

T. H. MACDONALD.  
SOUND REPRODUCER.

APPLICATION FILED DEC. 31, 1903.

2 SHEETS—SHEET 1.

FIG. 1.

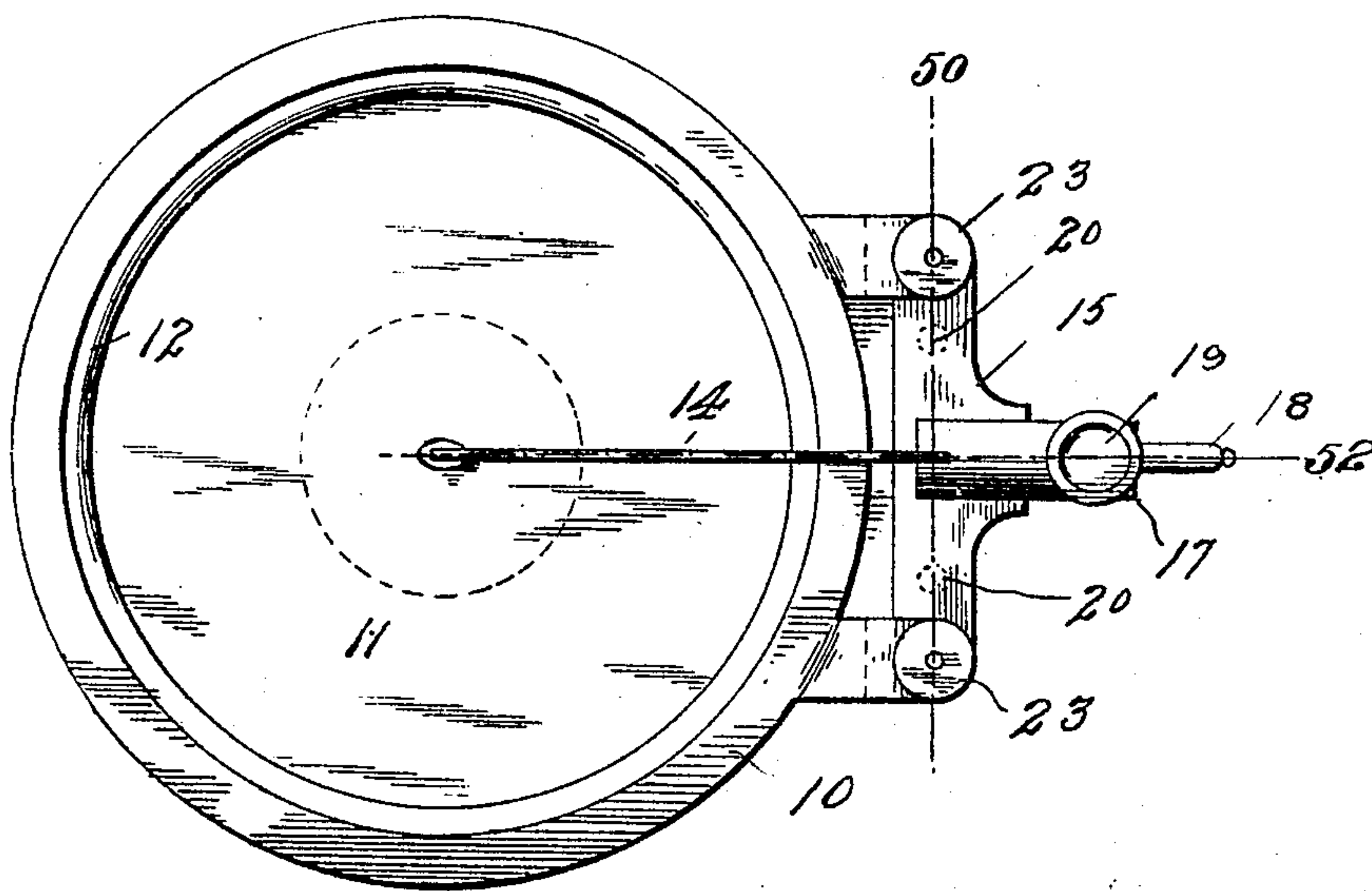


FIG. 2.

