Dec. 8, 1925. 1,565,227

O. GARRISON

CHUCK

Filed Oct. 26, 1920 2 Sheets-Sheet 1

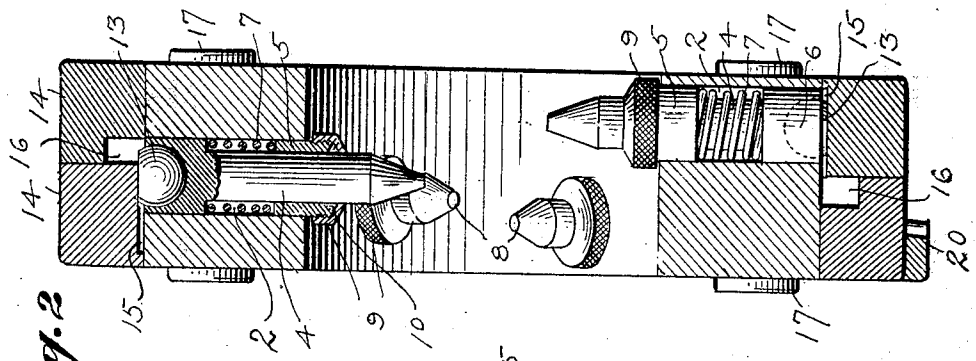


Fig. 2

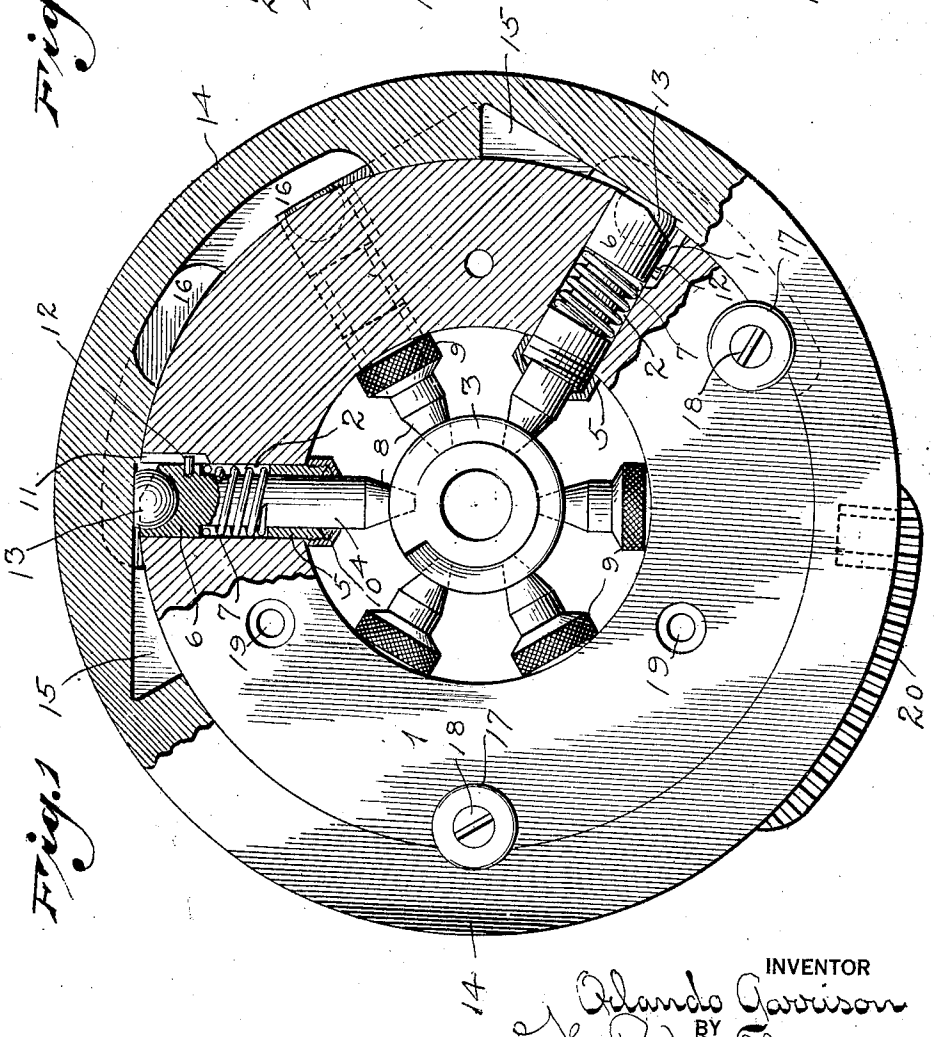


Fig. 1

