR CONTROLLED WORK CLAMPING MACHINE

Jeter M. Lancaster, High Point, N. C.

Application January 23, 1941, Serial No. 375,672

6 Claims. (Cl. 144—291)

This invention relates to a machine designed to clamp together the parts of articles of furniture such as cases, one of the objects being to provide an easily controlled mechanism which is so constructed as to insure accurate assembly of the parts at right angles to each other and, after once being adjusted to a case or other article, can be used, without resetting, for quickly clamping other similar articles, thereby materially speeding production.

A further object is to provide apparatus of this character which is reversible so as to quickly bring either of two opposed sides of the case into position in front of the operator.

A still further object is to provide new and novel means whereby the apparatus can be adjusted to a case or the like, it being possible thereafter to quickly release the clamped case and receive and clamp upon another case without resetting the parts.

A still further object is to provide a clamp utilizing air or other fluid under pressure for the purpose of gripping the case positioned in the clamp and for reversing the position of the gripped case, these operations taking place at the will of the operator.

Another object is to provide a clamp which is simple in construction and will not readily get out of order.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists of certain novel details of construction and combinations of parts hereinafter more fully described and pointed out in the claims, it being understood that there is no desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

In the accompanying drawings the preferred form of the invention has been shown.

In said drawings

Figure 1 is a front elevation of the clamp.

Figure 2 is an elevation of one end thereof.

Figure 3 is a section on line 3—3, Figure 1.

Figure 4 is a central vertical section through the bearing at one end of the machine and through the plunger casing or cylinder carried thereby, the plunger and its stem being shown partly in section and partly in elevation and a portion of the clamping jaw to which the stem is connected being shown in section.

Figure 5 is a view partly in section and partly in elevation of the bearing at the other end of the machine and the gudgeon journalled therein, a portion of one of the cross-heads being shown in section.

Figure 6 is a section through a portion of the adjustable jaw and a portion of its adjusting mechanism, the operating crank being shown partly in elevation.

Figure 7 is a horizontal section through one of the lower corner sleeves of the adjustable jaw and through the feed nut cooperating therewith, said section being indicated at 7—7, Figure 1, the engaged portion of the threaded rod being shown in elevation.

Referring to the figures by characters of reference, 1 designates side beams constituting the front and back portions of the base or bed frame of the machine and each of these can be supported by a pair of rollers 2 located adjacent to the ends thereof and constituting means whereby the structure can be moved from place to place. The beams 1 are joined at their ends by standards 3 and 4 each of which is provided in its upper end portion with a cylindrical bore 5 in which is fitted a bearing sleeve 6 of any suitable metal.

Journalled in the standard 3 is a gudgeon 7 provided at one end with an annular flange 8 to which is bolted or otherwise connected a boss 9 formed at the center of a plate 10 constituting a cross-head. This plate is of any suitable proportions and that face thereof remote from the flange 8 is flat while the opposite face is preferably reenforced by ribs 11 radiating from the boss 9.

A central longitudinal bore 12 is extended through the gudgeon 7 and also through the cross-head 10 and in this bore is slidably mounted a stem 13 one end of which projects through and beyond the cross-head 10 and is provided with an annular flange 14 bolted or otherwise joined to the middle portion of one face of a plate 15 constituting one of the jaws of the machine. The working surface of this plate is flat as shown while the opposed face to which the flange 14 is attached, is preferably reenforced by radial ribs 16 and a marginal flange 17.

A disk 18 is bolted to that end of gudgeon 7 remote from the flange 8 and is preferably recessed as at 19 to receive said end. This disk also has a central opening 20 in which the stem 13 is adapted to work. The flanged end 21 of a cylinder 22 is bolted to the marginal portion of the disk 18 and this cylinder is closed at its outer end by a head 23 which can be fastened in place in any suitable manner, as by means of tie-bolts 24 extending through the head and into the flange 21. The piston 25 is mounted for recip-

rocation in the cylinder and is secured at its center to the stem 13 by means of a bolt 26 or the like. A port 27 opens into the cylinder at the head 23 and another port 28 opens into the cylinder at its other end.