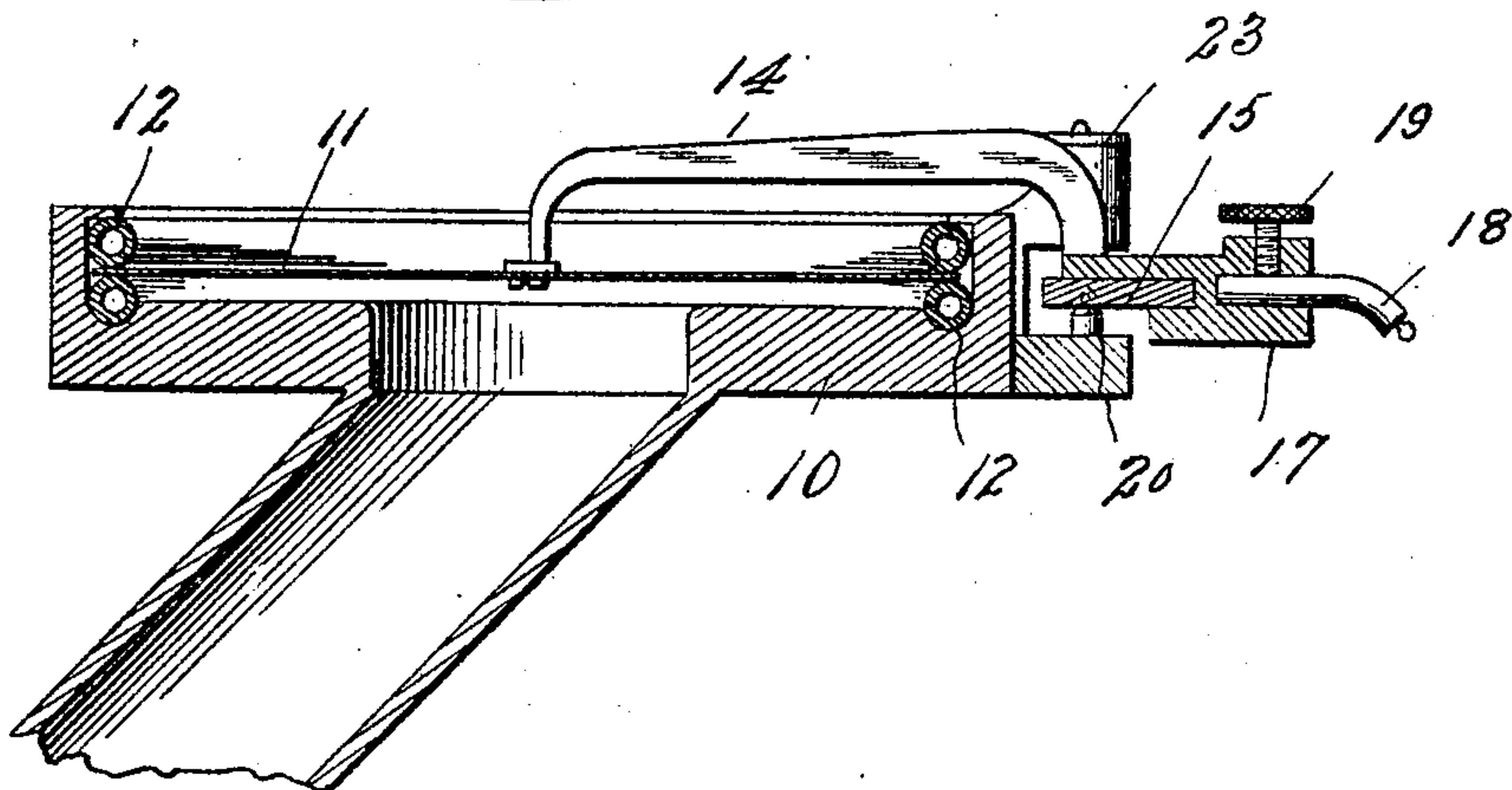
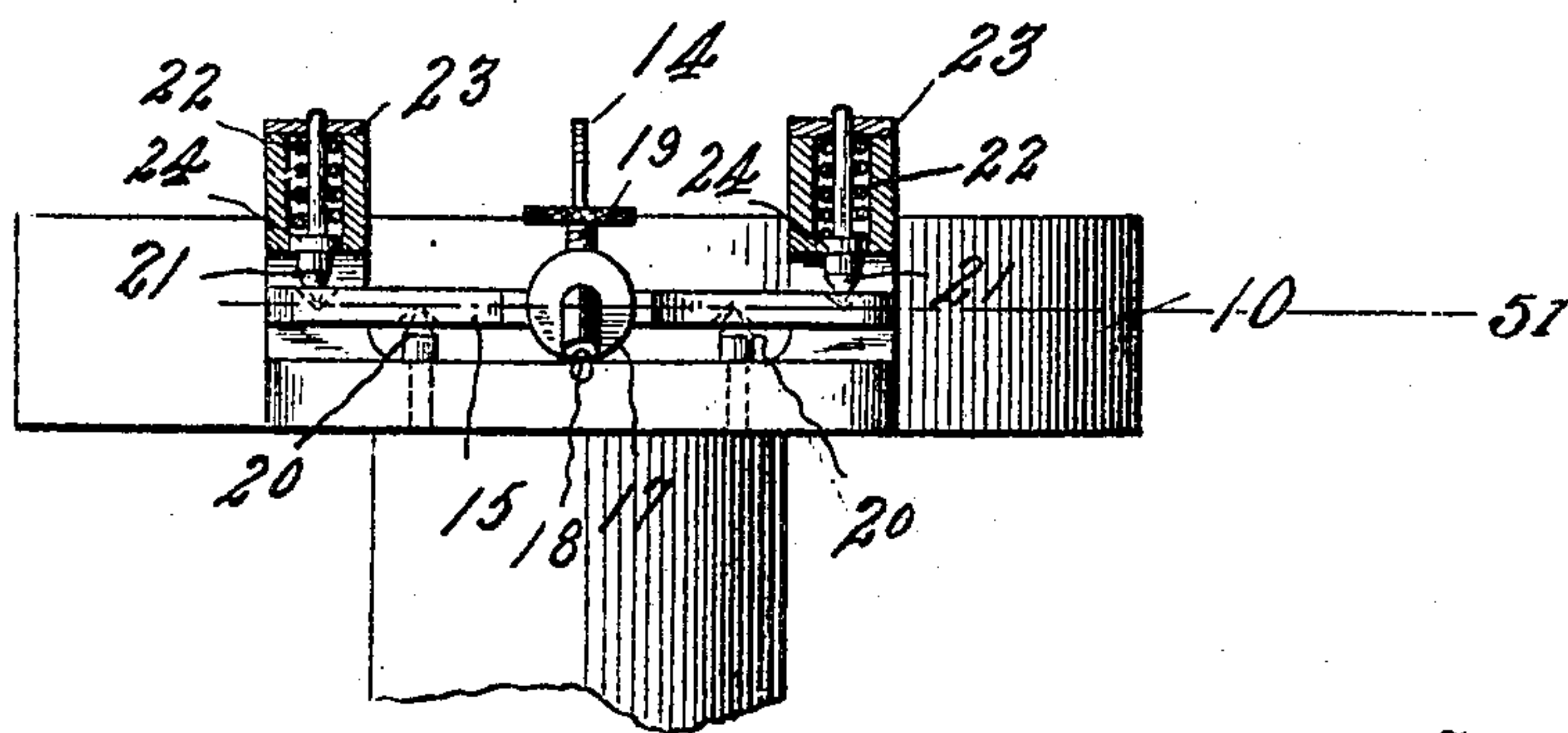


