

R. MULHOLLAND.

AXLE.

APPLICATION FILED DEC. 8, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

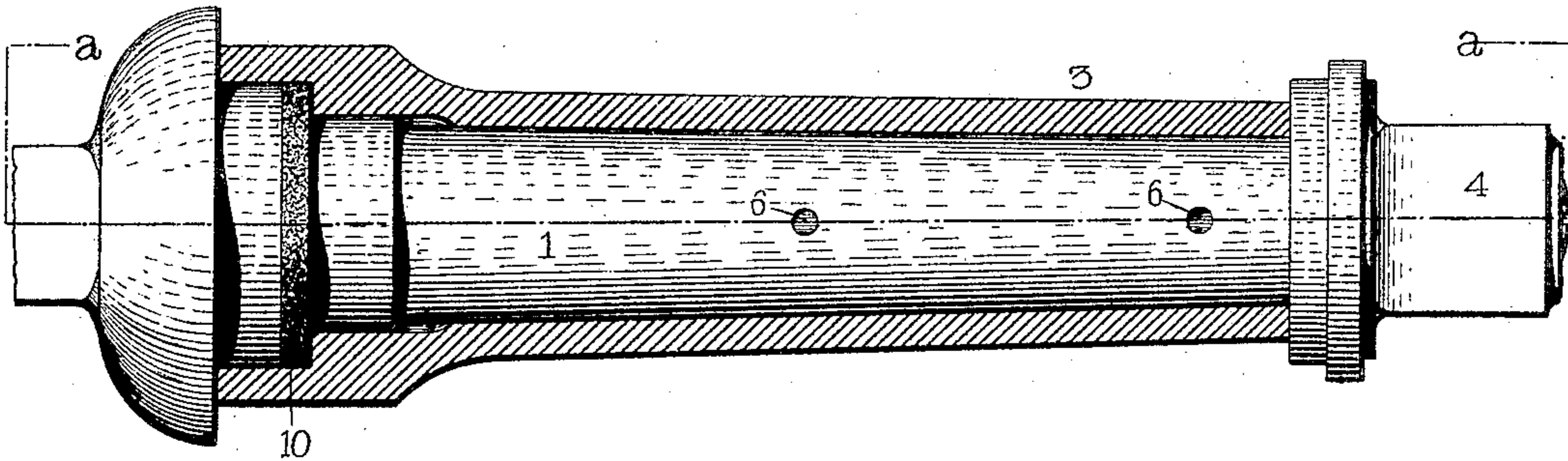


Fig. 2.

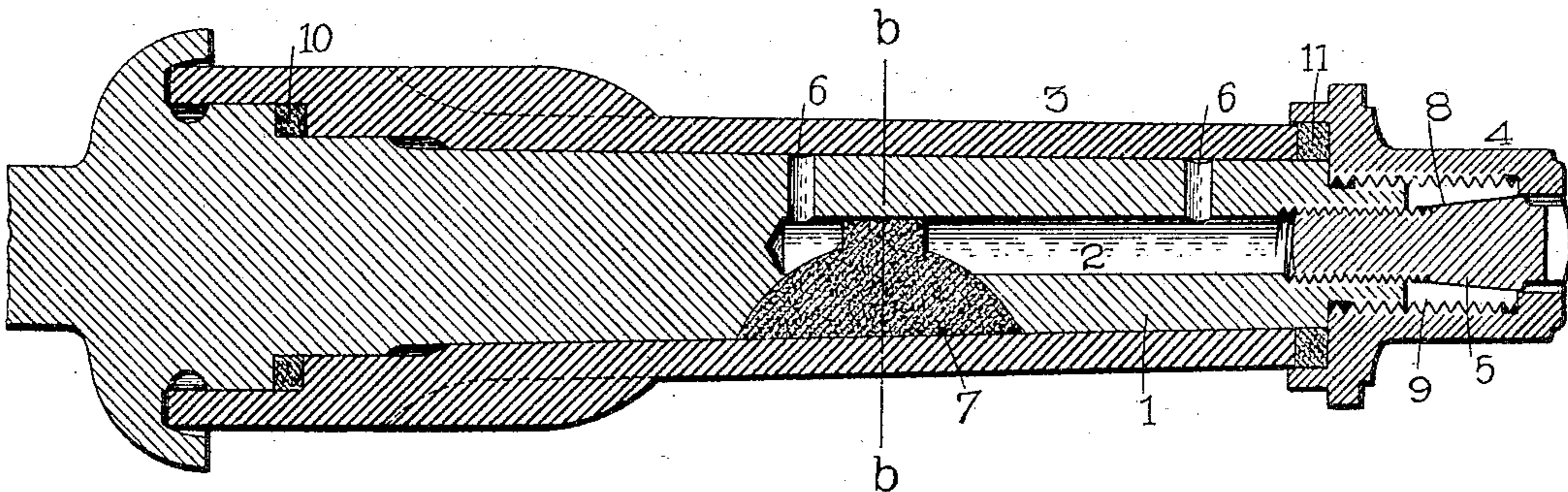


Fig. 3.