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Fig. 3

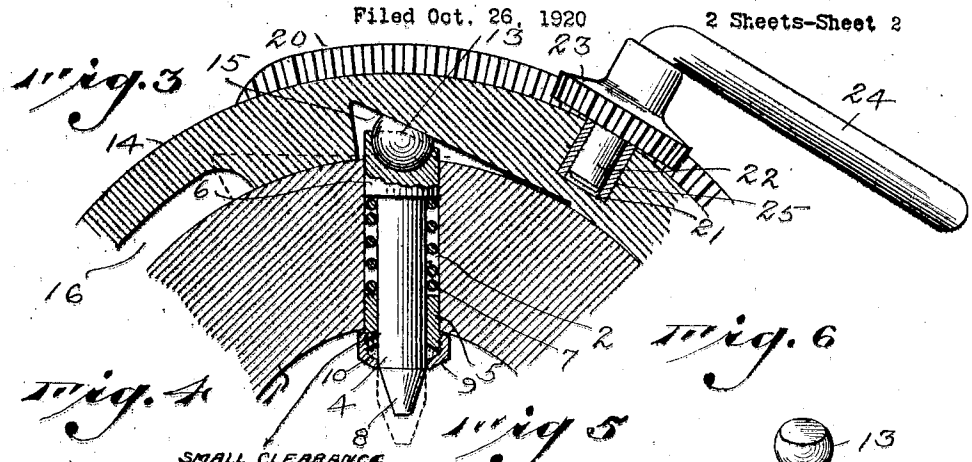


Fig. 6

Fig. 4

Fig. 5

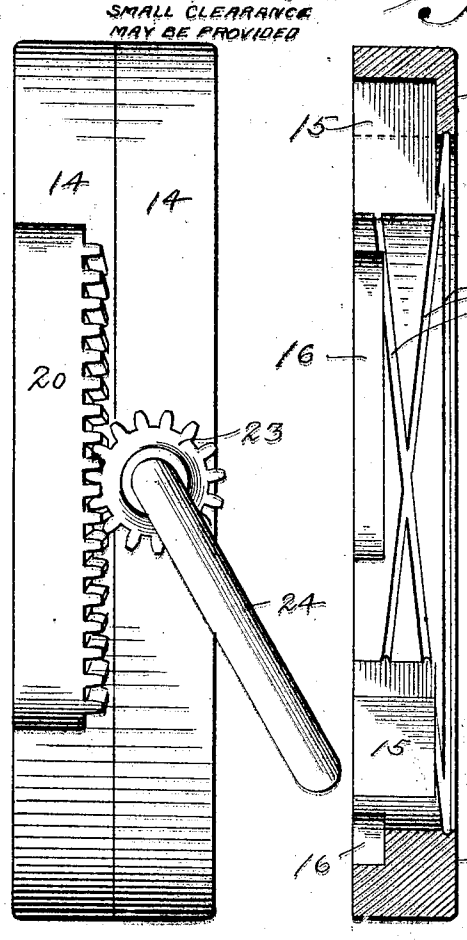


Fig. 7.

