L. V. JOHNSON.

ROTARY ENGINE.

APPLICATION FILED JULY 6, 1920.

1,401,336.

Patented Dec. 27, 1921.

3 SHEETS—SHEET 1.

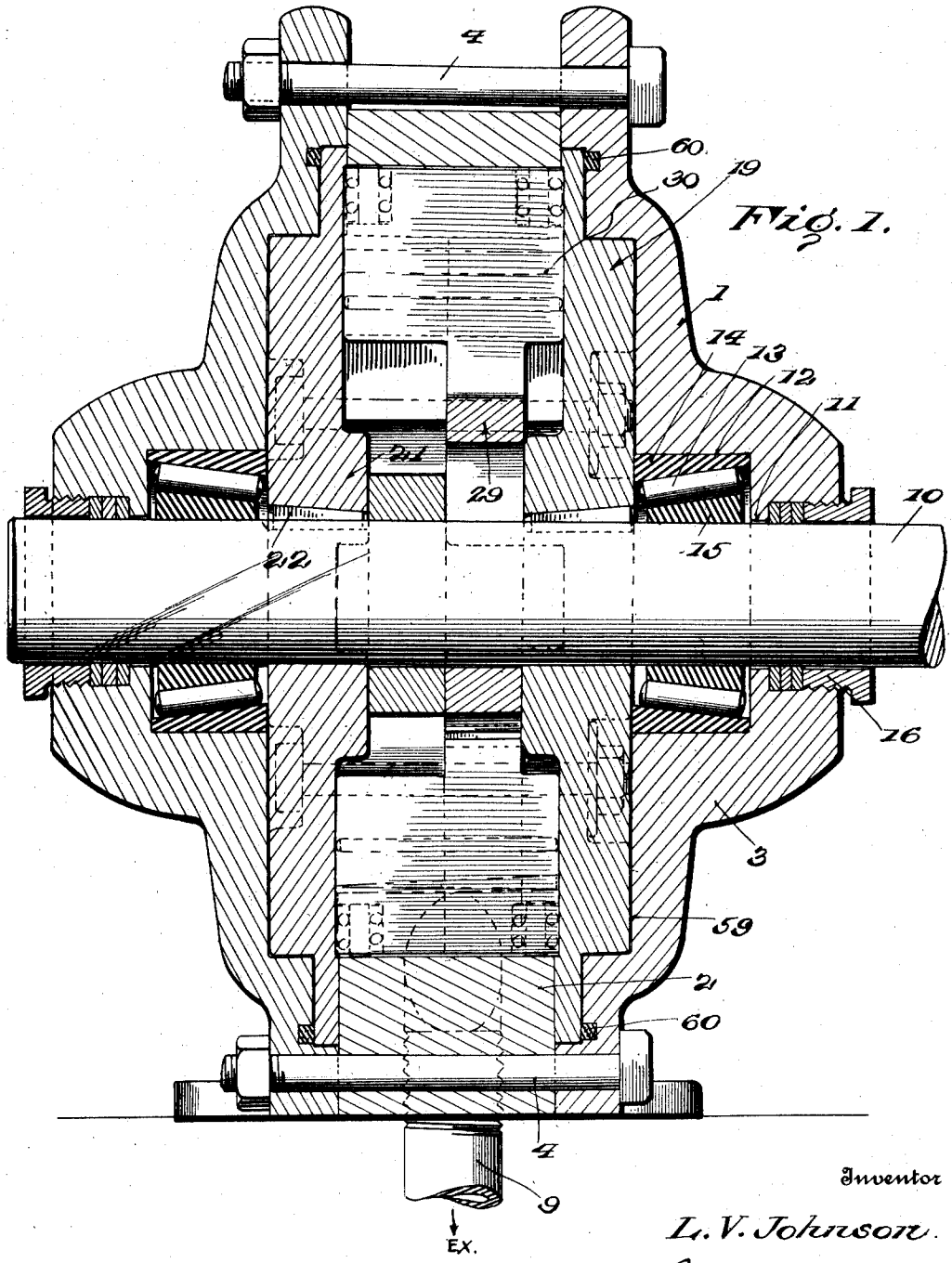


Fig. 1.