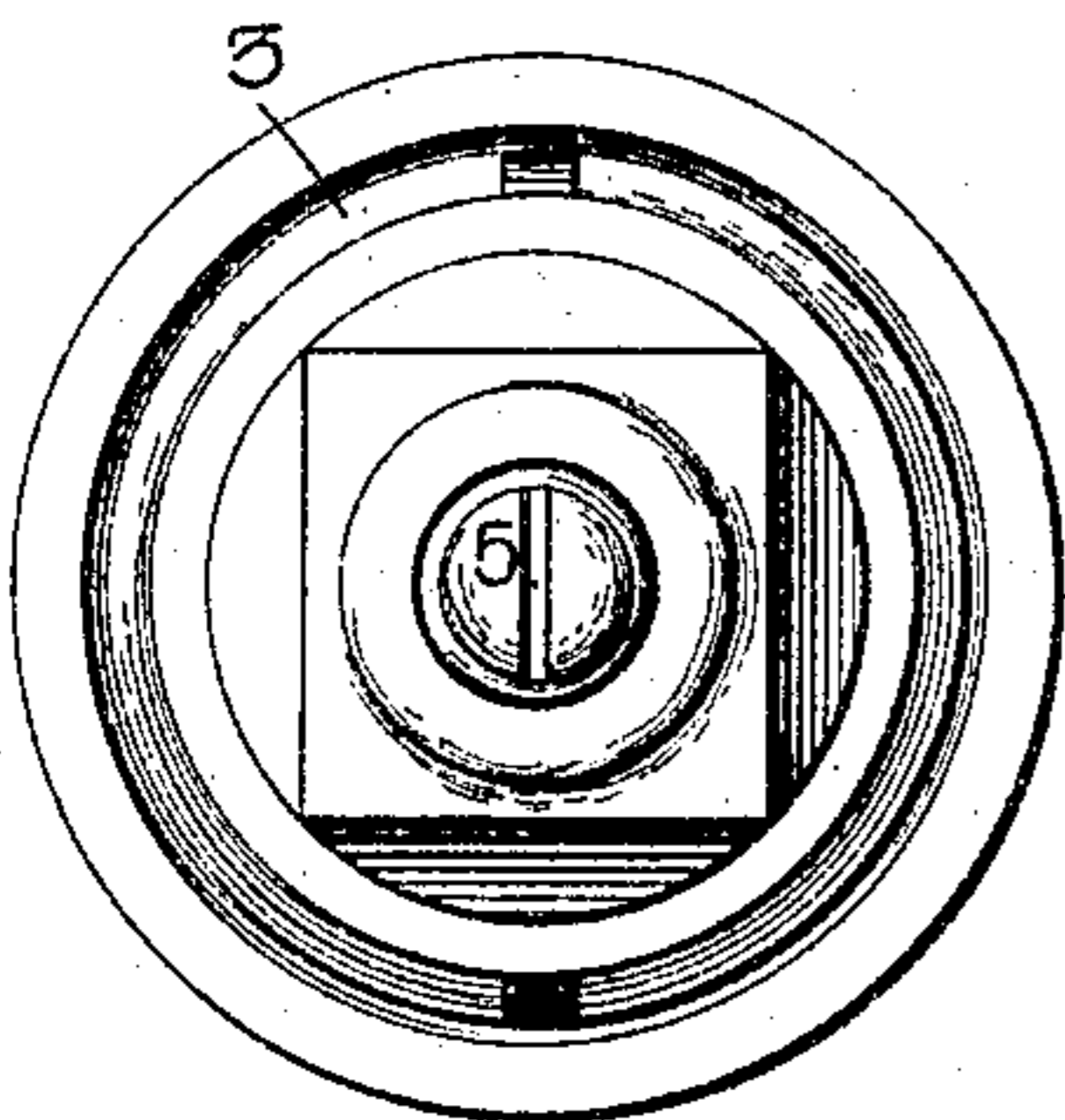


Fig. 4.

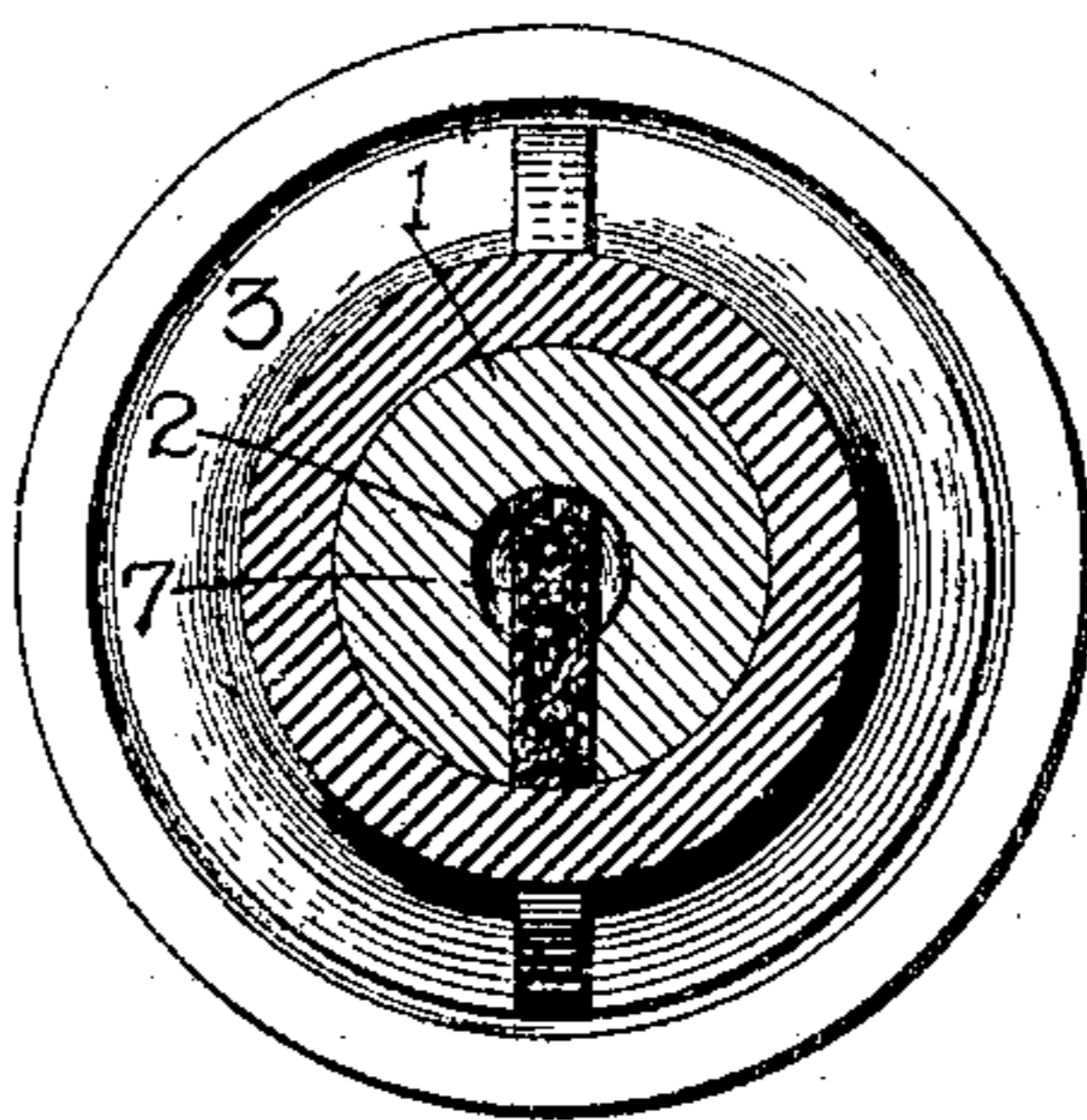
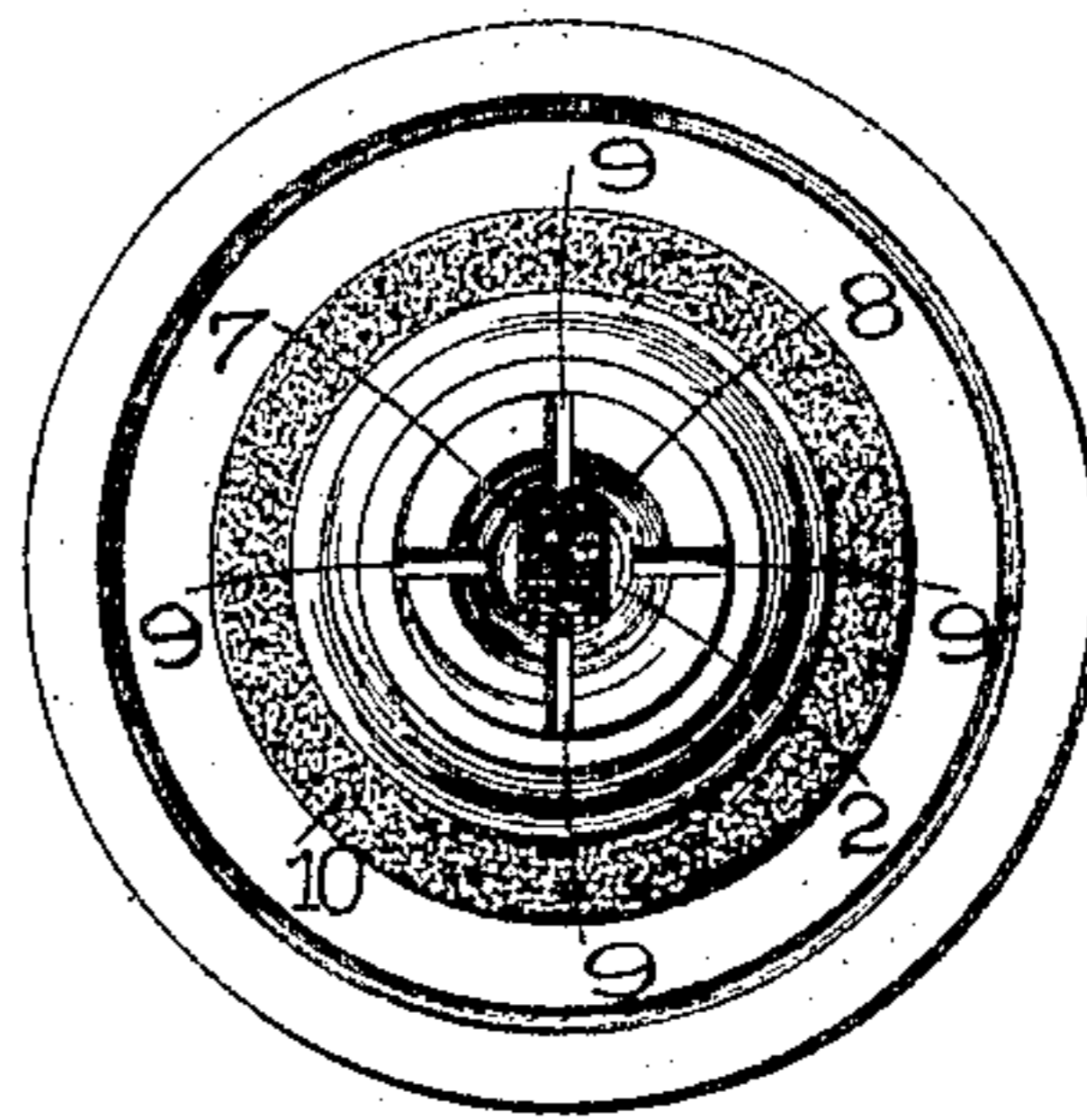