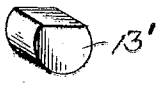
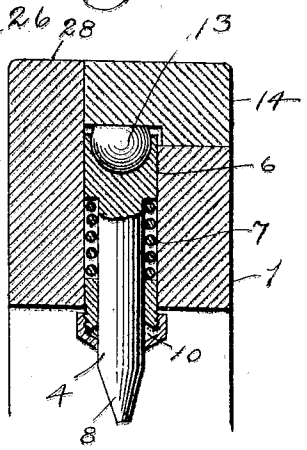


Fig. 8.



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Patented Dec. 8, 1925. 1,565,227

UNITED STATES PATENT OFFICE.

ORLANDO GARRISON, OF DAYTON, OHIO.

CHUCK.

Application filed October 26, 1920. Serial No. 419,637.

To all whom it may concern:

Be it known that I, ORLANDO GARRISON, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Chucks, of which the following is a specification.

My invention relates to chucks and more particularly to gear chucks, especially adapted for automatically centering and holding helical gears or worms, but which with modification of the engaging means, but employing the same general mechanism and mode of operation, can be adapted to other chucking purposes.

The object of the invention is to simplify the structure as well as the means and mode of operation of such devices, whereby they will not only be cheapened in construction, but will be more efficient in use, accurate and uniform in operation, easily controlled and unlikely to get out of repair.

A further object of the invention is to provide chucking means which will engage a helical gear or worm upon the pitch diameter intermediate the convolutions of the thread or teeth, thus centering the gear in relation with its pitch diameter, rather than in accordance with the root or crown of the tooth or thread, which may not be accurately formed.

A further object of the invention is to provide means for uniformly and simultaneously actuating the gear engaging members, whereby they will engage with substantially uniform pressure, and to further provide adjusting means whereby the pressure will be equalized, between different sets of work holding elements.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention consists of the features of construction, the parts and combinations thereof, and the mode of operation or their equivalents, as hereinafter described and set forth in the claims.

In the accompanying drawings, in which the preferred, but not necesarily the only embodiment of the invention, is disclosed, Fig. 1 is a front view of the assembled chuck forming the subject matter hereof, partly broken away, showing a worm gear engaged therein. Fig. 2 is a transverse sectional view of the assembled chuck. Fig. 3 is a detail sectionl view showing one of the work engaging plungers in its retracted or inoperative position, and the adjusting means for the several members. Fig. 4 is an exterior lateral view of the chuck, illustrating the adjusting gearing. Fig. 5 is a detail sectional view of one of the cam rings, removed from the chuck. Figs. 6 and 7 are detail views of contact or bearing shoes for the reciprocatory plunger. Fig. 8 is a detail sectional view of a modification of the construction shown in the preceding figures, wherein but a single series of work engaging elements, and a single cam ring are employed.

Like parts are indicated by similar characters of reference throughout the several views.

The present invention contemplates an annular head having therein a plurality of radially disposed longitudinally movable plungers, which are preferably though not necessarily arranged in two series. The plungers are spring retracted outwardly, and are forcibly projected inwardly in unison by means of a revoluble cam ring surrounding the exterior of the head. In the event that two series of plungers are employed, each series is provided with a separate cam ring, and adjusting means common to both rings is provided for effecting uniform adjustment of the plunger.

Referring to the drawing, 1 is an annular head, having therein a series of radially disposed holes or bores 2. The successive radial holes 2 are offset in relation with each other in the axial direction of the annular head 1, to agree with the pitch of the worm or other helical work body 3 to be centered and supported. Mounted in each of the radial holes 2 for reciprocatory movement in a radial direction is a plunger 4, having a sliding bearing in a sleeve or bushing 5, pressed into the inner end of the holes 2, and at its outer end having a somewhat enlarged head 6, having bearing engagment within the bore 2. Interposed between the inserted bushing 5 and the shoulder of the head 6, and surrounding the plunger 4 is a helical retracting spring 7, which bears at one end upon the bushing 5 and on the opposite end upon the head 6, tending to actuate the plunger 4 outwardly. At its inner end the plunger 4 is provided with a tapered extremity 8, the inclination or divergence of which agrees with the angle of the thread or teeth of the worm 3 to be engaged. The plungers 4 are of different

