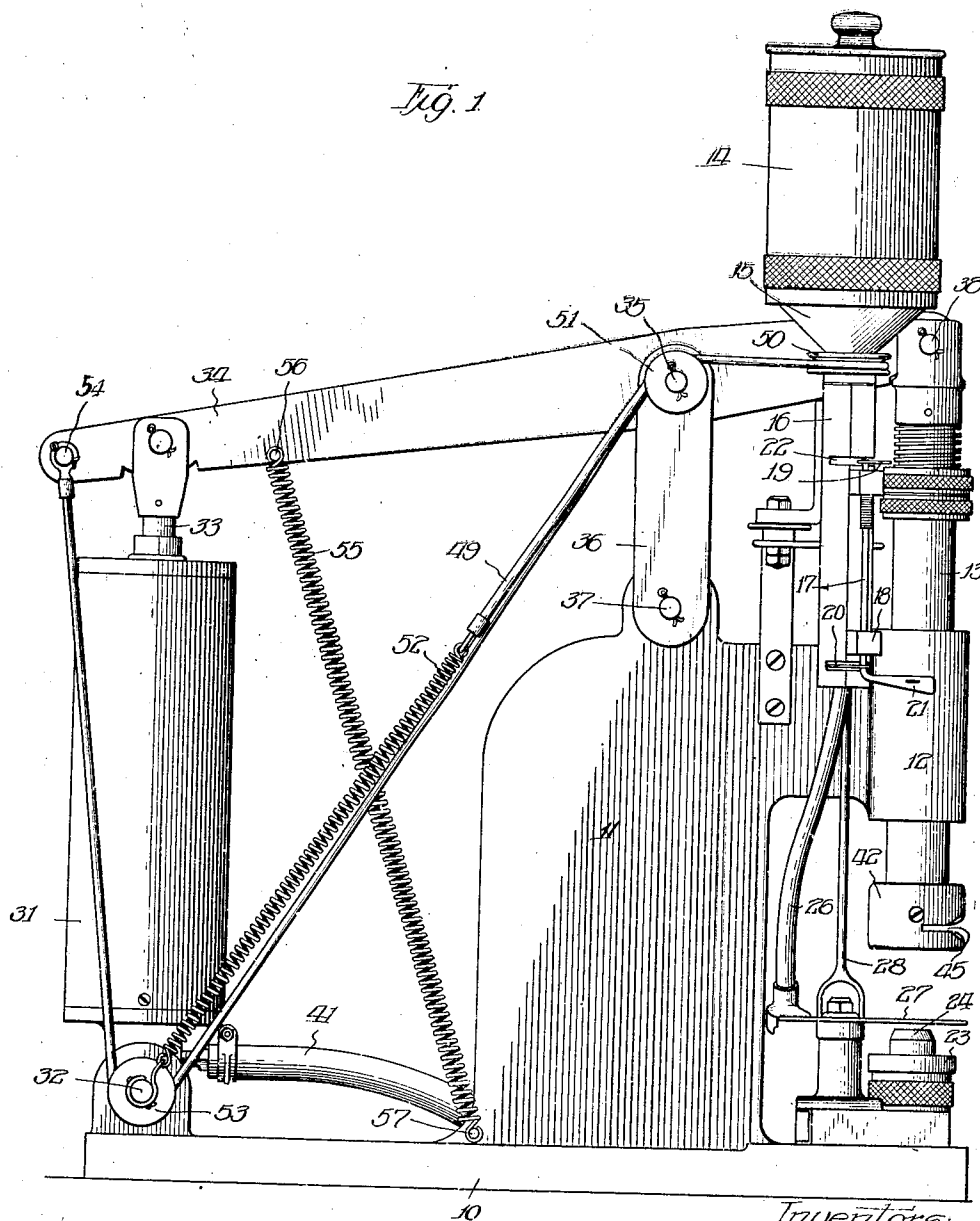


A. H. LONBOM AND J. R. PERRY,
 BALL RACE ASSEMBLING MACHINE.
 APPLICATION FILED JULY 16, 1920.

1,437,431.

Patented Dec. 5, 1922.
 4 SHEETS—SHEET 1.



Witness:
 R. Burkhardt.

Inventors:
 Axel H. Lombom
 John R. Perry,
 McKinson, Hunter, Byron & Knight
 attys.

