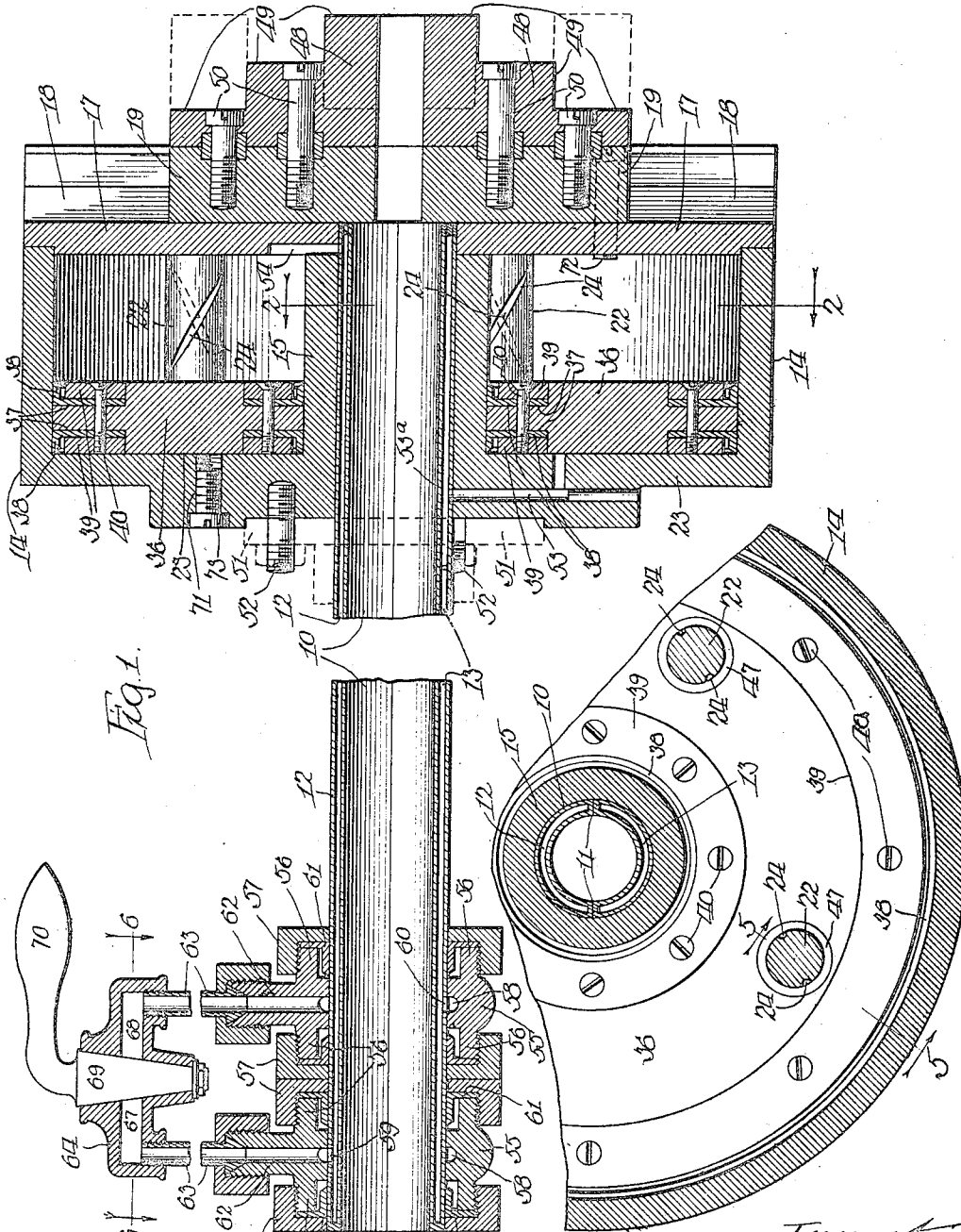


W. H. PECK.
 REVERSE JAW EXPANSION CHUCK.
 APPLICATION FILED MAR. 5, 1919.

1,311,665.

Patented July 29, 1919.

2 SHEETS—SHEET 1.



Witness:
Ref. Duran.