length and the tapered extremities 8 are differently proportioned to agree with the size and character of the work 3 to be held. The plungers 4 being radially disposed at different points throughout the length of the screw sleeve, it will be understood, are also located with special reference to the particular size and character of the worm gear to be operated upon. The bushings 5 project inwardly beyond the end of the bore 2, and are screw threaded to receive a compression cap 9, enclosing a collar 10 of packing material surrounding the plunger 4 intermediate the cap 9 and the ends of the bushings 5. This collar 10 of packing material serves to exclude water, grit and foreign material from the plunger bearings, and to retain lubricant therein. To prevent rotation of the plungers 4 the bore 2 is preferably provided with a laterally disposed communicating groove 11, engaged by a spline or stud 12, projecting from the head 6.

The head 6 of each of the plungers is formed with a terminal concave socket or seat in which is located a substantially semi-spherical bearing shoe 13. As shown in the drawing, these bearing shoes comprise truncated balls or spheres one side of which is ground off, to the extent of from one-fourth to one-third of the diameter to afford a plain or flat bearing face. This truncated spherical bearing member accurately fits with the socket or recess in the end of the plunger. To afford such accurately fitted bearing socket, the plunger head 6 is counterbored to approximately the desired depth and a hardened ball of the same diameter as the contact member 13 is then pressed thereinto, under heavy pressure prior to the hardening of the plunger. Such step is, however, merely an incident of manufacture, and may be varied or eliminated without departing from the invention. The truncated spherical bearing shoe 13 thus has a universal bearing, enabling it to variously adjust itself within its socket, without affecting the plunger by such adjusting movement.

To control the movement of the plunger 4, there is provided about the exterior of the annular head 1, a revoluble cam ring 14, having therein a series of cam depressions 15. In the drawings, these cam faces 15 have been shown as flat or straight in contour, and substantially tangentially arranged in relation with the inner circumference of the cam ring. These cam faces 15 are located within the interior circumference of the cam ring in such relation as to simultaneously engage the bearing shoes 13 of the different plungers pertaining to such ring in like relation. The flat face of the truncated spherical shoe 13 bears against the flat cam face 15 of the cam ring, thereby affording a wide uniform bearing surface, of contact. By rotating the cam ring 14, causing the cam surface 15 to pass over the contacting bearing shoes 13 with movement from the outer toward the inner end of such cam face 15, the plungers 4 are projected inwardly in unison one with the other, and with uniform degree of movement.

In the drawing, the plungers 4 are divided into two series, each of which is provided with its own cam ring 14, having therein the correspondingly located cam faces 15. These duplicate cam rings are located about the exterior of the annular head 1, in reverse relation, and bear one against the other as shown in Fig. 2. The spiral or helical allocation of the plungers 4 offset in the axial direction of the head 1 in relation with each other necessitates that one or more of such plungers will overlap the contacting faces of the respective cam rings. Such medially located plunger as is shown at the top in Fig. 2 will retain sufficient operative engagement with the cam face 15 of one of said rings to insure its proper operation, but will project laterally somewhat beyond the inner face of the ring into juxtaposition to the second cam ring 14. To prevent interference in such instances, the cam rings 14 are provided with clearance spaces or grooves 16, in their inner or adjacent faces, at points coincident with the location of plungers of the second series or those pertaining to the opposing cam rings. These cam grooves or spaces 16 are of sufficient length to permit the partial rotation of the cam ring necessary to actuate the plungers controlled thereby without interference with the plungers of the second series.

The cam rings 14 may be retained in position about the periphery of the head 1 by any suitable retaining means which will leave the ring and head free for relative rotary movement. In the present instance, there have been shown a series of buttons or collars 17, located in spaced relation adjacent to the periphery of the annular head 1, and overlapping the cam ring 14. These buttons or collars 17 are oppositely disposed as shown in Fig. 2, and are interconnected by screws or studs 18 extending thru suitable holes in the head 1. Intermediately disposed in different radial positions are counter-bored holes 19, extending transversely thru the head 1 by which the chuck may be secured to a face plate, a work table or other suitable support.