Journalled in the standard 4 is a gudgeon 29 provided at its inner end with an annular flange 30 and to this flange is bolted a boss 31 formed at the center of one face of a cross-head 32, there being reenforcing ribs 33 radiating from the boss. The other end of the gudgeon has an angular extension 34 on which is mounted a gear 35 which is held detachably thereto by any suitable means, such as a washer 36 and a bolt 37 and this gear obviously will rotate with gudgeon 29.

The cross-heads 10 and 32 are preferably duplicates and oppositely disposed. While they can be of any desired shape, it is preferred to make them oblong and these cross-heads are connected at their corners by rods 36 which are securely seated therein and are parallel with each other and at right angles to the inner faces of the cross-heads. Each rod is firmly held against rotation about its longitudinal center and each rod is provided with a screw-thread 37. The threads do not extend up to the cross-head 10 but, instead, an unthreaded surface is provided on each rod between cross-heads 10 and the thread, as indicated at 38.

The jaw 15 which is connected to stem 13 is of substantially the same configuration as the cross-head 10 but is provided at its corners with integral guide sleeves 39 fitted snugly upon and slidable along the unthreaded portions 38 of the respective rods. This sliding movement of jaw 15 and its sleeve 19 is limited in one direction by the cross-head 10 and in the opposite direction by stop collars 40 secured to the rods. In practice it has been found desirable to limit the movement of jaw 15 to about one inch but it is to be understood that the extent of movement can be varied to meet the requirements. This is made possible due to the fact that the collars 40 are adjustably attached to the rods, being held thereto by set screws 41 or the like.

As jaw 15 is connected to stem 13 which, in turn, is connected to the piston 25, said jaw will hereinafter be referred to as a fluid-actuated jaw. Another jaw, which is preferably actuated or adjusted by hand, is also provided and has been indicated at 42. This jaw is in the form of a plate proportioned like the jaw 15 and likewise provided at its corners with guide sleeves 43 slidably engaging the threaded portions of the rods 36. As the threads on the rods are flat, as shown particularly in Figure 7, these sleeves 43 can slide readily therealong, as will be obvious.

That face of the adjustable jaw 42 which is nearest cross-head 32 has a central boss 44 to which is bolted or otherwise joined an annular flange 45 at the base of a bearing sleeve 46 which is counterbored at one end as shown at 47. In this sleeve is journalled a stub shaft 48 having a collar 49 which is seated in the counterbore 47 and thus cooperates with sleeve 46 and boss 44 to hold the stub shaft against longitudinal movement without, however, interfering with its rotation. A sprocket 50 is keyed or otherwise attached securely to the shaft 48 where it can bear against the end of sleeve 46 and each end of the shaft 48 has an angular head 51 either one of which is adapted to enter a socket 52 formed in an operating crank 53 or the like. One of the heads 51 is preferably located in a recess 54 formed in the work-engaging flat surface of jaw 42.

Each of the rods 36 has its threaded portion engaged by a nut 55 adapted to thrust against that end of the adjacent sleeve 43 nearest the cross-head 32. Each nut has an annular flange 56 formed with an interior annular groove 57 and into this groove projects the outturned end 58 of a coupling plate 59 which, as shown particularly in Figure 7, is secured to the sleeve 43. Thus when the nut is rotated in one direction so as to feed along the threaded portion 37 of rod 36 it will thrust against sleeve 43 but, when rotated in the opposite direction it will pull on the sleeve through the plate 59.

To each of the flanges 56 is bolted a sprocket 60. All of the sprockets are of the same size and in the same plane. They are all engaged by an endless chain 61 a portion of which is looped so as to extend partly around and in engagement with the central sprocket 50 and also partly around and in engagement with an idler sprocket 62 carried by a plate 63 which is adjustably mounted on the jaw 42 as shown in Figure 3.

A cylinder 64 is mounted at one end on the bottom portion of standard 4 as shown in Figure 2 and is fixed relative to the standard. This cylinder has a piston 65 the stem 66 of which carries a rack bar 67 which is in constant mesh with gear 35 and is guided by an idler wheel 68 mounted on the standard. Cylinder 64 is provided with a port 69 at its lower end and another port 70 at its upper end and gear 35 and rack 67 are so proportioned that each complete stroke of the piston 65 and its stem 66 will produce a one-half rotation of gear 35 and those parts movable therewith.