A. H. LONBOM AND J. R. PERRY.
 BALL RACE ASSEMBLING MACHINE.
 APPLICATION FILED JULY 16, 1920.

1,437,431.

Patented Dec. 5, 1922.
 4 SHEETS—SHEET 2.

Fig. 2.

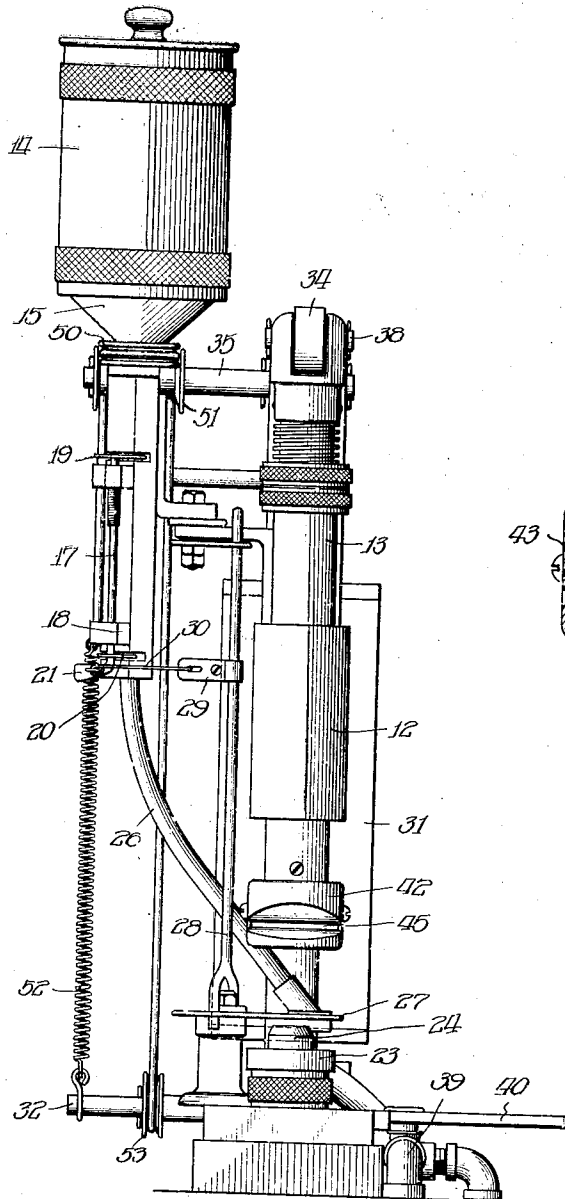
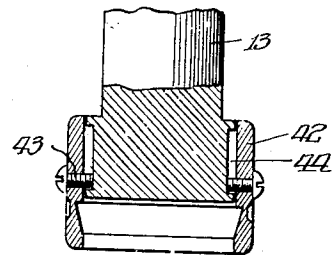


Fig. 3.



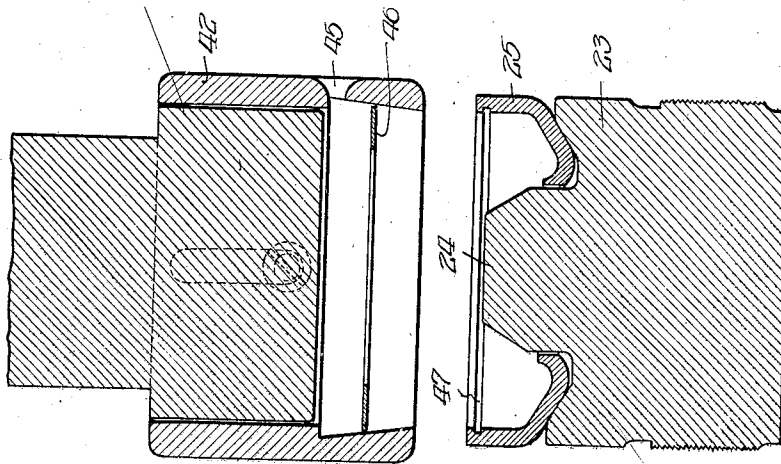
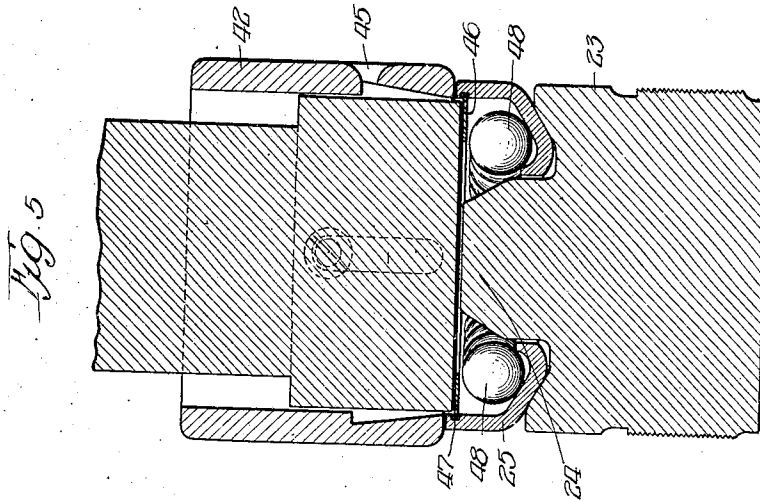
Witness:
A. Burkhardt