Fig. 5.



Witnesses.

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AXLE.

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2 SHEETS—SHEET 2.

Fig. 6.

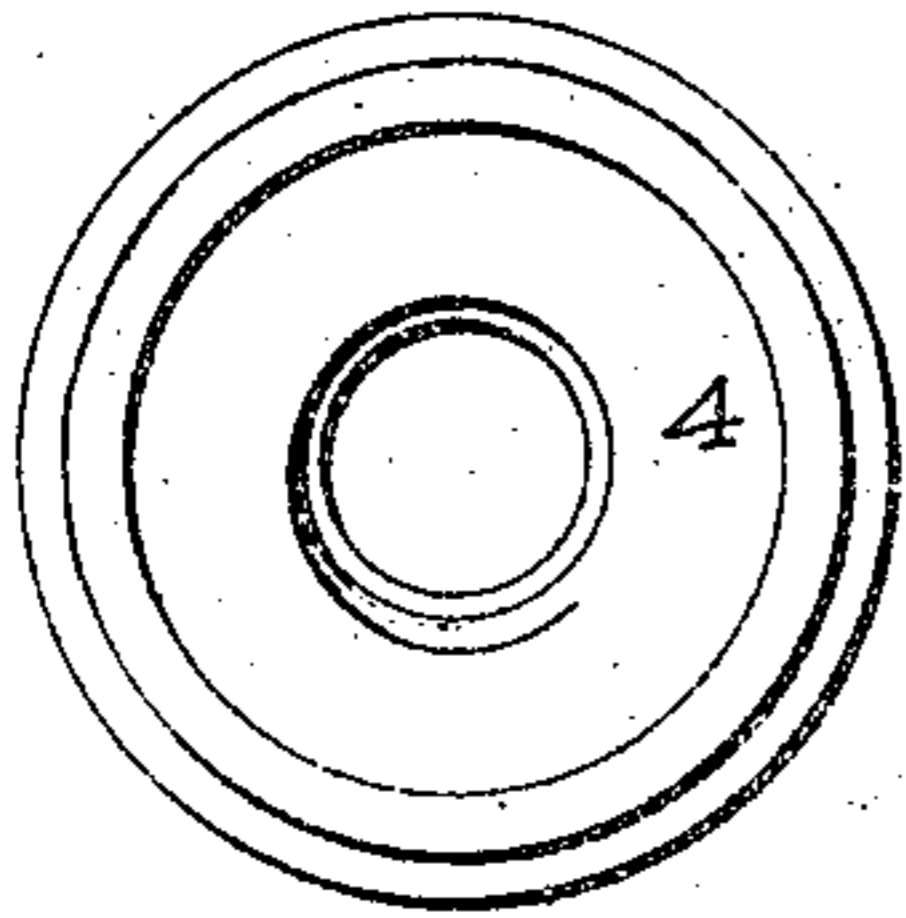


Fig. 7.