Each of the jaws 15 and 42 is provided at one end with a work support in the form of a plate 71 which extends across said end of the jaw and projects beyond the flat working face of the jaw. In other words the two plates 71 are extended toward each other and they are located at all times in the same plane. In addition to these work supports, each of the jaws is provided with an adjustable work support which can be in the form of an angle strip 72. Bolts 73 are extended through these strips and are adapted to be screwed into threaded openings 74 formed in the jaws in parallel series as shown, for example, in Figure 3.

A valve 75 is carried by one of the beams 1 and is adapted to be operated by a foot-pedal 76. This valve has a pipe 77 for supplying air or other fluid thereto under pressure and also has pipes 78 and 79 leading to the respective ports 69 and 70 of cylinder 64. The valve can be of any standard type whereby, when turned in one direction, it will direct fluid under pressure to one of the ports and exhaust from the other port whereas, when it is turned in the opposite direction, it will reverse the flow of fluid in the cylinder. In view of the fact that the valve itself constitutes no part of the present invention, it has not been deemed necessary to show or describe the same in detail.

Another valve 80 is mounted on standard 3, being located preferably at the same side of the machine as the valve 75. This is a three-way valve of any preferred construction adapted to be operated by a handle 81. Pipes 82 and 83 extends from this valve to the respective ports in cylinder 22 and another pipe 84 is used for directing air or other fluid under pressure into the valve 80. This valve is also of any standard con-

struction and for that reason it is not deemed necessary to show or describe the same in detail. It is preferable, however, to have the handle **81** so located that when it is turned to one side from a vertical position it will direct air to one of the ports whereas when it is turned to the other side of a vertical position it will direct air or other fluid into the other port. When in a vertical or intermediate position the cylinder piston **25** will be held against movement in either direction.

In practice the work supports **72** are adjusted along the jaws **15** and **42** so as to support at the proper elevation the case or other article of furniture to be clamped. Where large structures are to be clamped, the fixed supports **71** can be used and the adjustable supports **72** can be removed. In either case the structure to be clamped is placed on the work supports provided therefor and between the jaws **15** and **42**, jaw **15** being positioned against collars **40**. Jaw **42** is then fed against the work by rotating the sprocket **50** which, in turn, will transmit motion through the chain **61** to the four sprockets **60**, causing the sprockets to feed along the threaded portions **37** of rods **36** and thrust equally against guide sleeves **43** so that jaw **42** will be fed toward jaw **15**. This operation is continued until the case or other structure between the jaws is tightly clamped, all of the parts being pressed properly together. Following this clamping operation due to the manual adjustment of jaw **42**, the jaw **15** is permitted to recede a slight distance under the pressure exerted thereagainst through the clamped case by the jaw **42**. Fluid under pressure is then admitted to port **28** so as to throw the piston **25** toward head **23** and fully retract the jaw **15** from the work. The work can thereafter be readily removed and a new case, to be clamped, can be placed in position between the jaws. However no further adjustment of jaw **42** will be necessary. All that is required is to reverse the flow of air or other fluid under pressure into cylinder **22** so that it will force piston **25** and stem **17** longitudinally to clamp jaw **15** against the work. Following the clamping operation the operator, by reversing valve **75** can cause the cross-heads, the jaws, and the work carried thereby, to make a one-half rotation so as to reverse the work. Consequently the operator, located at the valve-side of the machine, is in a position to work upon both sides of the case or the like, thereby obviating the loss of time heretofore necessitated where it has been necessary for him to walk around a clamp in order to work upon all portions of the case. Obviously the reversal of the jaws and the clamped work is effected simply by changing the direction of flow of fluid under pressure to the cylinder **64** so as to cause the rack **67** to move in one direction or the other.

Importance is attached to the fact that the jaws **15** and **42** are always held with their working or clamping faces parallel to each other and at right angles to the guide rods **36**. Thus when the work is clamped, the parts thereof are held at right angles to each other and there is no danger of the finished article being distorted as a result of a faulty clamping operation. In practice the production of finished articles has been greatly accelerated because it becomes possible, following one adjustment of the clamp, to repeatedly clamp, reverse and release like articles in rapid succession.