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3 SHEETS—SHEET 2.

Fig. 2.

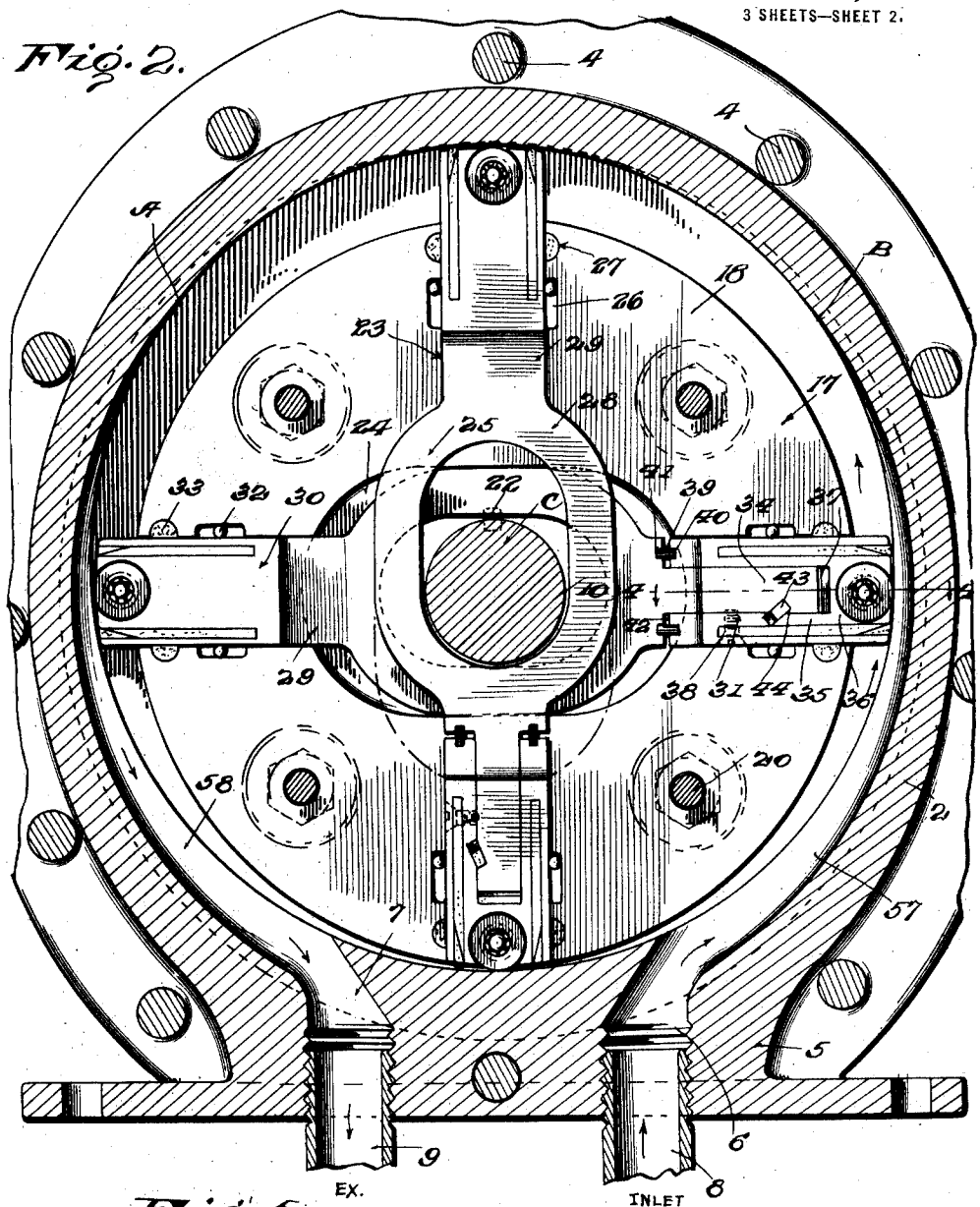
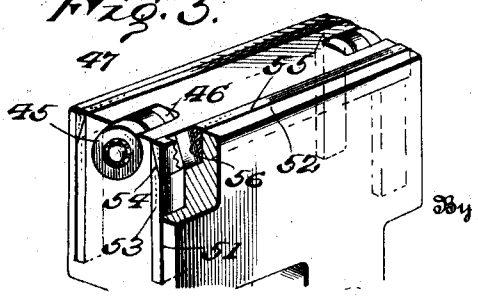


Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 3.