FIG. 3.



Witnesses

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2 SHEETS—SHEET 2.

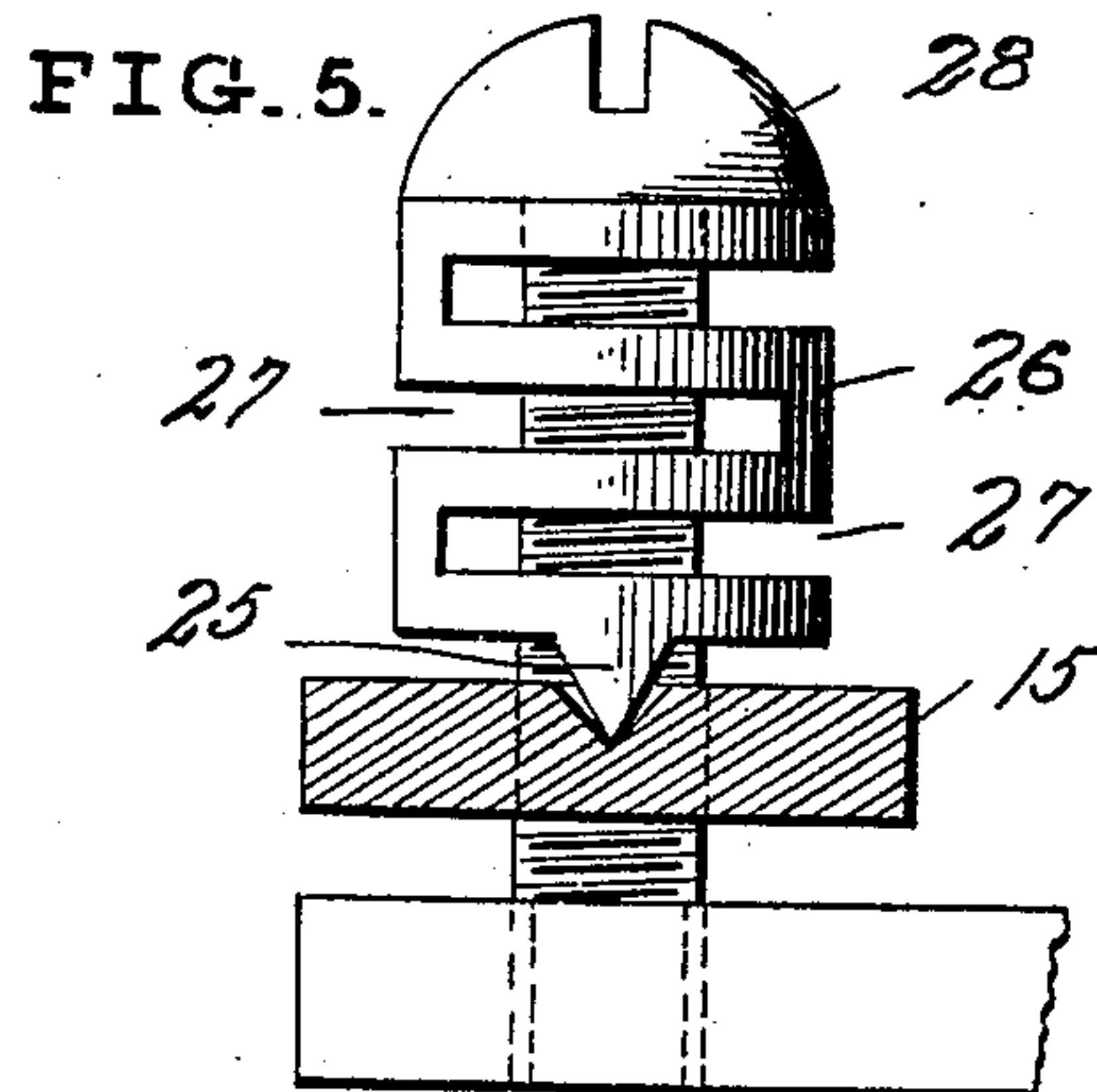
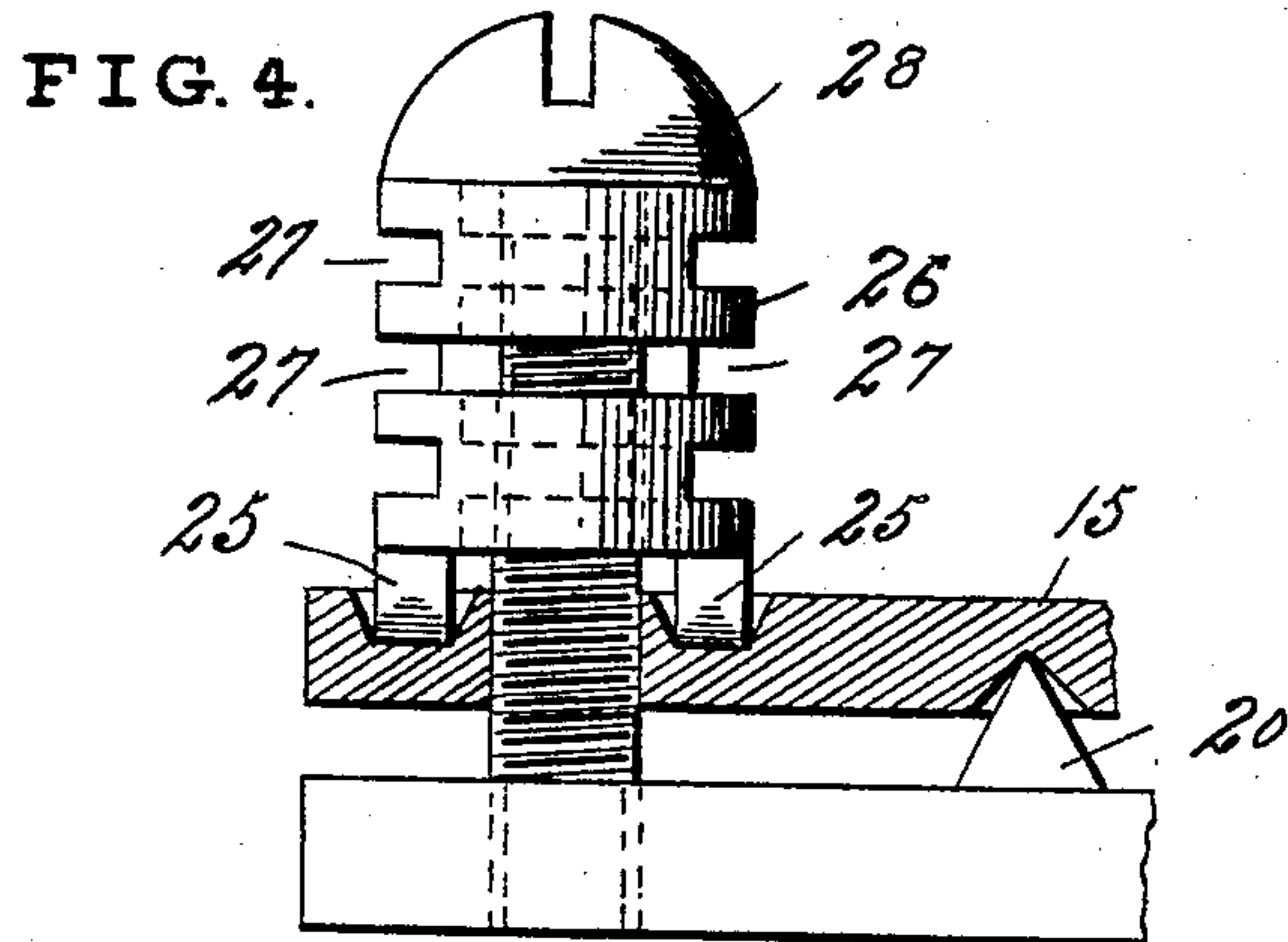