Inventors:
 Axel H. Lonbom
 John R. Perry,
 By *Hickinson, Huxley, Bynum & Knight*
attys.

A. H. LONBOM AND J. R. PERRY.
 BALL RACE ASSEMBLING MACHINE.
 APPLICATION FILED JULY 16, 1920.

1,437,431.

Patented Dec. 5, 1922.
 4 SHEETS—SHEET 3.



Witness:
 A. Burkhardt

Inventors
 Axel H. Lombom
 John R. Perry
 By *McKinson, Huxley, Rogers & Knight*
 Attys.

A. H. LONBOM AND J. R. PERRY.
 BALL RACE ASSEMBLING MACHINE.
 APPLICATION FILED JULY 16, 1920.

1,437,431.

Patented Dec. 5, 1922.
 4 SHEETS—SHEET 4.

Fig. 6

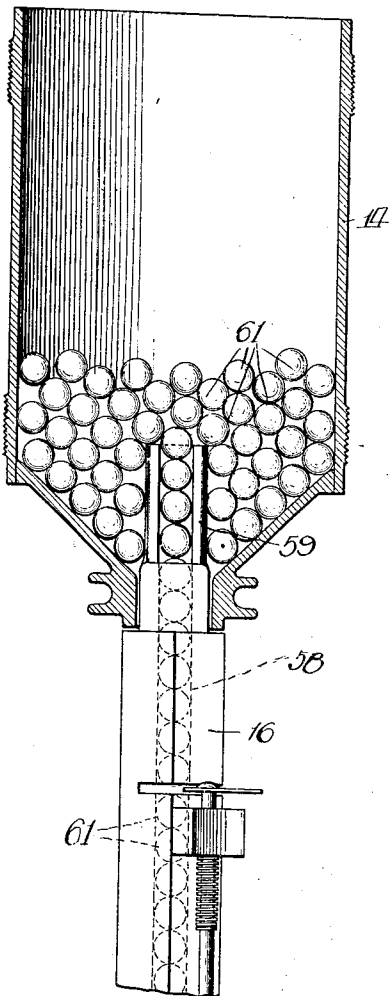


Fig. 7

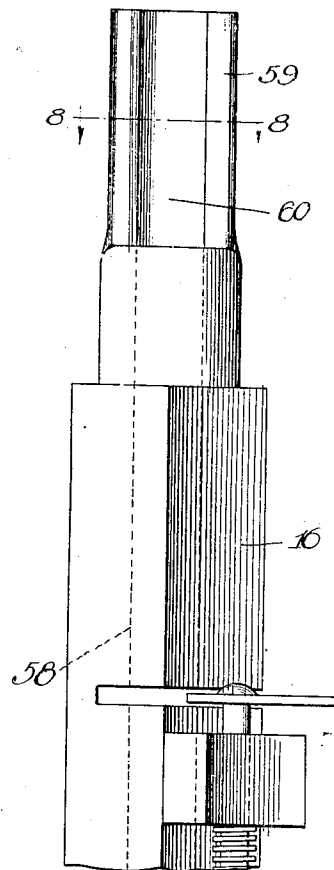
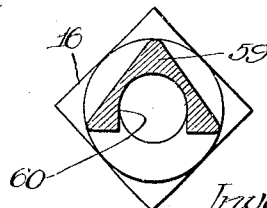


Fig. 8



Witness:
 A. Burkhardt

Inventors:
 Axel H. Lombom
 John R. Perry,
 By *McKinson, Hewley, Dupont & Knight* attys

UNITED STATES PATENT OFFICE.