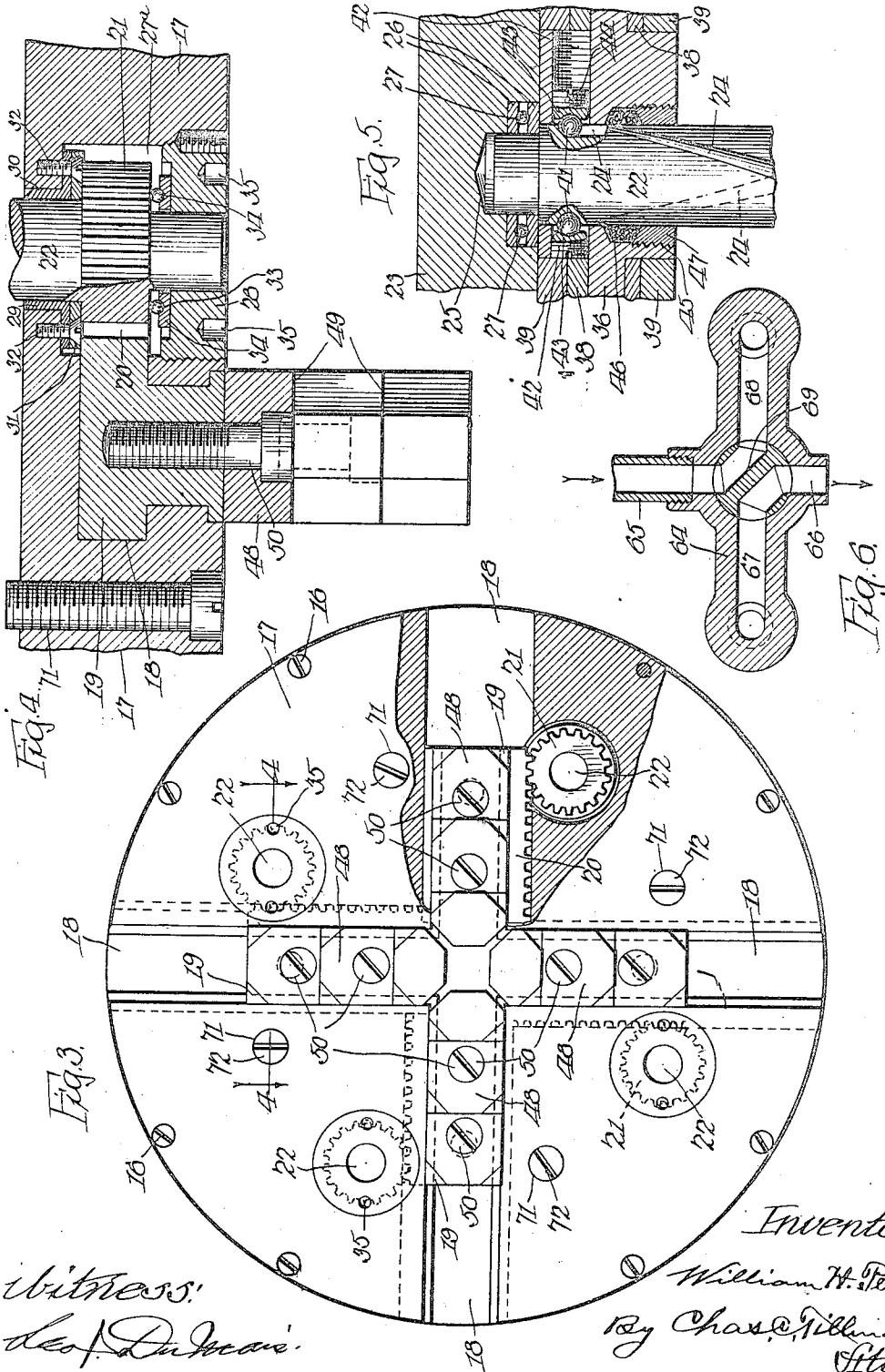
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Witness:
 Geo. Duane.

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UNITED STATES PATENT OFFICE.

WILLIAM H. PECK, OF CICERO, ILLINOIS.

REVERSE-JAW EXPANSION-CHUCK.

1,311,665.

Specification of Letters Patent.

Patented July 29, 1919.

Application filed March 5, 1919. Serial No. 280,837.

To all whom it may concern:

Be it known that I, WILLIAM H. PECK, a citizen of the United States, residing at Cicero, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Reverse-Jaw Expansion-Chucks, of which the following is a specification.