FIG. 6.

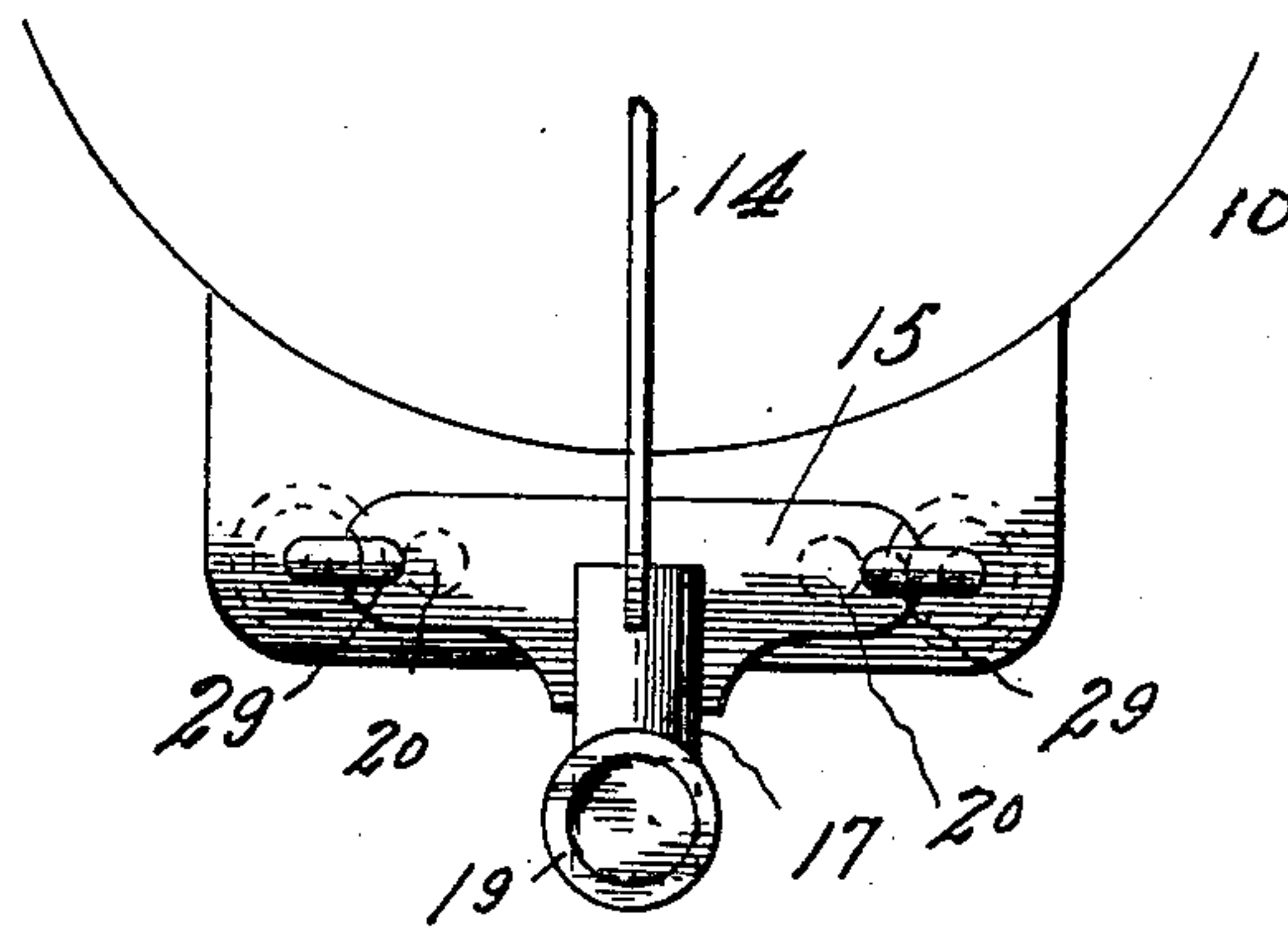