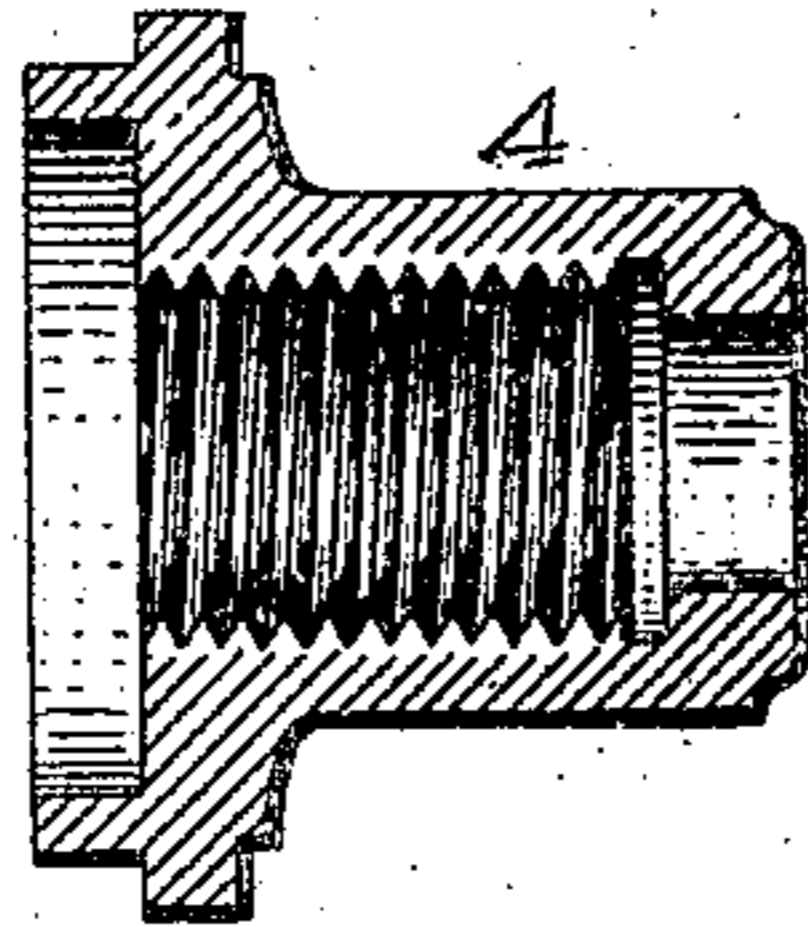


Fig. 8.

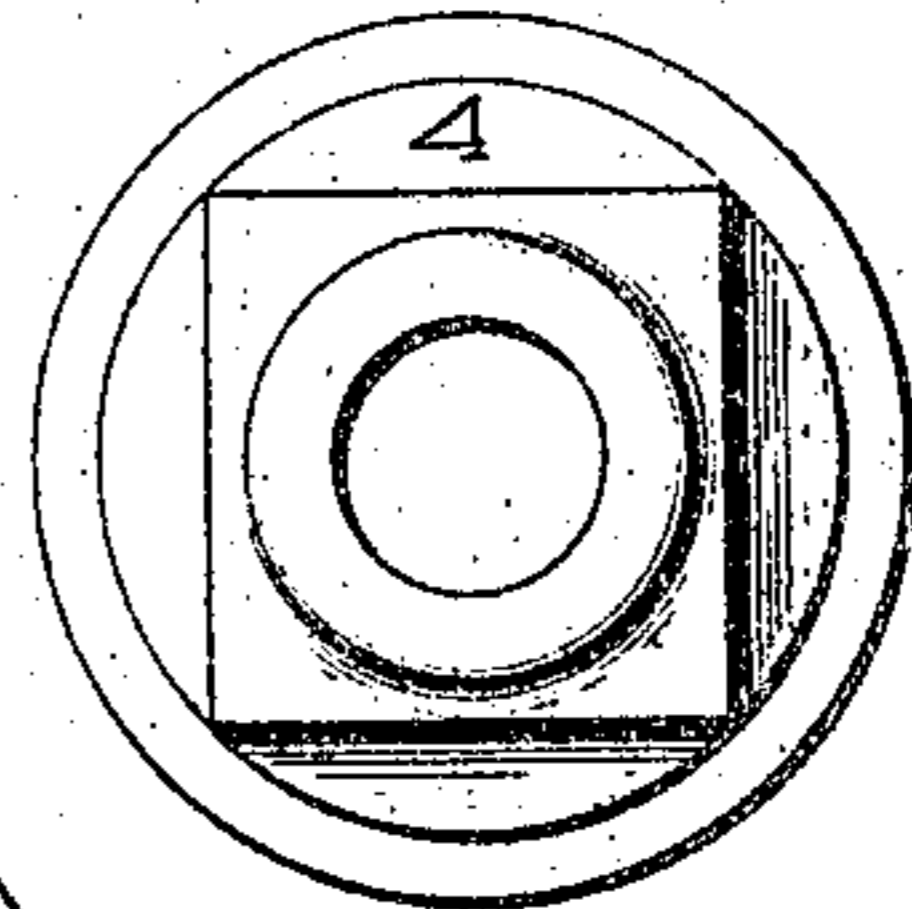


Fig. 16.

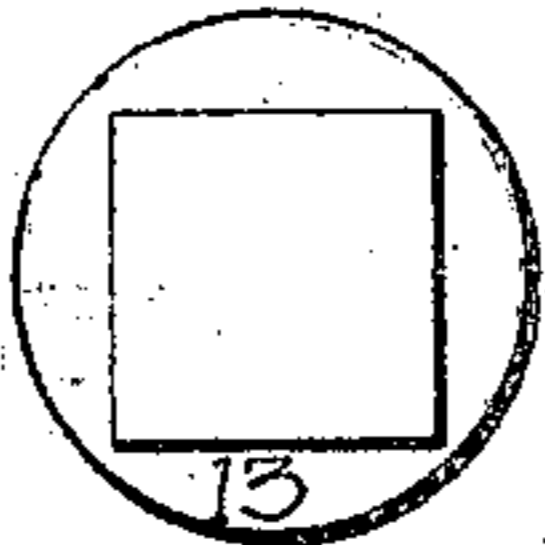


Fig. 17.

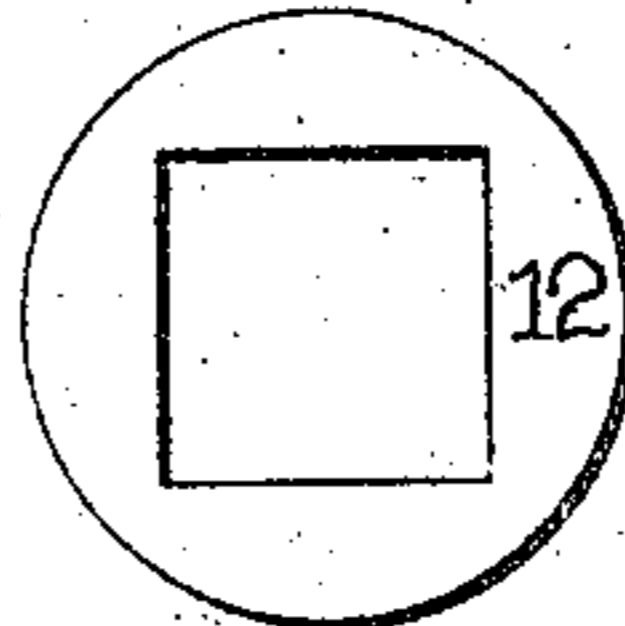


Fig. 9.