This invention relates to certain new and useful improvements in chucks of a type to be used mainly on lathes, wherein a plurality of jaws are mounted for radial movement and pneumatically operated in such a manner as to expand them so as to internally engage hollow work or articles such as pipes and the like, to be held thereby, or if desired, so that said jaws may be contracted or approximated to externally grip the work or articles and thereby firmly hold the same, and it consists in certain peculiarities of the construction, novel arrangement and operation of the various parts thereof as will be hereinafter more fully set forth and specifically claimed.

The principal object of the invention is to provide a pneumatically operated chuck of the above mentioned general character, which shall be simple and inexpensive in construction, strong, durable and efficient in operation, with its parts so made, arranged and coöperating one with another that the jaws thereof can be caused to grip the work either from within or from without.

Another object is to provide a chuck, which, while it is more particularly intended for use in connection with lathes for holding an object so that it can be rotated thereby, yet is applicable for use on drill-presses, planers and the like.

Other objects and advantages of the invention will be disclosed in the subjoined description and explanation.

In the accompanying drawings, which serve to illustrate an embodiment of the invention—

Figure 1 is a central vertical sectional view of the chuck and the controlling valve thereof, showing the tubular shaft on which they are mounted shortened for the convenience of illustration, and exhibiting the gripping jaws, by continuous lines, in position for engagement with the work within the same and by dotted lines in position for externally gripping the work.

Fig. 2 is a fragmental sectional view taken on line 2, 2 of Fig. 1, looking in the di-

rection indicated by the arrows, showing the manner of applying packing rings to the piston or plunger of the cylinder and the peculiar construction of the shaft on which the cylinder is mounted;

Fig. 3 is a front face view, partly in section, of the chuck showing the jaws thereof in position for expansion or for internally gripping the work.

Fig. 4 is an enlarged sectional view taken on line 4, 4 of Fig. 3, looking in the direction of the arrows;

Fig. 5 is a similar view taken on line 5, 5 of Fig. 2 looking in the direction of the arrows, showing the manner of mounting the shafts in the cylinder and its piston, for operating the jaws, and

Fig. 6 is a plan sectional view taken on line 6, 6 of Fig. 1, showing the construction of the controlling valve and the upper portion of its casing.

Like numerals of reference refer to corresponding parts throughout the different views of the drawings:

The reference numeral 10 designates the main or supporting shaft of the chuck, which shaft is by preference tubular in form and made of two pieces semi-circular in cross section, which pieces are brazed or otherwise joined together at their edges, as is clearly shown in Fig. 2 of the drawings, in which view it will be noted that each of the pieces comprising the shaft 10 is provided with a conduit which extends from near one end of the shaft to near the other end thereof. Each of these conduits has its ends closed and by preference are substantially semi-circular in cross section, but are divided from one another by means of the meeting edges 11 of the pieces of the shaft. Thus it will be understood that the shaft 10 is provided with a pair of conduits 12 and 13 which are independent of each other. Mounted on the shaft 10 is a cylinder 14 which has a centrally disposed hub 15, in which the shaft is located and to which it may be keyed or fixed in any suitable way. The front end of the cylinder 14 has mounted thereon and secured to its periphery by means of screw bolts 16 a head or end piece 17, which is provided on its outer surface with a plurality of radial guideways 18 for the reception and operation of rack bars 19, one of which is located in each of said guideways for slidable movement therein. Each of the bars 19 is provided on one of its sides

with a rack 20 which are for the purpose of meshing with pinions 21, one of which is mounted on each of the shafts 22 which are transversely journaled in the rear end 5 piece or head 23 of the cylinder 14, and in the front end piece or head 17 thereof, and extend across the cavity of the cylinder.