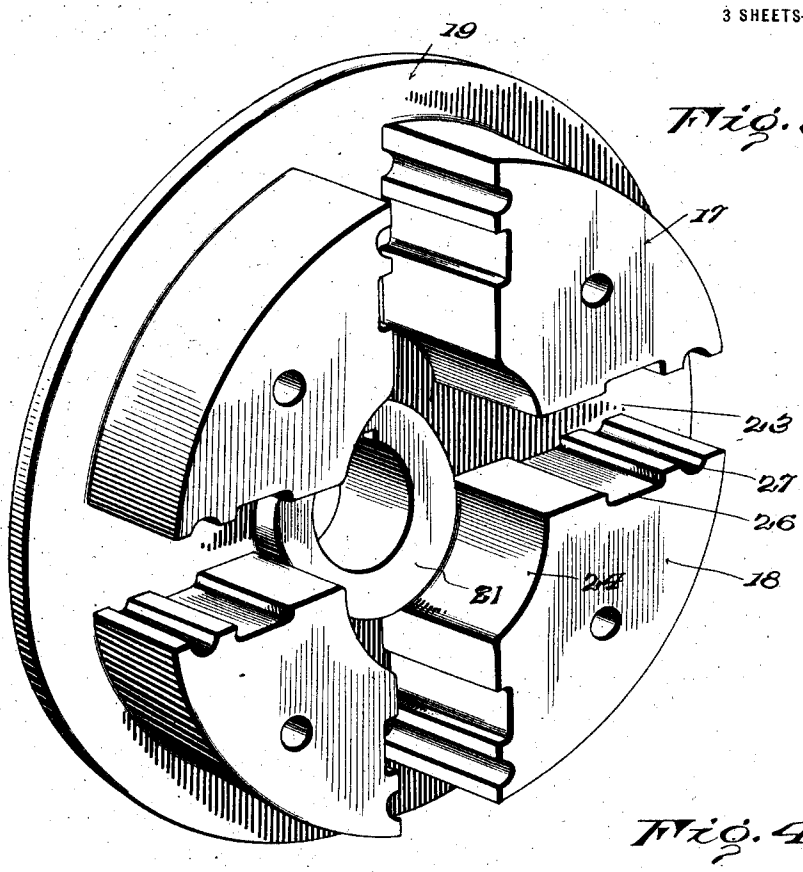
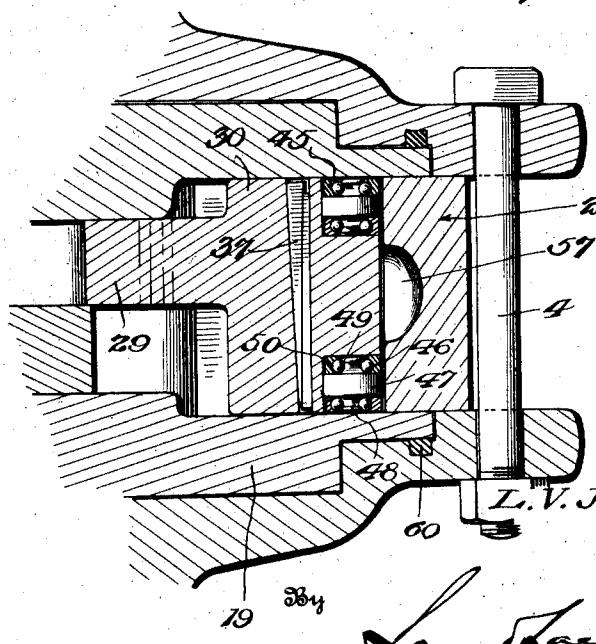


Fig. 4.



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UNITED STATES PATENT OFFICE.

LOUIS V. JOHNSON, OF FORT WORTH, TEXAS.

ROTARY ENGINE.