AXEL H. LONBOM AND JOHN R. PERRY, OF DANVILLE, ILLINOIS, ASSIGNORS TO
ALLITH-PROUTY COMPANY, OF DANVILLE, ILLINOIS, A CORPORATION OF ILLI-
NOIS.

BALL-RACE-ASSEMBLING MACHINE.

Application filed July 16, 1920. Serial No. 396,642.

To all whom it may concern:

Be it known that we, AXEL H. LONBOM and JOHN R. PERRY, both citizens of the United States, residing at Danville, in the county of Vermilion and State of Illinois, have invented certain new and useful Improvements in Ball-Race-Assembling Machines, of which the following is a specification.

Our invention relates to an apparatus for assembling ball races for ball bearings.

An object of our invention is to provide an apparatus whereby ball races may be quickly, easily and economically assembled.

Another object is to provide a ball race assembling machine which will be efficient in operation and which will be especially adaptable for successful commercial use.

Our apparatus includes means for measuring a predetermined quantity of balls, delivering the same to the races, and additional means for attaching a cover ring to the races in such manner as to retain the balls in proper position therein.

Our invention will be more fully understood from the specification and drawings and will be particularly pointed out in the appended claims.

In the drawings,—

Figure 1 is a side view of the preferred embodiment of our invention;

Figure 2 is an end view of Figure 1, looking at the right hand end thereof;

Figure 3 is a vertical sectional view of a detail of the plunger;

Figure 4 is an enlarged vertical sectional view of the plunger, ball race and support for the race, with the parts shown prior to the insertion of the balls in the race, and of the cover thereto;

Figure 5 is a view similar to Figure 4, showing the ring in position overlying the balls in the race;

Figure 6 is an enlarged vertical sectional view through the container for the bearing elements, showing a means for arranging the bearing elements in columnar formation;

Figure 7 is an enlarged view of the counting chamber; and

Figure 8 is a transverse section on line 8—8 of Figure 7.

The machine as embodied herein includes a base 10 which may be mounted in any de-

sirable manner on a table or other suitable support. An upright 11 rises from the base 10 and has an L-shaped end carrying an enlarged sleeve 12 in which a piston 13 is reciprocally mounted. Suitably supported above and by the frame member 11 is a container 14 in which a quantity of balls may be placed for delivery, as hereinafter described, in measured quantities to the ball races. The container 14 has a funnel-shaped lower end 15 in communication with what we term a counting chamber 16. The chamber is hollow and its interior is of size sufficient to arrange the balls which are delivered thereto in a vertical column. Outwardly of the chamber 16 a shaft 17 is mounted in suitable bearings 18, which shaft carries laterally extending top and bottom shutters 19 and 20, the shutters being mounted on the shaft in different angular positions with respect thereto. A handle 21 is formed by bending the lower end of the shaft in such manner as to be readily accessible for use. The shutters 19 and 20 are adapted to enter correspondingly disposed slots 22 in the counting chamber, for a purpose to be explained hereinafter.

On the base 10 and immediately below the plunger 13 is a cup-centering device 23 having a centrally disposed upstanding projection or hub 24, the purpose of this being to receive a ball race 25 and center the same in such manner as to be acted on by the plunger 13, as will be more fully explained. Extending from the lower end of the counting chamber 16 in such manner as to be moved over and away from the ball race 25 is a flexible tube 26 carried at the end of an arm 27 mounted on a shaft 28 which extends upwardly from the base 10 alongside the counting chamber 16. The rod 28 has a laterally extending arm 29 which is connected by means of a link 30 with the handle 21 of the shaft 17, the parts being so arranged that as the arm 27 is turned to bring the delivery end of the flexible tube 26 into position to deliver balls to the race 25, the shaft 17 will be moved to cause the lower shutter 20, which normally extends within the chamber 16, to be withdrawn, and the upper shutter 19 to be moved therein. This movement of the shutters permits the balls between the shutters 20 and 19 to be delivered to the ball

race 25. The adjustment of the shutters 19 and 20 determines the quantity of balls which may be delivered to the counting chamber from the container 14, and which quantity may be varied as conditions require.