As shown in Fig. 3 one of the shafts 22 is located near one side of each of the guide-ways 18 and on corresponding sides of said ways. Each of the shafts 22 is provided with a pair of oppositely disposed grooves 24 which are spirally extended in opposite directions from one end of the shaft to the other end thereof, as is clearly shown in Figs. 1 and 5 of the drawings. The rear end of each shaft 22 has its rear bearing 25 in the rear end or head 23 of the cylinder, and each of said shafts is surrounded near 20 its rear end by a pair of spaced-apart metallic rings 26, between which are located a series of anti-friction balls 27. The outer end of each of the shafts 22 is reduced outwardly from the pinion 21 on said shaft and has mounted thereon a bearing collar 28 25 which is screwed into a suitable opening 27^a in the head 17, which opening is of sufficient size to permit of the insertion of the pinion on the shaft, which pinion, as before stated, meshes with the rack 20 on the rack bar 19 adjacent thereto. Surrounding each of the shafts 22 is a collar or packing ring 29 of leather or other suitable material, which ring or collar is partly located in the 30 opening 30 in the head 17 for the shaft 22, and partly in the inner end of the enlarged opening 27^a, and is held in position by means of a ring 31 surrounding the shaft and screws 32 which engage the head 17 of the cylinder. Located between the collar and the face of the gear 21 adjacent thereto are anti-friction balls 33, which are held in place by means of grooved rings 34 on the inner end of the collar 28, which collar can be 35 suitably adjusted by means of a spanner wrench or other instrument inserted in openings 35 in said collar.

Slidably mounted on the hub 15 of the cylinder is a piston or plunger 36, which has 50 transverse openings therein at suitable points to receive the shafts 22, upon which said piston is also slidably mounted. At its outer periphery the piston 36 is provided on each of its sides with an annular recess 37 in which are located packing rings 38 of leather or other suitable material, which rings are held in position by means of metal rings 39 located on the sides of the piston and by means of screw bolts 40 ex- 60 tended through said rings and the piston. The inner periphery of the piston 36 is similarly formed and equipped with packing rings of the same construction as above mentioned. Located in each of the grooves 24 of each of

the shafts 22 is a ball 41, which are inserted through suitable screw threaded openings 42 radially located in the piston 36 near the rear end of each of the openings therein for the shafts 22, and said balls are retained in 70 position by means of a grooved member 43, each of which is held in place by a screw 44 engaging the openings 42. The front portion of the piston 36 is provided around each of the shafts 22 with a screw threaded 75 opening 45 for the reception of suitable packing 46 and a gland 47 for holding the same in position.

Mounted on the outer surface of each of the rack bars 19 is a gripping jaw 48, each 80 of which is by preference formed with steps 49 on its outer surface to engage the work or article to be held by the clutch. Each of these gripping jaws is detachably secured to its respective rack bar by means of screw 85 bolts 50 extended through said jaws and engaging said bars. By this arrangement it will be understood that by removing the screw bolts 50 from the bars 19 the positions of the jaws 48 may be reversed, when 90 they can again be secured to the rack bars by means of the screw bolts. It will be understood that when the jaws are in the positions shown by continuous lines in Fig. 1 of the drawings, they will be ready for en- 95 gagement with the work or article to be held from within, and that by reversing the position of the jaws to that shown by dotted lines in said figure, the said jaws will be in position to engage or grip the work ex- 10 ternally.

The cylinder may be fixed to the head plate or suitable part 51 (see dotted lines in Fig. 1 of the drawing) of the lathe or other machine in connection with which 100 the chuck is used by means of screw bolts 52 engaging suitable openings in the rear end of the cylinder.

As shown in Fig. 1, the rear end head 23 of the cylinder is provided with a port 53 11 which communicates with the conduit 13 of the main shaft 10 and leads into the cavity of the cylinder at the rear of the piston 36 therein. The inner surface of the front head or end piece 17 of the cylinder is provided with a port 54 which communicates 11 with the conduit 12 of the main shaft, and leads into the cavity of the cylinder in front of the piston therein.

In order to limit the strokes of the piston 12 the front head 17 of the cylinder and the rear head 23 thereof may be provided with a plurality of openings 71 for the reception of screws 72, which are countersunk at their outer ends in the outer surfaces of said 12 heads or cylinder ends, and each set of said screws may extend a suitable distance from the inner surfaces of the heads on each side of the piston so as to stop its movement in either direction. By this arrangement, it is 13

evident that as the movement of the piston causes the movement of the rack bars and gripping jaws thereon, through the instrumentality of the shafts 22 and pinions 21 thereon meshing with the rack bars, said movements will be restricted in either direction according to the distance in which the screws 72 extend into the cylinder from the inner surfaces of the ends thereof. It is also manifest that if it is desired to omit the screws 72 so as to permit the piston to have movement equal to the length of the cylinder, said screws can be removed and their openings 71 closed by means of short screws or screw plugs 73, as is shown in the rear head in Fig. 1 of the drawings. While I prefer to employ these screws for limiting the movement of the piston in either direction, yet it is obvious that they may be omitted from one of the heads and used in the other head only.