1,401,336. Specification of Letters Patent. Patented Dec. 27, 1921.

Application filed July 6, 1920. Serial No. 394,216.

To all whom it may concern:

Be it known that I, LOUIS V. JOHNSON, citizen of the United States, residing at Fort Worth, in the county of Tarrant and State of Texas, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

This invention relates to improvements in rotary fluid pressure engines and while the invention, in the embodiment illustrated in the drawings and to be hereinafter specifically described, is especially designed for use where steam is the motive fluid employed, I wish it understood that the principles of the invention may find embodiment in a modified structure for employment as a water motor, water pump, oil pump, ammonia pump or compressor, or as an engine or motor employing other motive fluids or as a pump for fluids other than those named. Also, it is to be understood that the engine embodying the invention may be modified to adapt it for use as a stationary power plant, or for use on steamships, automobiles, tractors, trucks, aeroplanes, etc.

The invention embodying the present invention is of that type comprising a casing or chamber within which is mounted for rotation of a rotor having radially slidable blades which coact at their outer ends with the circumferential wall of the casing and one object of the invention is to so construct the blades or pistons of the engine that the motive fluid will be positively retained so that maximum benefit will be derived therefrom, there being no possibility of leakage of the motive fluid about the blades or pistons.

Another object of the invention is to provide within the circumferential wall of the casing or chamber of the engine, a bypass passage for the live motive fluid, which passage will be so arranged that the pistons will receive the full force of the fluid and maximum power thus derived.

The invention also contemplates the provision of a similarly arranged bypass passage for the exhaust motive fluid.

Another object of the invention is to provide an engine of the class described of such construction that it will be unnecessary to employ a lubricant upon the contacting surfaces of the pistons and the circumferential wall of the casing or chamber of the engine.

A still further object of the invention is to provide a novel arrangement of means for reducing to a minimum the friction between these surfaces without, however, impairing the fluid-tight engagement between these parts.

The invention also has as a further object the provision of a novel means for providing a fluid-tight contact between the outer ends of the pistons and the circumferential wall of the casing.

In the accompanying drawings:

Figure 1 is a vertical transverse sectional view through an engine constructed in accordance with the principles of the invention,

Fig. 2 is a vertical sectional view taken in a plane at right angles to the plane of Fig. 1,

Fig. 3 is a perspective view of one section of the rotor of the engine,

Fig. 4 is a detail horizontal sectional view taken substantially on the line 4—4 of Fig. 2,

Fig. 5 is a perspective view, partly in section, illustrating the construction of one end of one of the pistons.

The casing of the engine is indicated in general by the numeral 1 and the same comprises a circumferential wall 2 and side walls 3, these parts being united by means of bolts 4. The circumferential wall 2 is provided with a base portion 5 adapted to be secured in any suitable manner to a supporting surface upon which the engine as a whole is disposed, and this base portion is formed with an inlet port 6 and an exhaust port 7 into which ports are respectively fitted pipes 8 and 9, the former leading from any suitable source of motive fluid supply and the latter to any convenient point of discharge. The engine shaft is indicated by the numeral 10 and the same is fitted through bearing openings 11 formed in alinement in the sides 3 of the casing, these sides being preferably recessed in their inner faces as at 12 to accommodate roller bearings 13 and their races 14 and 15, and in their outer faces being constructed for the employment of stuffing boxes 16 through which the shaft 10 extends in the manner best shown in Fig. 1 of the drawings.

At this point it is to be noted, and particularly by reference to Fig. 2 of the draw-

ings, that the inner surface of the circumferential wall 2 of the engine casing is not of cylindrical form, although this surface of the said wall between the points A and B in Fig. 2, describes the arc of a circle having as its center the point C. This point, however, is above the axis of the engine shaft 10 as will be evident by reference to the said Fig. 2. The portion of the surface of the wall of the casing between and below the points A and B is eccentric to the point C, and it will be observed that horizontally the cylinder is of greater internal diameter than vertically.