Mounted on a pivot 32 at the back or rear of the base 10 is a fluid pressure cylinder 31, arranged so as to rock with respect to the base 10. Projecting from the upper end of the cylinder is a piston 33 connected at one end of an arm 34, which arm is pivoted at 35 to a link 36 extending upwardly from the upright 11 of the frame, and which link is preferably pivoted at 37 to the upright; the purpose of this construction being to permit rocking of the arm 34 as the piston 33 is caused to move. The other end of the arm 34 is connected by means of a pivot 38 to the upper end of the plunger 13, whereby to reciprocate said plunger as the piston 33 is operated. Adjacent the cup-centering device 23 is a valve 39 operated by a handle 40, which valve controls communication through a conduit 41 with the interior of the fluid pressure cylinder 31, so that as the handle 40 is moved the piston 33 may be caused to rock the arm 34.

The lower end of the plunger 13 has a head member 42 encircling the lower end thereof and slidably supported thereon by pins cooperating with slots 44 in the plunger head. One side of the head 42 is provided with a slot 45 into which a ball-retaining ring 46 may be inserted for application to the ball race 25. The interior of the lower portion of the head 42 is inclined as shown for the purpose of preventing the ring 46 from falling out and permitting movement of the plunger 13 relatively to the head 42. That is to say, said head 42 is shaped on its interior in the form of a truncated cone.

The operation of our device is as follows:

The parts being in the position shown in Figure 1, that is, in normal position, a quantity of balls is put into the container 14. Immediately, by reason of gravity, these descend into the counting chamber 16, where, by reason of the shutter 20 projecting into said chamber, the column of balls is brought to rest. A ball race 25 is then placed on the ring-centering device 23 and the arm 27 rotated by the operator of the machine. The rotation of this handle, by reason of the link connections with the shaft 17, causes the upper shutter 19 to move into the path of balls in the counting chamber, preventing the passage of any more from the container 14 into the counting chamber. Continued movement of the shaft moves the lower shutter 20 out of the path of the balls and the quantity of balls in the counting chamber then passes through the flexible conductor 26 into the ball race 25. A ball-retaining ring 46 is then inserted

through the slot 45 in the head 42 on the plunger, as shown in Figure 4. When the ring 46 has been placed in position, the fluid control valve 40 is operated to cause the plunger to descend. The plunger and its head 42 will descend until the head 42 engages the upper edge of the ball race 25, whereupon it is brought to rest. By reason of the mounting of the head 42 on the plunger 13, whereby relative movement is possible, continued movement of the plunger is permitted. The plunger then engages the ring 46 and moves the same downwardly and by reason of the converging walls of the lower portion of the head 42 slightly bends the ring 46 so that the same is forced into the ring-receiving recess 47 formed near the upper edge of the ball race 25. By reason of the resiliency of the ring the same immediately assumes its normal shape in the recess 47, which is clearly shown in Figure 5 of the drawings. When in this position the ring 46 acts to retain the balls in the race 25, so as to prevent escape of the balls from the race. The valve handle 40 is then actuated to retract the plunger 13 so that the assembled ball race may be removed and another race 25 be put in position for filling in the manner before described.

We have shown a belt 49 passing around a pulley 50 integral with the lower end of the ball container 14 and which belt passes over suitable pulleys 51 carried by the pivots 35 of links 36. One end of the belt is connected to a spring 52, the other end of which spring is attached to the pivot 32 of the cylinder 31. The other end of the belt is continued downwardly over a pulley 53 carried on the pivot 32 and upwardly where the belt is connected to the arm 34 by means of a pin 54 or other suitable connection. A spring 55 is connected at one end 56 to the arm 34 and at the other end 57 to any suitable portion of the base or frame, which spring acts to return the parts to normal or inoperative position, which is the position shown in Figures 1 and 2 of the drawings. It will be observed, therefore, that as the piston 13 is reciprocated the belt 49 will cause the ball container 14 to rotate, which action serves in aiding the discharge of the balls into the counting chamber 16.

Referring to Figure 6 of the drawings, there is shown in section the interior of the container 14. The counting chamber 16 communicates with the interior of the container 14 by means of a member having in the present instance a cylindrical opening 58 extending therethrough, the upper end of the container being extended at 59 and having one side of the cylindrical opening 58 exposed, as at 60. This portion of the counting chamber extends inwardly of the bottom of the container, so that the bearing ele-

ments (in the present instance being balls 61) may enter the cylindrical opening 58 in the counting chamber and by reason of the construction of such opening, be arranged in columnar form, so as to be delivered to the ball race 25 for the purpose hereinbefore described.

