

J. W. KEELEY.
FLEXIBLE STAY BOLT.
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Fig. 1.

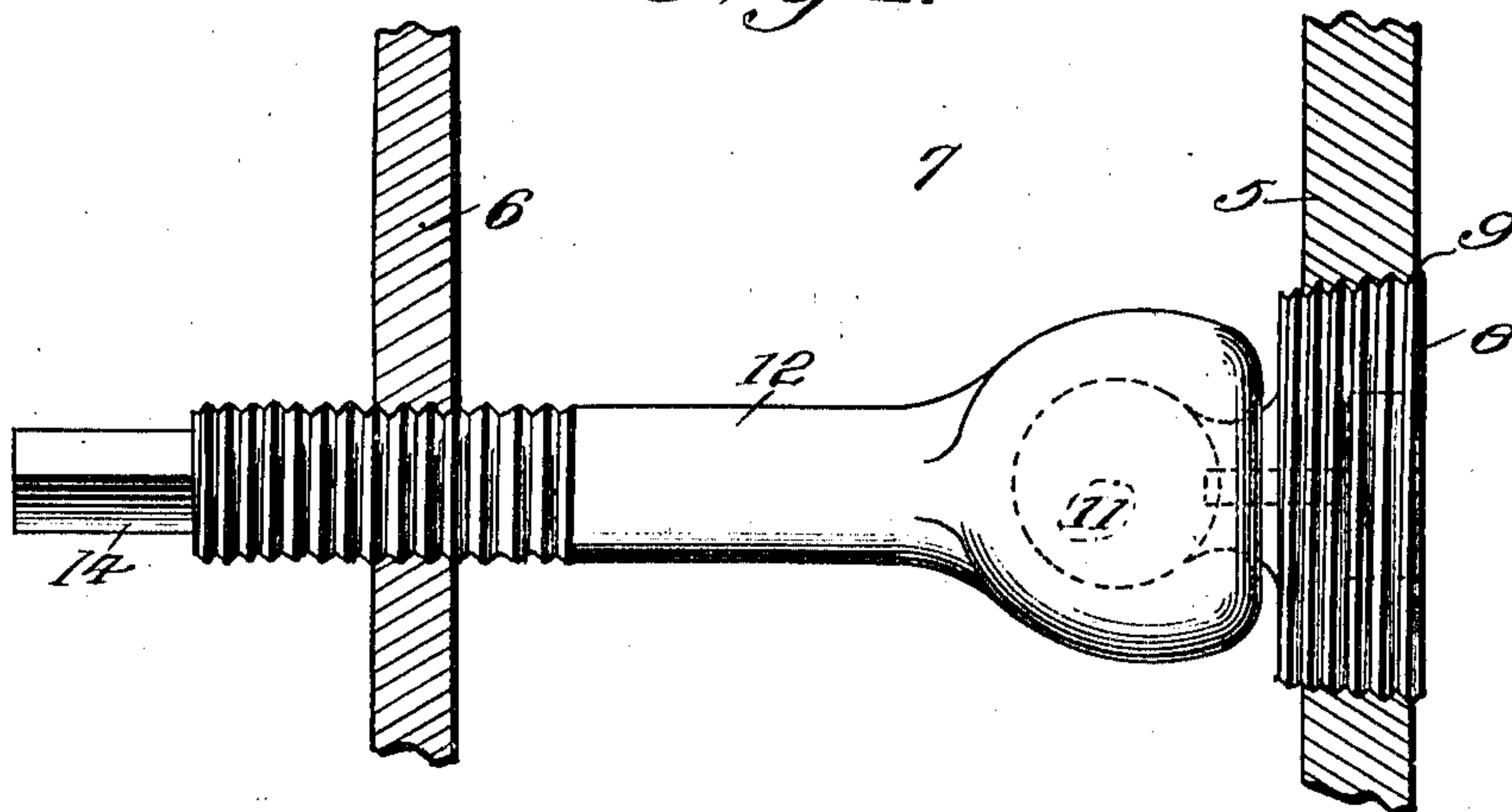


Fig. 2.