The cam rings 14 may be adjusted by manual effort as by spanners or other means for rotating the cam ring, but as a convenient and efficient adjusting means by which uniform pressure may be gradually effected, there has been provided upon the exterior or peripheral face of one of the cam rings 14 a short segment bar 20, containing gear

teeth, while in the opposing cam ring 14, at a corresponding point, there is provided a socket 21, to receive the pilot stud 22 of a gear pinion 23 carried upon a hand lever 24. The socket 21 is preferably provided with a hardened bushing 25. The gear pinion 23 is fixedly mounted upon the hand lever 24, and when the pilot stud 22 is engaged within the socket 21, the teeth of the pinion 23 will intermesh with the segmental gear rack 20 upon the second cam ring. In this construction, either cam ring is capable of movement independent of the other. Upon the rotation of the gear pinion 23, the gear pinion may travel over the segmental rack 20, carrying with it the cam ring 14 containing the socket 21, with which the pinion is engaged, or in lieu thereof, the pinion carrying ring may temporarily remain at rest, and upon rotation of the pinion the ring carrying the gear teeth 20 will be rotated, projecting the segmental rack bar past the pinion. The cam rings 14 having the least resistance will be the first to move, and when the plungers controlled thereby have been advanced into engagement with the work to afford resistance greater than that of the second cam ring, the latter will then rotate in relation with the first ring until the pressure exerted by the plungers carried by the respective ring is equalized, whereupon further adjustment of the gear pinion will effect a simultaneous differential movement of the cam rings 14, sufficient to firmly set the respective plungers 4 against the work 3 with uniform pressure.

Inasmuch as these chucks are frequently used upon grinding machines, in the presence of fine grit and water, the cam rings 14 are accurately fitted to the head, and to further insure exclusion of water and grit, the contact faces are provided with minute oil grooves or channels 26, which insures a uniform distribution of lubricant which will exclude water or moisture from the joints. As before mentioned, the water and grit is excluded from the plunger bearing by means of the packing collar 10.

In Fig. 7 there is shown a modification of the bearing shoe 13, wherein a cylindrical roller like member 13′ having a flattened face is provided in lieu of the truncated spherical bearing shoe 13. It will be obvious that in such construction in lieu of the spherical or concave socket, the end of the plunger would be provided with a transverse semicircular groove to receive the modified form of bearing shoe.

In Fig. 8, there is shown a modified construction employing but a single cam ring in lieu of the construction heretofore described. In such modification the annular head 1 is provided with a peripheral flange 28, against which the cam ring bears. The construction is otherwise as before described, except that in such instance, all of the plungers 4 are controlled by the single cam ring. In such construction one element of the actuating gearing is carried upon the peripheral flange 28 and the other element upon the revoluble cam face.

To accommodate the plungers 4 to slight variations of the worm due to shrinkage or warping in hardening or other slight inaccuracies of manufacture, the bearing bushings 5, thru which the plungers 4 reciprocate, are made with a loose fit, whereby the plunger is allowed a slight floating action within the bearing bushing by which it may automatically adjust itself to compensate for such variations. In practice this clearance provided has been but five thousandths of an inch, which permits a deviation of two and one half thousandths of an inch in either direction. This capability for compensation is found to be quite desirable for the usual character of standard production, although if every worm operated upon is very accurately cut and ground to size, such play of the plunger will be unnecessary.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific details shown, but that the means and construction herein disclosed comprise but one of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. In a chuck of the character described, an annular head, a plurality of radially disposed longitudinally movable plungers carried by said head, said plungers being offset in relation one with another in the axial direction of the annular head to form a helically arranged series, and means for simultaneously reciprocating the plungers.