Surrounding the shaft 10, but so as to permit the same to rotate therein are a pair of casings, each of which is composed of an annular or ring-like member 55, having on each of its sides an externally screw threaded flange 56 with each of which an annular collar or cap 57 engages. Each of the members 55 has on its inner surface a circumferential groove 58, one of which grooves has communication through a port 59 in the shaft 10 leading to the conduit 12 thereof, and the other of said grooves has communication through a port 60 with the conduit 13 of said shaft. Located between each of the caps or rings 57 and each of the flanges 56 is a packing ring 61 of any suitable material, which will prevent leakage of the compressed air or fluid under pressure, which passes through the members 55 and the conduits of the main shaft. Each of the members 55 has a hollow stem 62 extended therefrom which are connected by means of suitable pipes 63 to a valve casing 64, which has connected thereto an inlet pipe 65 leading from a supply of fluid under pressure (not shown; see Fig. 6). This casing also has an outlet or exhaust port 66, and is provided with channels or ports 67 and 68 which communicate through the pipes 63 with the grooves 58 of the members 55 surrounding the main shaft. Located in the casing 64 is a valve 69 which may have a handle 70 for turning the same so as to open and close the channels 67 and 68 alternately.

From the foregoing and by reference to the drawings, it will be readily understood and clearly seen that, assuming that the parts are in the positions shown in Fig. 1 of the drawings, and it is desired to cause the gripping jaws 48 to engage the work to be held internally, which work it will be assumed is in position around one of the steps 49 of each of said jaws, it is only necessary to turn the valve 69 to the position shown in

Figs. 1 and 6 of the drawings, when it is obvious that the compressed air or fluid under pressure supplied through the pipe 65, channel 68 of the valve casing 64, and through the groove of the member 58, adjacent to the cylinder, will enter the conduit 13 of the main shaft and pass therefrom through the port 53 of the cylinder, thus forcing the piston 36 forwardly, in which operation the balls 41 carried by the piston and operating in the grooves 24 of the shafts 22, will cause said shafts to rotate and through the engagement of the pinions 21 on said shafts with the racks 20 of the rack bars, will cause said bars to be moved outwardly, thus expanding the gripping jaws 48 against the inner surface of the work. When it is desired to release the gripping jaws, the valve 69 should be turned to open the channel 67 to the inlet pipe 65, which operation will permit the fluid under pressure to pass through the conduit 12 into the front portion of the cylinder and force the piston 36 thereof rearwardly, in which operation it will be understood that the air or fluid located between the rear surface of the piston and the rear head or end thereof will be exhausted through the port 53, the conduit 13, the port 60, channel 58, and from thence through the exhaust port 66 of the valve casing.

Having thus fully described my invention what I claim as new and desire to secure by Letters Patent is—

1. The combination with a main shaft having a pair of longitudinal conduits adapted for communication with a supply of fluid under pressure, of a cylinder mounted on said shaft and having ports communicating with said conduits and provided at one of its ends with a plurality of radial guideways, a plurality of shafts journaled in the ends of the cylinder on corresponding sides of said guideways and each having a pair of opposed and spirally extended grooves, a pinion on each of said shafts, a rack bar slidably mounted in each guideway in mesh with said pinions, a jaw mounted on each of said rack bars, a piston mounted in the cylinder between the ports thereof and having openings for said shafts, a ball located in each of the grooves of each of the pinion carrying shafts, means communicatively connecting the said conduits with a supply of fluid under pressure, and a controlling valve located in said means.

2. The combination with a main shaft having a pair of longitudinal conduits adapted for communication with a supply of fluid under pressure, of a cylinder mounted on said shaft and having ports communicating with said conduits and provided at one of its ends with a plurality of radial guideways, a plurality of shafts journaled in the ends of the cylinder on corresponding

sides of said guideways and each having a pair of opposed and spirally extended grooves, a pinion on each of said shafts, a rack bar slidably mounted in each guideway in mesh with said pinions, a stepped jaw mounted on each of said rack bars, a piston mounted in the cylinder between the ports thereof and having openings for said shafts, a ball located in each of the grooves of each of the pinion carrying shafts, means communicatively connecting the said conduits with a supply of fluid under pressure, and a controlling valve located in said means.