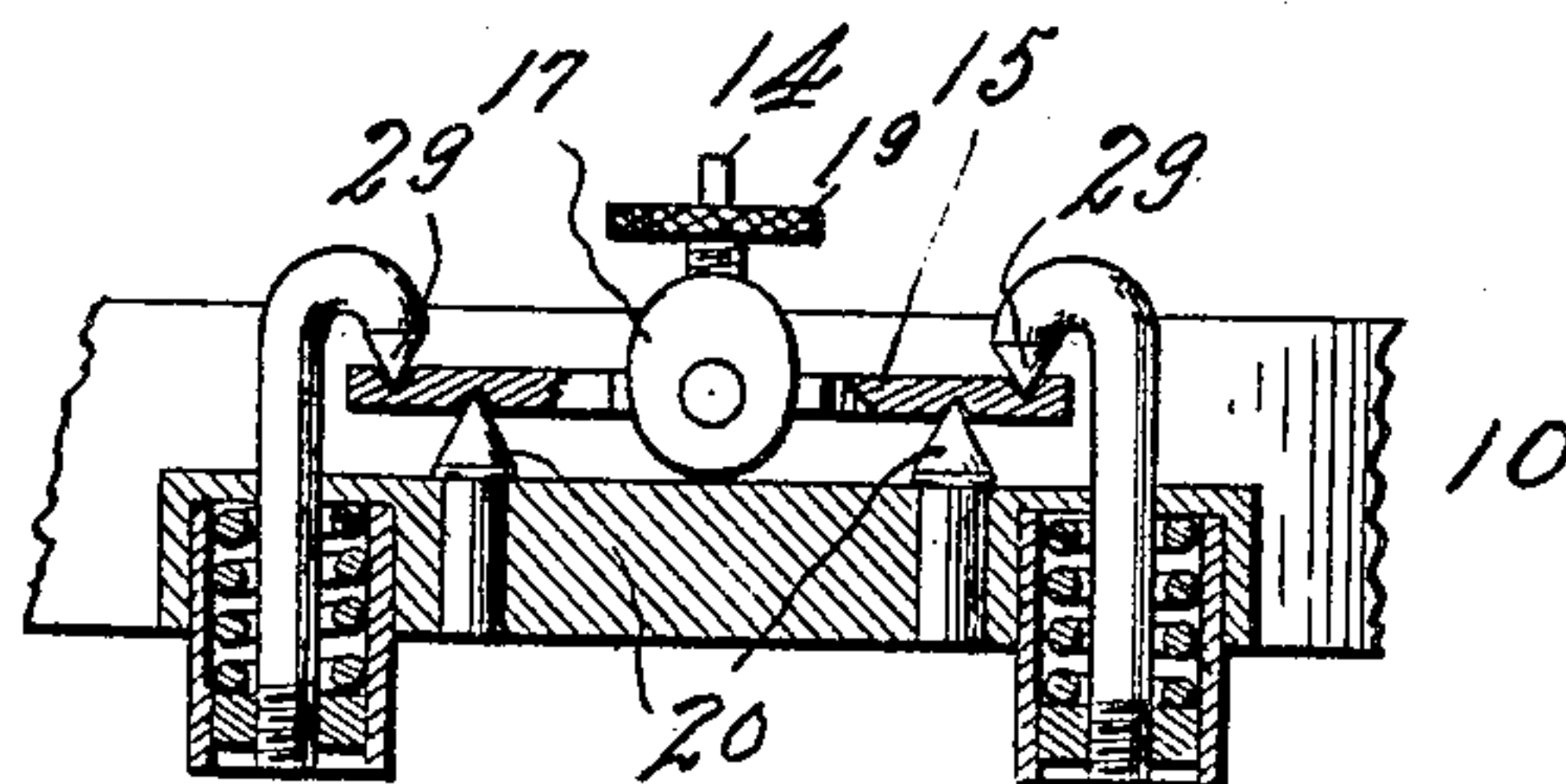