By mounting the cross-heads **10** and **32** with coaxial gudgeons and connecting these cross-heads by the parallel rods **36**, a smoothly operating rigid frame is provided and maintenance of the jaws **15** and **42** in correct parallel relation is insured under all conditions.

What is claimed is:

1. A reversible work-clamping machine including spaced standards, alined gudgeons journalled therein, cross-heads fixedly joined to the respective gudgeons and between the standards, parallel rods connecting the cross-heads and cooperating therewith to form a rigid frame, separate opposed parallel jaws slidably mounted on the rods, a cylinder secured to and coaxial with one of the gudgeons, a piston therein, a coaxial stem connecting the piston and one of the jaws and slidable in the cylinder and its gudgeon, means for directing fluid under pressure into either end of the cylinder, a gear on the other gudgeon, a rack engaging the same, a fixed cylinder, a piston in the cylinder connected to the rack, and means for directing fluid under pressure into either end of the fixed cylinder to turn the gear, said gear being proportioned to make a one-half rotation when turned to the limit of its movement in either direction.

2. A reversible, work-clamping machine including opposed cross-heads mounted to turn about a common axis, parallel rods connecting the cross-heads and cooperating therewith to form a rigid frame, opposed clamping jaws slidably mounted on the rods, means under the control of an operator for sliding one of the jaws relative to the other jaw, a gear rotatable with the frame, a rack in mesh therewith, a cylinder, a piston in the cylinder connected to the rack, and means under the control of the operator for directing fluid under pressure into either end of the cylinder, thereby to turn the frame and the jaws in either direction while in work-clamping position.

3. A reversible, work-clamping machine including spaced standards, alined gudgeons journaled therein, work-clamping and holding means carried by the gudgeons, said means including a slidable jaw, a cylinder secured to and coaxial with one of the gudgeons, a piston therein, a coaxial stem connecting the piston and the slidable jaw and slidable in the cylinder and its gudgeon, means for directing fluid under pressure into either end of the cylinder, a gear on the other gudgeon, a rack engaging the same, a fixed cylinder, a piston in the fixed cylinder connected to the rack, and means for directing fluid under pressure into either end of the fixed cylinder to turn the gear, said gear being proportioned to make a one-half rotation when turned to the limit of its movement in either direction.

4. A reversible, work-clamping machine including opposed cross-heads mounted to turn about a common axis, parallel elements connecting the cross-heads and cooperating therewith to form a rigid frame, opposed clamping jaws slidably mounted on the elements, means under the control of an operator and operable from a point outside the frame for sliding one of the jaws relative to the other jaw independently of the rotation of the frame, a gear rotatable with the frame, and fluid operated means under the control of the operator for turning the gear, the frame and the jaws through a one-half rotation in either direction while the jaws are in work-clamping position.

5. A reversible work-clamping machine including spaced standards, alined gudgeons journaled therein, a frame connecting the gudgeons, adjustable jaws carried by the frame, a cylinder secured to and coaxial with one of the gudgeons, a piston therein, a coaxial stem connecting the piston and the slidable jaw and slidable in the cylinder and its gudgeon, means for directing fluid under pressure into either end of the cylinder, a gear on the other gudgeon, a rack engaging the same, a fixed cylinder, a piston in the cylinder connected to the rack, and means for directing fluid under pressure into either end of the fixed cylinder to turn the gear, said gear being proportioned to make a one-half rotation when turned to the limit of its movement in either direction.

6. A reversible, work-clamping machine including spaced standards, aligned gudgeons journaled therein, work-clamping and holding means carried by the gudgeons, said means including a slidable jaw, a cylinder secured to and coaxial with one of the gudgeons, a piston therein, a coaxial stem connecting the piston and the slidable jaw and slidable in the cylinder and its gudgeon, means for directing fluid under pressure into either end of the cylinder, a gear on the other gudgeon, a rack engaging the same, and fluid-operated means under control of an operator for moving the rack back and forth thereby to rotate the gear and frame back and forth through approximately 180°.

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