3. The combination with a main shaft having a pair of longitudinal conduits adapted for communication with a supply of fluid under pressure, of a cylinder mounted on said shaft and having ports communicating with said conduits and provided at one of its ends with a plurality of guideways, shafts journaled in the ends of the cylinder on corresponding sides of said guideways and each having a pair of opposed and spirally extended grooves, a pinion on each of said shafts, a rack bar slidably mounted in each guideway in mesh with said pinions, a jaw mounted on each of said rack bars, a piston mounted in the cylinder between the ports thereof and having openings for said shafts, a ball located in each of the grooves of each of the pinion carrying shafts, a valve mechanism mounted on the main shaft and having communication with the conduits thereof and provided with an inlet and exhaust port, and a controlling valve mounted on said mechanism between said ports.

4. The combination with a main shaft having a pair of longitudinal conduits adapted for communication with a supply of fluid under pressure, of a cylinder mounted on said shaft and having ports communicating with said conduits and provided at one of its ends with a plurality of radial guideways, a plurality of shafts journaled in the ends of the cylinder on corresponding sides of said guideways and each having a pair of opposed and spirally extended grooves, a pinion on each of said shafts, a rack bar slidably mounted in each guideway in mesh with said pinions, a stepped jaw detachably mounted on each of said rack bars, a piston mounted in the cylinder between the ports thereof and having openings for said shafts, a ball located in each of the grooves of each of the pinion carrying shafts, a valve mechanism mounted on the main shaft and having communication with the conduits thereof and provided with an inlet and exhaust port, and a controlling valve mounted on said mechanism between said ports.

5. The combination with a supporting shaft having a pair of longitudinal con-

duits, of a cylinder axially mounted thereon and having ports communicating with said conduits and provided at one of its ends with a plurality of radial guideways, a plurality of shafts journaled in the ends of the cylinder between said guideways and each having a pair of opposed grooves spirally extended thereon in opposite directions, a pinion on each of said shafts, a rack bar slidably mounted in each guideway and in mesh with said pinions, a gripping jaw detachably mounted on each rack bar, a piston mounted in the cylinder between the ports thereof and having openings for said shafts, a ball located in each of the grooves of each of the pinion carrying shafts and carried by the piston, a pair of casings surrounding the supporting shaft and each having a passageway independently communicating with the conduits of said shaft, a connection uniting said passageways and having an inlet port communicating with a supply of fluid under pressure and an exhaust port, and a controlling valve located in said connection between the passageways of the casings and between said inlet and exhaust ports.

6. The combination with a main shaft having a pair of longitudinal conduits, of a cylinder mounted on said shaft and having ports communicating with said conduits and transversely extended screw threaded openings in at least one of its heads and provided at one of its ends with a plurality of radial guideways, screws located in said openings, a plurality of shafts journaled in the ends of the cylinder on corresponding sides of said guideways and each having a pair of opposed grooves spirally extended thereon in opposite directions, a pinion on each of said shafts, a rack bar slidably mounted in each guideway in mesh with said pinions, a jaw mounted on each of said rack bars, a piston mounted in the cylinder between the ports thereof and having openings for said shafts, a ball located in each of the grooves of each of the pinion carrying shafts and carried by the piston, means communicatively connecting the said conduits with a supply of fluid under pressure, and a controlling valve located in said means.

7. The combination with a main shaft having a pair of longitudinal conduits, of a cylinder mounted on said shaft and having ports communicating with said conduits and transversely extended screw threaded openings in each of its heads and provided at one of its ends with a plurality of radial guideways, screws located in said openings, a plurality of shafts journaled in the ends of the cylinder on corresponding sides of said guideways and each having a pair of opposed grooves spirally extended thereon in opposite directions, a pinion on each of

said shafts, a rack bar slidably mounted in each guideway in mesh with said pinions, a jaw mounted on each of said rack bars, a piston mounted in the cylinder between the ports thereof and having openings for
5 said shafts, a ball located in each of the grooves of each of the pinion carrying shafts and carried by the piston, a valve mechanism mounted on the main shaft and having communication with the conduits 10 thereof and provided with an inlet from a supply of fluid under pressure and an exhaust port, and a controlling valve mounted on said mechanism between said inlet and exhaust port.

WILLIAM H. PECK.