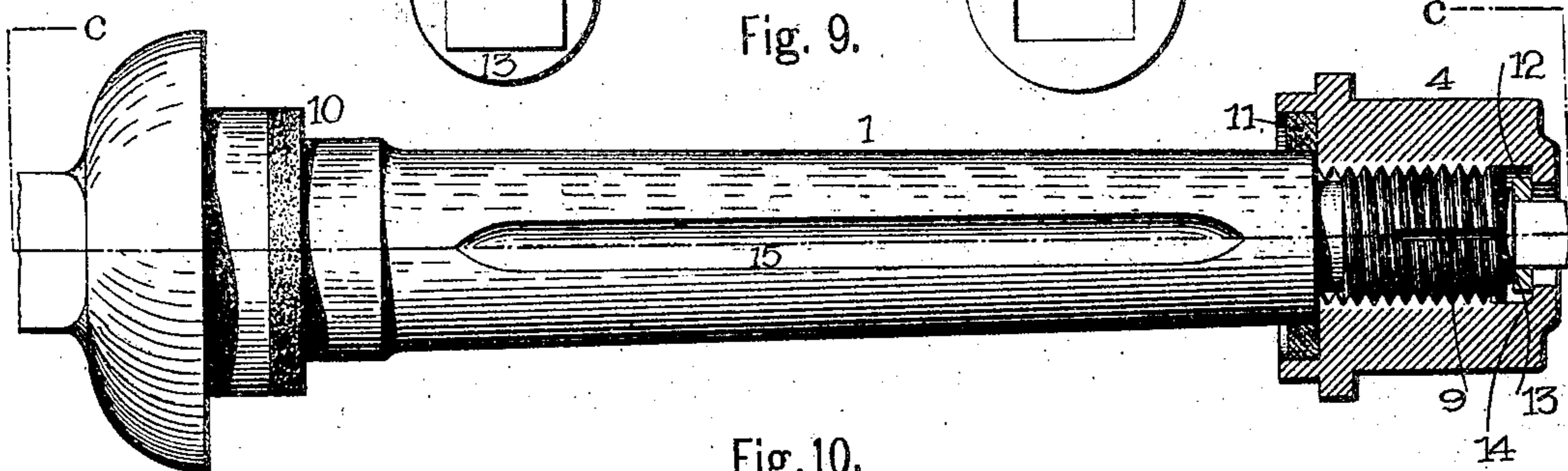


Fig. 10.

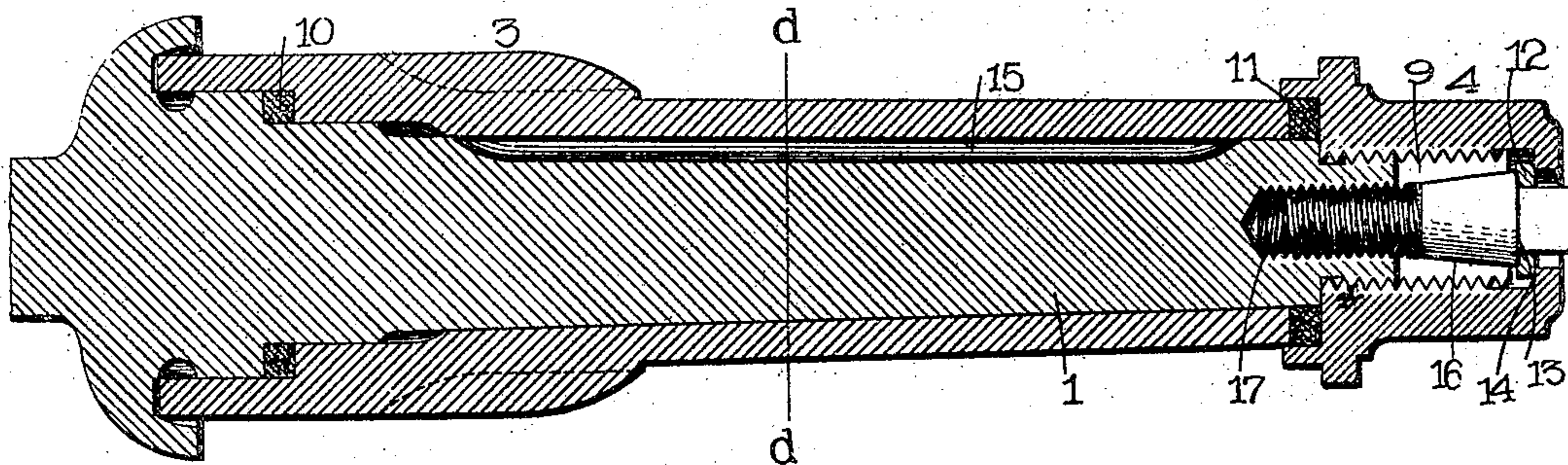


Fig. 11.