The rotor comprises a pair of counterpart sections one of which is clearly illustrated in Fig. 3 of the drawings. These sections, which are indicated by the numeral 17, are fitted together face to face and each comprises a cylindrical body portion 18 and a head portion 19 which is of greater diameter than the body portion 18 and projects peripherally beyond the said body portion 18, the two portions being, however, concentric. The two rotor sections are secured together by any suitable means as for example by bolts 20, and the sections are provided with hub portions 21 secured by keys 22 to the shaft 10 so that the rotor is held for rotation with the said shaft. Each section 17 of the rotor is formed in its body portion 18 with intersecting diametric slots or recesses 23 which extend from the abutting faces of the sections to the inner faces of the head portions 19 and thus divide the said body into segments. Also, the body is formed centrally or, in other words, in the corners of its segments, with recesses 24 which receive the yoke-shaped body portions 25 of the pistons of the rotor. For a purpose to be presently explained, the opposing walls of each slot 23 are formed with oppositely located recesses 26 and 27. The pistons, which are indicated in general by the numeral 28, include, in addition to their intermediate yoke portions 25, which portions straddle the shaft 10 in the manner shown in Fig. 2, relatively short shank portions 29 terminating in the piston heads. Each piston has two heads, one indicated in general by the numeral 30 and the other in general by the numeral 31. The head 30 of each piston is of integral construction and of a width equal to the width of the chamber of the engine casing. When disposed in position, the heads 30 and 31 of each piston are received slidably in diametrically opposite ones of the slots 23, and the said piston heads work in and out in these slots as the rotor turns about its axis. In order to reduce friction, bearing rollers 32 are arranged within the recesses 26 and have bearing between the inner walls of these recesses and the opposing faces or sides of the respective piston heads. In order to prevent leakage of the motive fluid employed, suitable packings 33 are arranged within the recesses 27 and contact the said faces or sides of the piston heads.

As before stated, the heads 30 of the pistons are integral or, in other words, they are an integral part with their shanks 29 but the heads 31 differ somewhat in this respect as in this case each shank portion 29 is provided with an extension 34 straddled by the spaced side portions 35 of the body of the piston head, which body is indicated by the numeral 36. Thus, in this latter instance, the piston head is formed separate from the shank 29 and slidably adjustably fits the extension 34 of the shank so that the head may be lengthened or shortened and thus the piston as a whole may be correspondingly lengthened or shortened so that in all positions of rotation of the rotor the outer ends of the heads will properly contact the inner surface of the circumferential wall 2 of the engine casing. In order that the body 36 of the piston head 31 may be moved or adjusted in an outward direction to lengthen the piston, wedge shims 37 are disposed within the space between the outer end of the extension 34 and that face of the body which is located between the spaced portions 35. Of course, by driving these shims together, the body of the head will be forced in an outward direction and, after the desired adjustment has been obtained, the body may be secured in its position of adjustment by the tightening of a set screw 38 which is fitted through one of the spaced portions 35 and bears at its inner end against the adjacent face of the extension 34. In order to prevent relative spreading of the spaced portions 35, keys 39 are driven into recesses 40 and 41 formed respectively in the inner ends of the spaced portions 35 and in shoulders 42 provided at the juncture of the extension 34 with its respective shank 29.

In order that the body 36 may be forced inwardly in adjusting the same where it is required to shorten the piston, a key 43 may be driven into diagonally formed recesses 44 in the inner face of one of the spaced portions 35 and the adjacent side face of the extension 34, the diagonal disposition of these recesses and the key 46 serving to draw the body 36 inwardly as the key is driven into place. The key is illustrated in its entirety in Fig. 2 of the drawing, but it will be understood that after it has been driven in to a proper distance to suitably adjust the body of the head, it is to be cut off flush with the face of the piston head as a whole.

In order to reduce to a minimum the frictional contact between the outer ends of the pistons and the circumferential wall of the

casing, it is preferable that the outer face of each piston head be formed in each of its ends with an approximately cylindrical recess 45 opening through said face and through the adjacent end face of the head, and disposed within each of these recesses is an anti-friction device comprising bearing rings 46 and an anti-friction roller 47 which is disposed between the rings and has projecting spindle portions 48 which extend into the rings 46 and are surrounded by bearing balls 49 arranged within recesses 50 formed within said rings. The rings 46 may be retained within the recesses 45 in any desired manner, and the peripheries of the rollers 47 project slightly beyond the end face of the respective piston head and have rolling contact with the inner surface of the circumferential wall 2 of the casing.