FIG. 7.



Witnesses

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# UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO  
AMERICAN GRAPHOPHONE COMPANY, OF BRIDGEPORT, CONNECTICUT,  
A CORPORATION OF WEST VIRGINIA.

## SOUND-REPRODUCER.

No. 795,293.

Specification of Letters Patent.

Patented July 25, 1905.

Application filed December 31, 1903. Serial No. 187,296.

*To all whom it may concern:*

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented a new and useful Improvement in Sound-Reproducers, which invention is fully set forth in the following specification.

This invention relates to sound-reproducers of the general form described in application filed April 17, 1903, Serial No. 153,143, wherein the stylus-carrying arm oscillates on pivot-points. These pivot-point reproducers are now used with "zigzag"—that is, laterally undulating—sound-records; but they are found also to give superior reproductions with records of varying depth.

In the application referred to above the invention is embodied in a reproducer whose stylus arm or support is fulcrumed on one side upon a knife-edge or pointed centers and on the other side upon coiled compression-springs. These springs can be made to press very firmly in the direction of their axes, while offering a very slight resistance to the oscillations of the diaphragm. This reproducer is therefore very responsive to the overtones, which give richness and quality to sounds.

One object of the present invention is to construct a reproducer wherein the pressure which holds the stylus-bar will be exerted entirely in the plane of its axis of oscillation. When spiral springs are brought to bear directly upon the rocker-bar, the spring-pressure extends to each side of the center of oscillation a distance equal to the radius of the spring. Although the resistance offered to oscillation in such construction is very slight, it is (in some cases, at least) advantageous to eliminate it.

In the accompanying drawings, Figure 1 is a plan view, Fig. 2 a longitudinal section, and Fig. 3 a cross-section, of a reproducer constructed in accordance with the invention. Figs. 4 and 5 are detail views in section at right angles to each other, illustrating a mode of pivoting the stylus-bar. Figs. 6 and 7 are details in plan and section, respectively, showing another mode of pivoting the stylus-bar.

The casing 10, diaphragm 11, gaskets 12, bar or lever 14, attached to the diaphragm, and rock-bar 15, which is virtually a part of bar or lever 14, and the continuation 17 of the bar or lever 14, having a socket for re-

ceiving the stylus 18, and a set-screw 19 for holding the stylus in place are or may be substantially as heretofore made and as described in my aforesaid application. The bar 15 is fulcrumed on one side upon the pivot-points 20, whose axes are at right angles to the diaphragm, as in my former application. On the other side the rock-bar is also fulcrumed upon pivot-points 21, these pivot-points being pressed toward the bar 15 by means of springs 22. The points 20 and 21 are all in the same plane, or, in other words, the axes of the pivot-points are all in the same plane, represented by the line 50, Fig. 1. Consequently the pressure is confined to the axis of oscillation of the bar or lever represented by line 51, Fig. 3, passing through all of the points. Furthermore, it follows that the bearings of points 20 and 21 are all in the same plane, which is transverse to the plane of oscillation of the stylus-bar. The plane of oscillation of the stylus-bar is represented by the line 52, Fig. 1. Inasmuch as the angle of these sockets is greater than that of the centers 20 21, the bearings are only on the extreme points, and the bar has freedom of oscillation within a limited but ample radius.