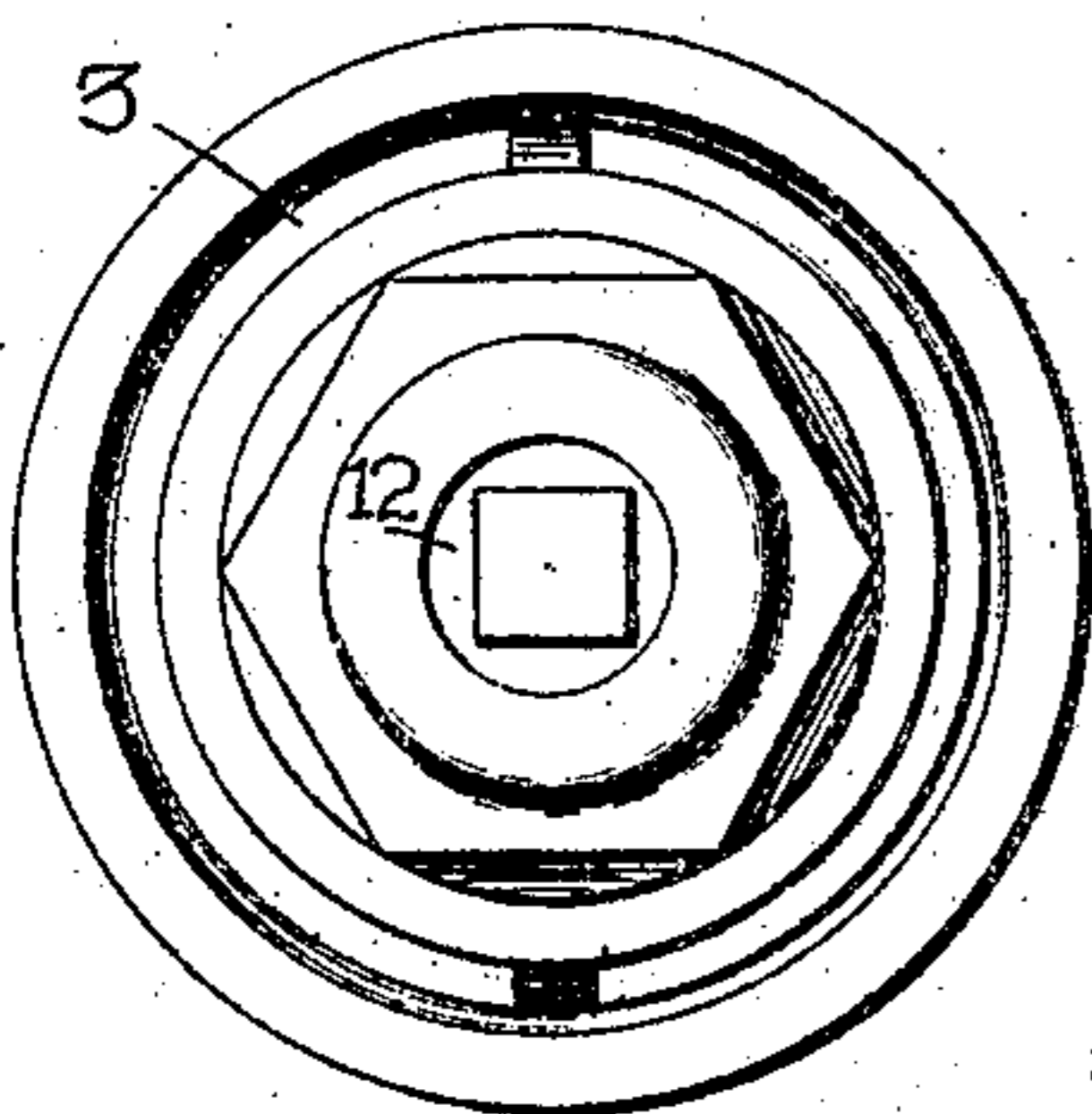


Fig. 13.

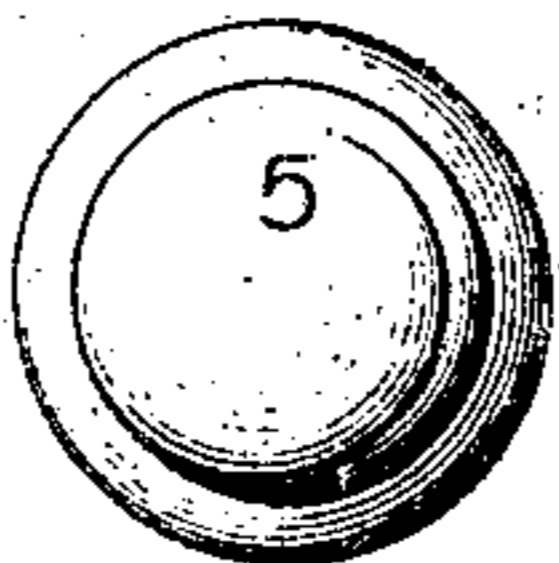


Fig. 14.

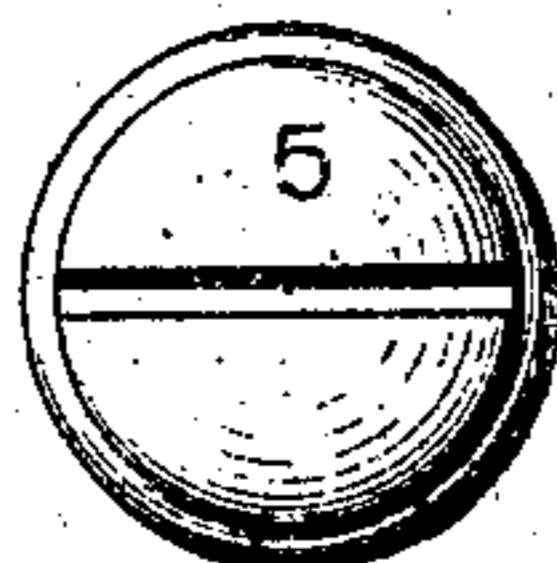


Fig. 12.