In order to provide a fluid-tight fit between the piston heads and the casing walls, packing means is provided which will now be described. Recesses 51 are formed in the end faces of the two piston heads in front and in rear of the respective recesses 45, and these recesses 51 at their outer ends are connected by transversely extending recesses 52 formed in the outer end faces of the said piston head. Disposed within the recesses 51 are strips 53 which have their outer ends beveled as indicated by the numeral 54 and projected into the ends of the recesses 52. Packing strips 55 are arranged longitudinally within the recesses 52 and are beveled upon one face as indicated by the numeral 56 so that their said beveled faces will ride against the beveled ends 54 of the respective strips 53. Thus, due to centrifugal force and to the pressure exerted against the projecting outer edge portions of the strips 55, the strips will ride outwardly upon the bevels 54 and will thus at all times snugly contact the inner face of the circumferential wall 2 of the engine casing.

The inlet port 6 for the casing has leading from it a bypass passage 57 which is formed circumferentially in the wall 2 of the casing and gradually decreasing in depth as it recedes from its intake end, the said bypass passage terminating substantially at the point B. Likewise, an exhaust passage 58 is formed in the said wall 2 and communicates with the exhaust port 7, this passage terminating at the point A. Referring now to Fig. 2 of the drawings, it will be observed that when the rotor is, for example, in the position shown in this figure, the steam or other motive fluid employed will pass through the passage 57 and past the outer end of the right hand piston head in the said figure and exert its pressure against the uppermost piston head in the said figure. It will also be understood that exhaust fluid will pass, in the position of the parts illustrated, about the left hand piston to the exhaust port 7 without being trapped between the uppermost piston and the said left hand piston in the said figure. Between the points A and B, however there can be no passage of the motive fluid about the ends of the pistons and, therefore, while the pistons are successively moved between these points, they will receive the full force of the motive fluid employed.

An engine constructed in accordance with the present invention is extremely durable in its construction and in actual operation it has been found that the same will operate with extreme smoothness and without vibration and will develop great horsepower in proportion to its size and likewise in proportion to the pressure required and the amount of fuel necessary to be consumed in developing the pressure.

By reference to Fig. 1 of the drawings, it will be observed that the head portions 19 of the rotor sections are rotatably seated within correspondingly formed or shaped recesses within the inner faces of the sides 1 of the engine casing, these recesses being indicated by the numeral 59, and if desired, annular packing gaskets 60 may be employed between the peripheral portions of the side faces of the head portions 19 and the walls of the recesses 59.

Having thus described the invention, what is claimed as new is:

1. In a rotary fluid pressure engine, a casing having an inlet and an exhaust communicating with its chamber, a rotor within the chamber, and a piston carried by the rotor, the said piston including a head having an end presented to the circumferential wall of the chamber, anti-friction means carried by the head for coaction with the said wall, and means at opposite sides of the said anti-friction means, in the direction of rotation of the rotor, establishing fluid-tight connection between the piston head and the walls of the casing.

2. In a rotary fluid pressure engine, a casing having an inlet and an exhaust communicating with its chamber, a rotor within the chamber, and a piston carried by the rotor and having a head presented at its outer end to the circumferential wall of the chamber, anti-friction means carried by the head and coacting with the said wall of the chamber, and packing means located in front and in rear of said anti-friction means and carried by the piston head and coacting with the said wall of the chamber, said packing means comprising a strip extending transversely of the head and having a beveled face, and the said head carrying a beveled portion seating the said face.

3. In a rotary fluid pressure engine, a casing having an inlet and an exhaust communicating with its chamber, a rotor with-

in the chamber, and a piston carried by the rotor for coaction with the circumferential wall of the casing, the said piston having a shank portion and a head, the latter including spaced portions straddling the shank portion whereby the head is slidably adjustably assembled with the said shank portion, means coacting with the head and shank portions for preventing relative spreading of the spaced portions of the head, and means whereby the head may be secured in positions of adjustment.

In testimony whereof I affix my signature.

LOUIS V. JOHNSON. [L. S.]