2. In a gear chuck, an annular head, a plurality of radially disposed longitudinally movable plungers carried by the head, said plungers having conical heads shaped and proportioned to agree substantially with the indentations of the gear within which

they engage approximately upon the pitch line of the gear with clearance between the ends of the plungers and the bottoms of the indentations, and means for longitudinally adjusting said plungers.

3. In a chuck of the character described, an annular head, a plurality of radially disposed reciprocatory plungers carried by said head, said plungers being offset in relation with one another and separated into two helically arranged series, and independent actuating means for the plungers of each series.

4. In a chuck of the character described, an annular head, a plurality of radially disposed reciprocatory plungers carried by said head, said plungers being offset in relation with one another and separated into two helically arranged series, two independently rotatable adjusting rings mounted upon said head, each of said rings having operative engagement with the reciprocatory plungers of one series, whereby the plungers pertaining to each series are adjusted independent of the plungers of the other series by the relative rotation of the head and adjusting ring pertaining to such series.

5. In a chuck of the character described, an annular head, a plurality of radially disposed reciprocatory plungers arranged in a helical succession, and actuating means for the plungers by which a portion of the plungers may be simultaneously reciprocated independent of the remaining plungers and for subsequently reciprocating such remaining plungers.

6. In a worm chuck of the character described, an annular head, a plurality of radially disposed reciprocatory plungers carried thereby, said plungers having tapered extremities to be projected radially between adjacent threads of the worm gear and so shaped and proportioned as to engage the worm gear thread approximately at the pitch diameter of the worm gear, and means to reciprocate said plungers.

7. In a worm chuck of the character described, an annular head, a plurality of conical reciprocatory engaging elements disposed in different radial directions and carried by said head, the angularity of said conical elements being substantially in agreement with the angularity of the worm threads and adapted to engage said threads approximately upon the pitch line of the worm gear, and means to simultaneously advance the conical elements into engagement with the worm gear to be held.

8. In a worm chuck of the character described, an annular head, a plurality of worm engaging elements disposed in different radial directions and offset axially in relation with the head to agree with the helical direction of the worm threads, the engaging ends of said elements being shaped to enter between adjacent threads of the worm gear which they engage approximately upon the pitch line thereof, and means for simultaneously actuating the engaging elements into engagement with the worm gear to be held.

9. In a holder for helical gears and the like, a supporting member, a series of radially disposed truncated conical studs projecting therefrom with their apexes directed inwardly, said studs being shaped and proportioned to engage within the indentations of the gear substantially upon the pitch line of the gear teeth.

10. In a holder for helical gears and the like, a supporting member, a series of inwardly directed radial studs, located in spaced relation, in a helical succession agreeing with the helical pitch of the gear and contoured for lateral engagement with the teeth of the gear substantially upon the pitch line only thereof.

11. In a holder for helical gears and the like, a supporting member, a series of inwardly directed radially disposed studs, revolubly adjustable, each about its own axis, said studs being positioned and contoured for engagement within the indentations of the gear substantially upon the pitch line thereof, and independently revoluble to compensate for wear.

12. In a gear chuck and the like, a supporting member, a plurality of radially disposed inwardly directed reciprocatory plungers carried thereby, the inner ends of the plungers being conically tapered for engagement within the indentures of a gear to be held with the teeth of which the plungers laterally engage substantially upon the pitch line of such gear, and means to reciprocate the tapered plungers.

13. In a chuck for a helical gear member, an annular head, a plurality of radially disposed reciprocatory plungers, said plungers being arranged in a helical succession agreeing with the pitch of the gear member to be held, said plungers being co-related into different groups, and means for simultaneously reciprocating the co-related plungers of each group independent of the adjustment of the plungers of the other group.

14. In a chuck, an annular head, a plurality of reciprocatory plungers disposed in different radial positions carried by said head, means for actuating the plungers, a socket formed in the outer extremity of each plunger and a truncated spherical body seated in said socket for engagement with the actuating means.