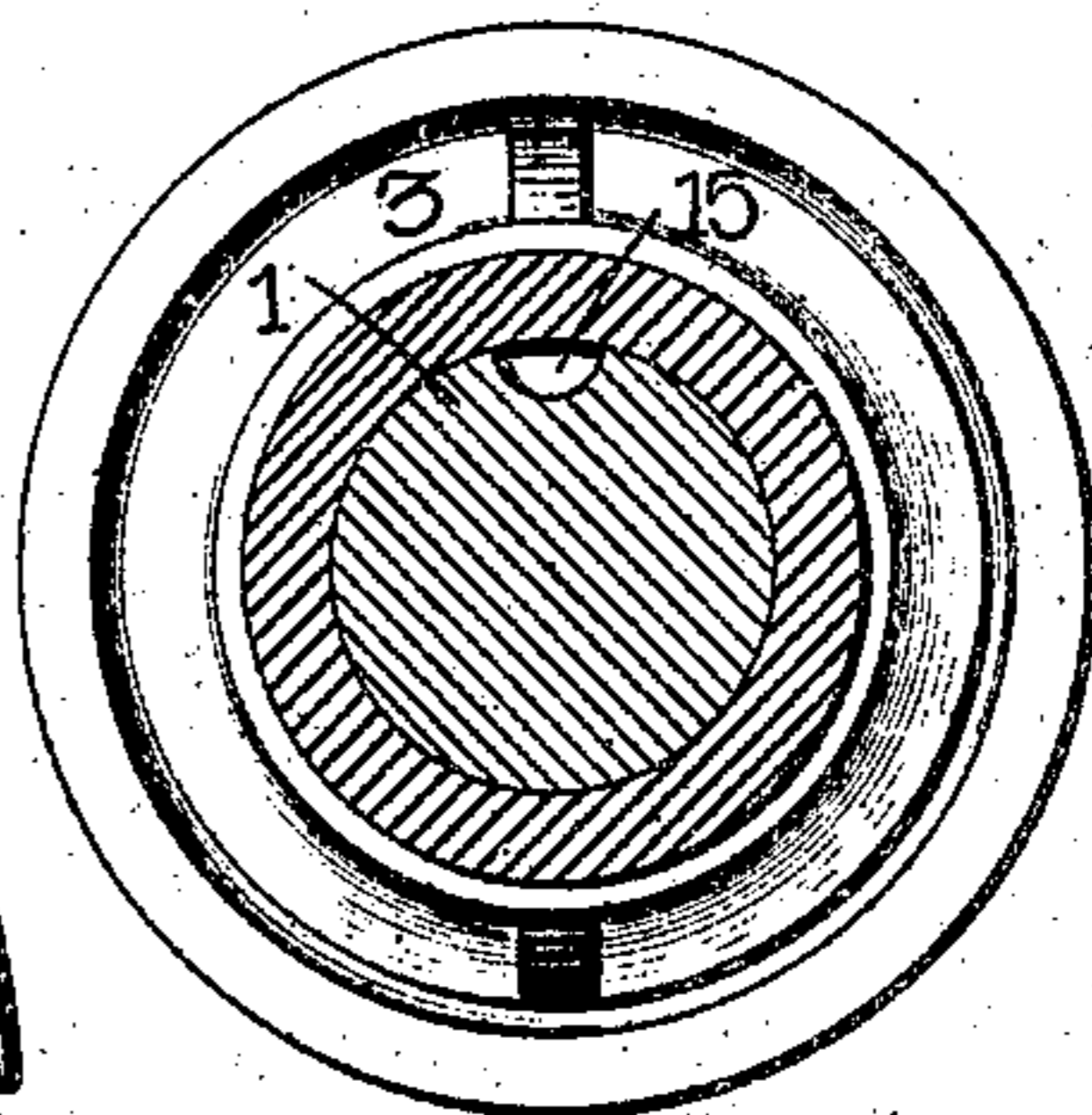
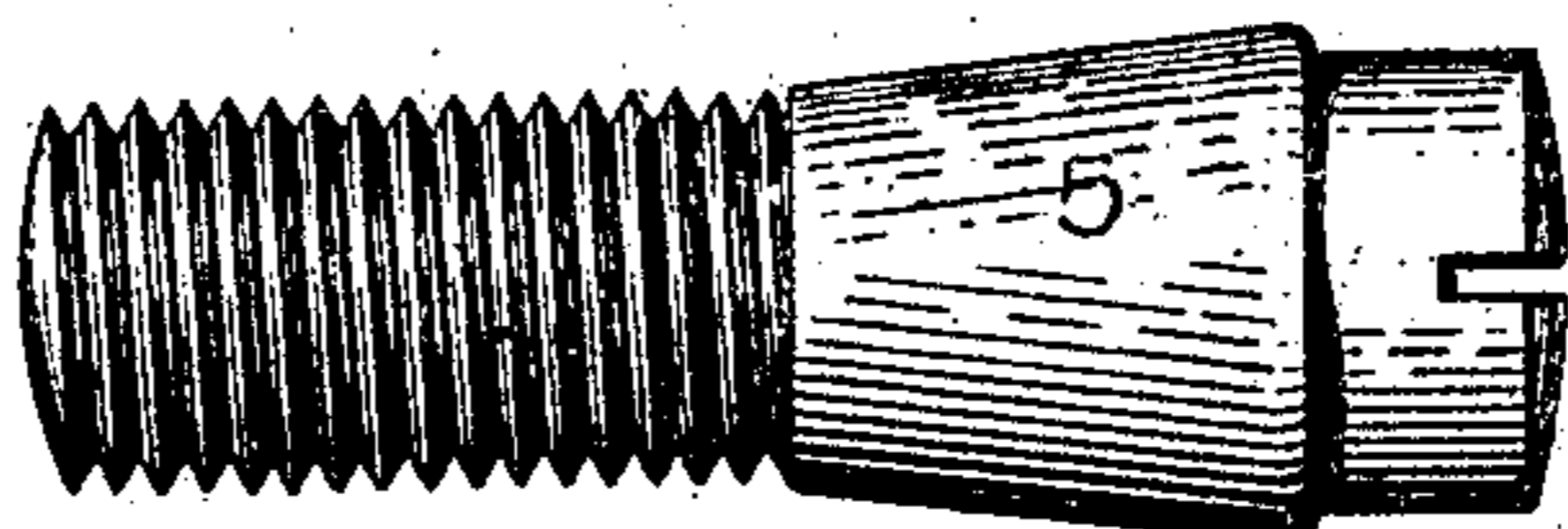


Fig. 15.



Witnesses.

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# UNITED STATES PATENT OFFICE.

RICHARD MULHOLLAND, OF DUNKIRK, NEW YORK.

## AXLE.

No. 803,012.

Specification of Letters Patent.

Patented Oct. 31, 1905.

Application filed December 8, 1904. Serial No. 235,937.

*To all whom it may concern:*

Be it known that I, RICHARD MULHOLLAND, a citizen of the United States, residing at Dunkirk, in the county of Chautauqua and State of New York, have invented certain new and useful Improvements in Axles, of which the following is a specification.

This invention relates to an improved means for positively locking the axle-nut of a vehicle-axle upon the axle.

It consists in providing the outer end or that portion of the axle upon which the nut screws with a recess which is in part tapered and smooth-surfaced and in part uniformly screw-threaded, slitting at least in part the walls of the axle surrounding said recess, and screwing a bolt having a screw-threaded part and a tapered smooth-surfaced part into said recess to force the smooth-surfaced tapered part against the smooth-surfaced tapered and slitted part of the wall of the recess to expand the axle end against the nut, and thus lock it in place.

The principal object of the invention is to construct a locking device for locking an axle-nut upon an axle which can be applied to any ordinary form of axles with but slight alteration and in which appreciable wear is practically prevented, stripping of screw-threads entirely obviated, and the axle-nut is fastened in place by the expansion of a slitted portion through a tapering smooth-surfaced portion of a screw-bolt, which in turn prevents the screw-threaded portion of said bolt from voluntarily unscrewing by the longitudinal tension of the tapering portion, which tends to draw the inclined walls of the interfitting screw-threads against each other and frictionally lock them together.

The invention also relates to certain details of construction, all of which will be fully and clearly hereinafter described and claimed, reference being had to the accompanying drawings, in which a preferred adaptation of the invention is shown.

Figure 1 is a plan view of a reservoir-axle equipped with my improved locking device for the axle-nut with a central longitudinal section through the axle-box. Fig. 2 is a central longitudinal section through the axle, axle-box, axle-nut, and tapered bolt on line *a a*, Fig. 1. Fig. 3 is an end view of the axle and its component parts, shown in Fig. 1. Fig. 4 is a transverse section on line *b b*, Fig. 2. Fig. 5 is an end view of the axle and axle-box with axle-nut and tapered bolt removed.

Figs. 6, 7, and 8 are detached views of the axle-nut. Fig. 9 is a plan view of a grooved axle equipped with the locking device with the axle box or casing removed and a central longitudinal section through the axle-nut. Fig. 10 is a central longitudinal section on line *c c*, Fig. 9. Fig. 11 is an end view of the grooved axle and its component parts. Fig. 12 is a transverse section on line *d d*, Fig. 10. Figs. 13, 14, and 15 are detached views of the tapered locking-nut having a slitted head. Fig. 16 is a detached end view of another form of tapered bolt having a square head. Fig. 17 is a detached view of the tapered bolt-washer.

In referring to the drawings for the details of construction like numerals designate like parts.