As shown in the drawings, the pivot-points 21 are supported in brackets 23, which are part of the frame of the reproducer, and the springs 22 are shown as coiled compression-springs, pressing at one end against the bracket 23 and at the other against a collar 24 on the pivot-points 21. These details are of course immaterial. The pivot-points 21 may be displaced against the pressure of the springs to remove the stylus-bar. In Figs. 4 and 5 another mode of applying the clamping-pressure is illustrated. The movable pivots 25 (in this case knife-edges, which are the equivalents of points, though points are preferred) are formed on a piece of steel tubing. In this tubing 26 are several saw-cuts 27, alternately from opposite sides, which give resilience longitudinally to the tube. A screw 28 presses the tubes or spring pivot-supports against the bar 15.

In Figs. 6 and 7 is shown a modification of the construction of Figs. 1, 2, and 3. The pivot-points 29 are in this instance hook-shaped, so that the shanks extend to the opposite side of the bar from the points. This



construction has the additional advantage that the pivot-supports, besides being movable, can be simply turned to one side, thereby releasing the stylus-bar.

In Figs. 1, 2, and 3 the stylus is shown as curved downward—that is, transversely to the plane of the diaphragm—this form being convenient for use with records of varying depth. A straight stylus can be inserted in the socket, and, indeed, no change in the reproducer is necessary to change it from one to the other form of record. It is necessary only to support it in that position relatively to the record in which it will operate most efficiently.

What is claimed is—

1. In a sound-reproducer, a stylus bar or lever fulcrumed on centers on both sides and firmly held between said centers, the axis of oscillation of the bar being transverse to the axes of the centers.

2. In a sound-reproducer, a stylus bar or lever fulcrumed on centers and held thereon by pressure exerted solely in the plane of the axes of said centers, the axis of oscillation of the bar being transverse to the axes of the centers.

3. In a sound-reproducer, a stylus bar or lever fulcrumed on centers whose axes are transverse to the axis of oscillation of said bar or lever, and held thereon by yielding pressure exerted solely in the plane of the axes of said centers.

4. In a sound-reproducer, a stylus-bar fulcrumed on one side upon fixed pivot-points and on the other upon removable pivot-points the axis of oscillation of the bar being transverse to the axes of the pivot-points.

5. The combination with the stylus-bar of a pivotal support therefor consisting of pivots on each side of the bar, the axes of said centers being all in the same plane and transverse to the axis of oscillation of said bar.

6. The combination with the stylus-bar of a pivotal support therefor consisting of pivots on each side of the bar, the bearing-points

of said pivots being all in the same plane transverse to their axes.

7. The combination with the stylus-bar of a pivotal support therefor consisting of pivots on each side of the bar, one or more of said pivots being integral with a support which is resilient lengthwise of the axes of the pivots.

8. The combination with the stylus-bar of a pivotal support therefor consisting of pivots on each side of the bar, one set of the pivots having hook-shaped shanks and being pressed against the bar by yielding pressure, so that they can be turned aside to release the bar.

9. In a sound-reproducer, the combination of a diaphragm, a stylus-bar attached at one end to the diaphragm, an antifriction-bearing upon which said bar is fulcrumed, means for holding the bar on its bearing with yielding pressure, and a stylus carried by said bar and curved transversely to the diaphragm.

10. In a sound-reproducer, a stylus bar or lever fulcrumed on centers, and means for exerting pressure to tension said centers, said pressure being exerted solely in the plane of the axes of the centers, said plane being transverse to the plane of oscillation of said bar.

11. A sound-reproducer comprising a stylus-arm, a support, pivot-points between said arm and support, and tensioning means for exerting tension only in a plane of said pivot-points transverse to the axis of the stylus.

12. In a sound-reproducer, a stylus bar or lever mounted to oscillate upon antifriction-bearings, means for exerting spring-pressure solely in a plane of the axis of oscillation of said bar to tension said bearings, said plane being transverse to the plane of oscillation of said bar.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

A. B. KEOUGH,  
C. A. GIBNER.