It will be observed that by our invention it is possible to quickly and efficiently assemble ball races with the requisite number of balls therein and with the ball-retaining ring suitably secured therein. The capacity of the machine is limited only by the ability of the operator to supply empty ball races and cover rings to the various parts and operate the valve control handle 40.

No means are disclosed herein for securing relative adjustment between the upper and lower shutters 19 and 20 whereby to vary the number of balls delivered from the container 14 to the ball race. Suitable means for this purpose will occur to those skilled in the art.

While we have described more or less precisely the details of our invention, we do not wish to be understood as limiting ourselves thereto, as we contemplate changes in form and the proportion of parts and substitution of equivalents as circumstances may suggest or render expedient, without departing from the spirit of our invention.

We claim:

1. In a device of the character described, a hopper for balls, means for measuring and delivering by gravity a predetermined number of said balls to a ball race and means for pressing a retaining member into said ball race for retaining said balls in proper position.

2. In a device of the character described, ball race positioning means, means for measuring and delivering by gravity a predetermined number of balls to a ball race located on said positioning means, and means for pressing a retaining member into said ball race for retaining said balls in proper position.

3. In a device of the character described, a hopper for balls, means connecting with said hopper for causing said balls to take a position in a column and means for measuring and conducting a predetermined number of said balls to a ball race.

4. In a device of the character described, a hopper for balls, means connecting with said hopper for causing said balls to take a position in a column, means for measuring and conducting a predetermined number of balls to a ball race, said hopper being provided with means for moving same to insure free action of the balls within said hopper.

5. In a device of the character described, a hopper for balls, agitating means for said hopper, means for measuring and delivering by gravity a predetermined number of

said balls to a ball race, means for pressing a retaining member into said ball race for retaining said balls in proper position.

6. In a device of the character described, a hopper for balls, means for measuring and delivering by gravity a predetermined number of said balls to a ball race, means for pressing a retaining member into said ball race for retaining said balls in proper position and agitating means for said hopper, said agitating means being in cooperative association with said pressing means.

7. In ball race filling mechanism, in combination, ball race positioning means, and a plunger, said plunger having a collar movable relative thereto for locating the retaining member for a ball race, said plunger being adapted to force said retaining member into place in said ball race.

8. In ball race filling mechanism, in combination, ball race positioning means, and a plunger, said plunger having a collar movable relative thereto for locating the retaining member for a ball race, said plunger being adapted to force said retaining member into place in said ball race, said plunger and collar having a common axis normally vertically placed, said collar having an interior contour in the shape of an inverted truncated cone.

9. In ball race filling mechanism, in combination, ball race positioning means and a plunger, said plunger having a collar movable relative thereto for locating the retaining member for a ball race, said plunger being adapted to force said retaining member downwardly, said plunger and collar having a common axis vertically placed, said collar having a side opening for the admission of a retaining member and having a lower portion for holding said retaining member.

10. In combination, a hopper for balls, means connecting with said hopper for causing said balls to take position in a column, means for cutting off a predetermined number of balls in said column for measuring purposes, means for delivering said predetermined number of balls to a ball race, and plunger means for pressing a retaining member into said ball race.

11. In combination, a hopper for balls, means connecting with said hopper for causing said balls to take position in a column, means for cutting off a predetermined number of balls in said column for measuring purposes, means for delivering said predetermined number of balls to a ball race, plunger means for pressing a retaining member into said ball race, and means for agitating said hopper to cause the free running of said balls.

12. In a machine of the class described, a hopper for balls, ball race positioning means, means connecting with said hopper

for causing said balls to take up a position
in a column, means for cutting off a prede-
termined number of said balls in said col-
umn for measuring purposes, means for con-
5 ducting said predetermined number of balls
to a position in proximity with said posi-
tioning means, means for pressing a retain-
ing member into said ball race and control

means for said cutting off means and said
pressure means located adjacent to said po- 10
sitioning means.

Signed at Danville, Illinois, this 2d day
of June, 1920.

AXEL H. LONBOM.
JOHN R. PERRY.