This invention consists of an axle having a recessed and slitted end which is in part tapered and smooth-surfaced and in part of uniform diameter and screw-threaded, an axle-nut on said end and a bolt having a screw-threaded part of even thickness screwing into the screw-threaded part of the recess, and a tapered smooth-surfaced part engaging and sliding against the smooth-surfaced tapered wall of the recess for expanding the axle end to lock the axle-nut in place thereon. In Figs. 1 to 5, inclusive, is shown a reservoir-axle to which this locking device is applied. In these figures, 1 represents the axle, which has a deep longitudinal recess 2 in its outer end, which constitutes an oil reservoir or chamber; 3, the axle box or casing; 4, the axle-nut, and 5 the tapered locking-bolt. An oil inlet or inlets 6 is provided in the axle, which extend into communication with the interior reservoir 2. An enlarged opening or recess is cut in the axle, which extends to the reservoir and in which a lubricating-pad 7, of felt or other suitable material, is placed. (See Fig. 2.) The wall of the recess 2 is tapered and smooth-surfaced for a short distance inwardly from its extreme outer end, as shown at 8 in Fig. 2, and is of even diameter and screw-threaded from the termination of the tapered portion sufficiently to receive the screw-threaded end of the tapered lock-bolt 5. The lock-bolt 5 consists of a screw-threaded portion of even thickness, a plain or smooth surfaced tapered portion which presses and slides against the tapered wall 8, and a slitted head. It may, however, be provided with a square head, as shown in Figs. 9, 10, 11, and 16, or with a head of any other form capable of

engaging with a turning implement in lieu of the slitted head. The wall of the recess 2, surrounding the smooth-surfaced tapered portion thereof, is provided with a plurality of longitudinal slits 9 to permit expansion when the lock-bolt is screwed into place. The usual washers 10 and 11 are arranged between the axle and one end of the axle-box and the axle-nut and the opposite end of the axle-box. The screw-threaded portion of the lock-bolt serves when screwed into place to expand the slitted and tapered portion of the recess, and thereby lock the axle-nut in place on the axle, and is in turn frictionally locked against involuntary unscrewing from the vibration of the vehicle when in use or from other analogous causes by the longitudinal tension produced by the tendency of the contracting pressure of the tapering smooth-surfaced walls of the recess upon the tapered smooth-surfaced portion of the bolt to force said bolt outwardly, and thus draw the interfitting screw-threads of the bolt and recess walls against each other and into tight frictional engagement. The advantage of this is that when the axle-nut is fastened firmly in place the locking-bolt is also firmly held in place and requires considerable pressure to start it unscrewing. The locking-bolt when in locking position is locked against longitudinal movement by its screw-threaded portion and against rotation by the frictional tension exerted by its tapered portion. Provision is preferably made to prevent the lock-bolt 5 entirely unscrewing and dropping should it in any way become loosened, which consists of a washer 12, formed substantially as shown in Fig. 17, which is fitted over the bolt-head and against the shoulder 13 at the outer termination of the tapered portion of the bolt and by engaging with the inwardly-extending shoulder 14 of the axle-nut holds the bolt from removal through the opening in the axle-nut.

In the form shown in Figs. 9 to 16, inclusive, the axle is provided with a peripheral longitudinal groove 15, in which a lubricating-strip may be placed, and a longitudinal recess in its outer end which has a tapered outer portion 16 and a screw-threaded inner portion 17. The lock-bolt 5 is of similar form to that described with reference to the reservoir-axle, with the sole exception that the head is square, as shown in Fig. 16, instead of being slitted, and is therefore designated by the same numeral.

The great advantage of this improved construction is chiefly due to the fact that ordinary axles can be equipped by simply forming a tapered and slitted recess in the end of the axle and fitting a tapered lock-bolt therein. Other advantages reside in the simplicity and the arrangement of the lock at the best possible point which is directly within the axle-nut, the tapered portion of the screw expanding the axle end directly against the axle-nut,

and thus locking it rigidly in place, and the holding of the lock-bolt against its entire detachment by the shoulder of the axle-nut when it is in place. Still another great advantage resides in the perfect adjustability of the axle-nut to take up wear or lost motion from time to time. In this improved construction that portion of the wall of the recess in the axle which is tapered is also smooth-surfaced, and the tapered part of the lock-nut is likewise smooth-surfaced and is adapted to slide upon the tapered surface of the recess-wall.

I claim as my invention—

1. In a device of the class described, an axle having a recess in its outer end, the surrounding wall of which is tapered smooth-surfaced and slitted in its outer portion and of even diameter and screw-threaded in its inner portion, an axle-nut screwing on said end and a locking-bolt having a screw-threaded inner part engaging in the screw-threaded portion of the recess, an outer head and a tapered smooth-surfaced part located between the screw-threaded inner part and the head and engaging the tapered portion of the recess, whereby the locking-bolt is held against longitudinal movement when in locking position by the engagement of its screw-threaded portion, and against unscrewing by the frictional interlocking of the interfitting screw-threads through the longitudinal tension on the tapered portion, substantially as set forth.

2. In a device of the class described, an axle having a recess in its outer end the surrounding wall of which is tapered smooth-surfaced and slitted in its outer portion and of even diameter and screw-threaded in its inner portion, an axle-nut on said axle and a locking-bolt for expanding said axle end directly within and against the encircling axle-nut to positively lock said axle-nut upon said axle and including an outer smooth-surfaced tapered part arranged to slide within the correspondingly smooth-surfaced tapered wall portion of the axle-recess and an inner screw-threaded part arranged to engage in the screw-threaded inner portion of the wall of said recess, substantially as set forth.

3. In a device of the class described, an axle having a recessed end the circular wall of which is screw-threaded in its inner portion and tapered smooth-surfaced and slitted in its outer portion, an axle-nut on said end and a lock-bolt engaging in said recess having a screw-threaded inner end and a smooth surfaced and tapered outer portion.

4. An axle having its outer end slitted and at least in part externally screw-threaded and a longitudinal recess in said end, the wall of which is in its outer portion interiorly tapered and smooth-surfaced and in its inner portion interiorly screw-threaded and of even diameter, an axle-nut screwing on the slitted part of the axle and a locking-bolt fit-

ting in the recess having a smooth-surfaced tapered outer part engaging the tapered wall of the recess and a screw-threaded inner portion of uniform lead and even diameter  
5 screwing into the screw-threaded portion of the recess, substantially as set forth.

5. In a device of the class described, a vehicle-axle having its end recessed with the circular wall of the recess tapered and smooth-surfaced from the outer termination of the  
10 axle to near the middle of the recess and screw-threaded from the termination of the tapered portion to the inner termination of the recess and the wall of the recess also being  
15 at least in part slitted to permit expansion, an axle-nut fitting upon the axle end

and directly around the expansible portion thereof and a locking-nut fitting in the recess and having an inner screw-threaded part engaging in the screw-threaded end of the recess and an outer tapered and smaller surfaced part slidably engaging the tapered portion of the recess, whereby the screwing in of the locking-bolt will expand the slitted end of the axle directly within the axle-nut and  
20 locks the same rigidly in place, substantially as set forth.  
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Witnesses:

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