15. In a chuck, an annular head, a plurality of reciprocatory plungers disposed in different radial positions carried by said head, means for actuating the plungers, and a bearing member interposed between the plunger and actuating means having a sub-

stantially flat bearing face engaging with one member and having rocking and revoluble engagement with the other member.

16. In a chuck for a helical gear member, an annular head, a series of radially disposed reciprocatory plungers carried by the head and arranged in a helical succession substantially agreeing with the helical pitch of the gear member to be engaged, a pair of independently adjustable rings, each controlling a plurality of plungers of said series mounted upon the head exteriorly of the corresponding plungers, and relatively rotatable in relation therewith, and independent of the ring pertaining to the other plungers, said rings having cam faces upon which the outer ends of the plungers abut whereby the plungers controlled by each ring are simultaneously actuated by the relative rotation of the head and corresponding ring and means for opposing the resistance of one ring against that of the other ring, to effect relative adjustment of the less resistant ring to afford uniform pressure of the plungers.

17. In a chuck for a helical gear member, a series of radially disposed reciprocatory plungers arranged in a helical succession substantially agreeing with the helical pitch of the member to be held, a pair of relatively adjustable rings for actuating different plungers of the series at different times, and operating means common to both rings by which the resistance of one ring may be opposed to that of the other ring to effect an equalized adjustment of the plungers.

18. In a chuck, an annular head, a plurality of reciprocatory plungers arranged in different radial positions carried by the head, two relatively rotatable cam rings carried by the head, internal cam faces on said ring upon which the outer end of the plungers abut, each ring controlling the movement of a portion of the plungers independent of the adjustment of the remainder of the plungers, and means common to both rings for rotating said rings in reverse directions in relation with each other and with the head to effect the adjustment of the plungers.

19. In a chuck, an annular head, a plurality of reciprocatory plungers arranged in different radial positions and carried by the head, two relatively rotatable adjusting rings mounted upon said head, independently controlling the adjustment of different plungers of the plurality, a series of gear teeth carried by one of the rings, a gear pinion carried by the other ring and meshing with the said gear teeth, whereby the rotation of said pinion will effect the rotation of the adjusting ring which meets with least resistance relatively to the other ring to effect the adjustment of the plungers under uniform pressure.

20. In a chuck, an annular head, a plurality of reciprocatory plungers arranged in different radial positions and carried by the head, two relatively rotatable adjusting rings surrounding the reciprocatory plungers and upon the inner circumference of which said plungers abut, and independently controlling the adjustment of different plungers of the plurality, and an actuating element engageable simultaneously with both rings to effect the relative rotation of the rings.

21. In a chuck, an annular head, a plurality of reciprocatory plungers arranged in different radial positions and carried by the head, said plungers being arranged in two groups, two relatively rotatable adjusting rings mounted upon said head, each ring being positioned in a plane common with the plungers comprising one of said group, and independently controlling the adjustment of different plungers comprising the respective groups, and an operating lever directly mounted upon one of said rings and having direct engagement with the other ring, either of which may comprise the fulcrum for the movement of the other by said lever, as the resistance of said rings to rotation may differ.

22. In a chuck, a plurality of reciprocatory plungers arranged in different radial positions relative to a common center, two relatively rotatable bodies controlling the adjustment of said plungers, concentrically arranged in relation with said common center in planes common with a plurality of such plungers, and upon which the plungers terminally abut, and an actuating element simultaneously engageable with both said relatively rotatable bodies for effecting their relative rotation to adjust said plungers, substantially as specified.

23. In a chuck, an annular head, a plurality of reciprocatory plungers disposed in different radial positions, carried by said head, means for actuating the plungers and bearings for the plungers in which one or more of the plungers have a loose float fit, whereby the plunger is capable of a limited side play independent of its reciprocatory movement.

In testimony whereof, I have hereunto set my hand this 15th day of October A. D. 1920.

ORLANDO GARRISON.