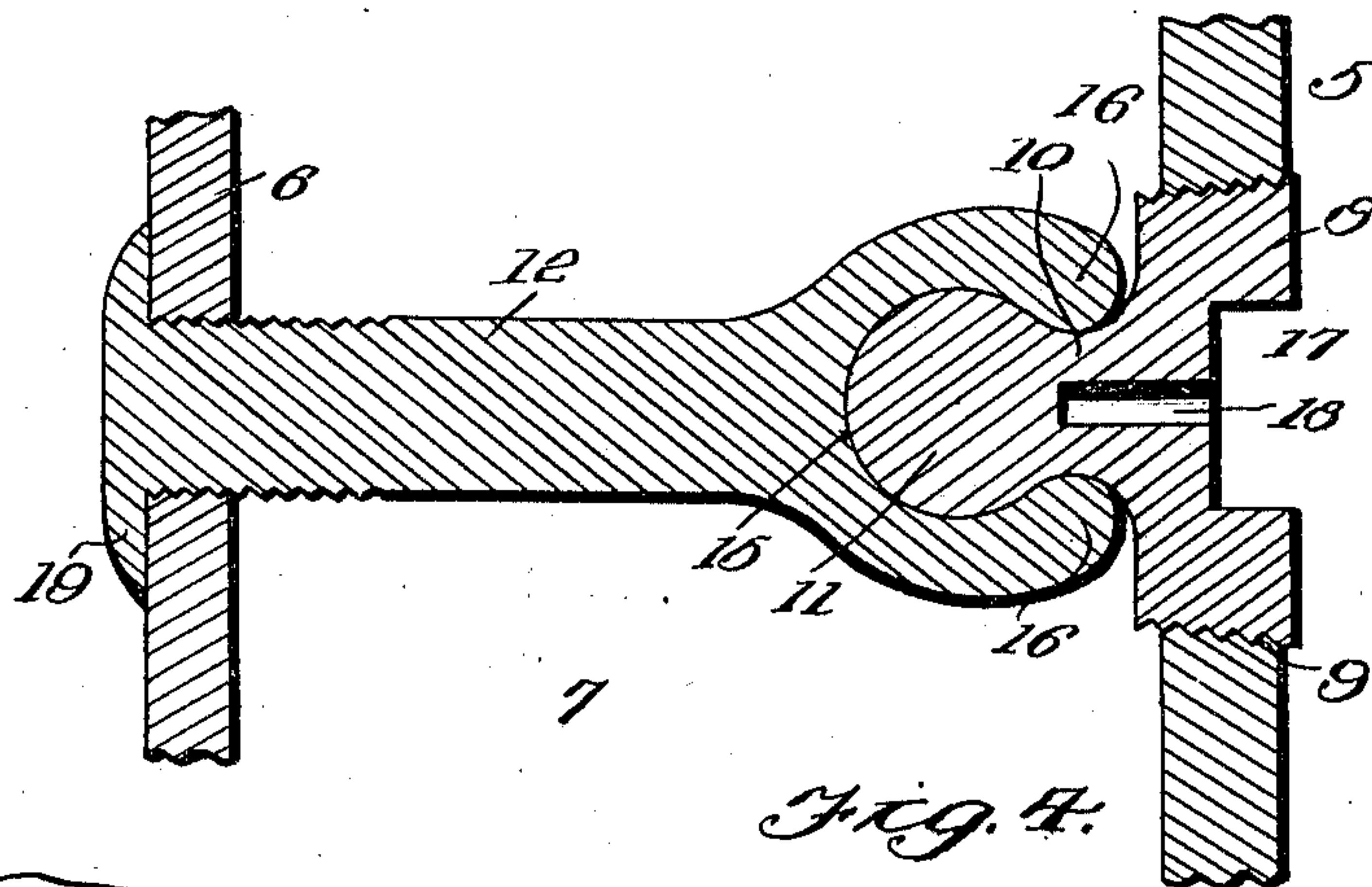


Fig. 3.

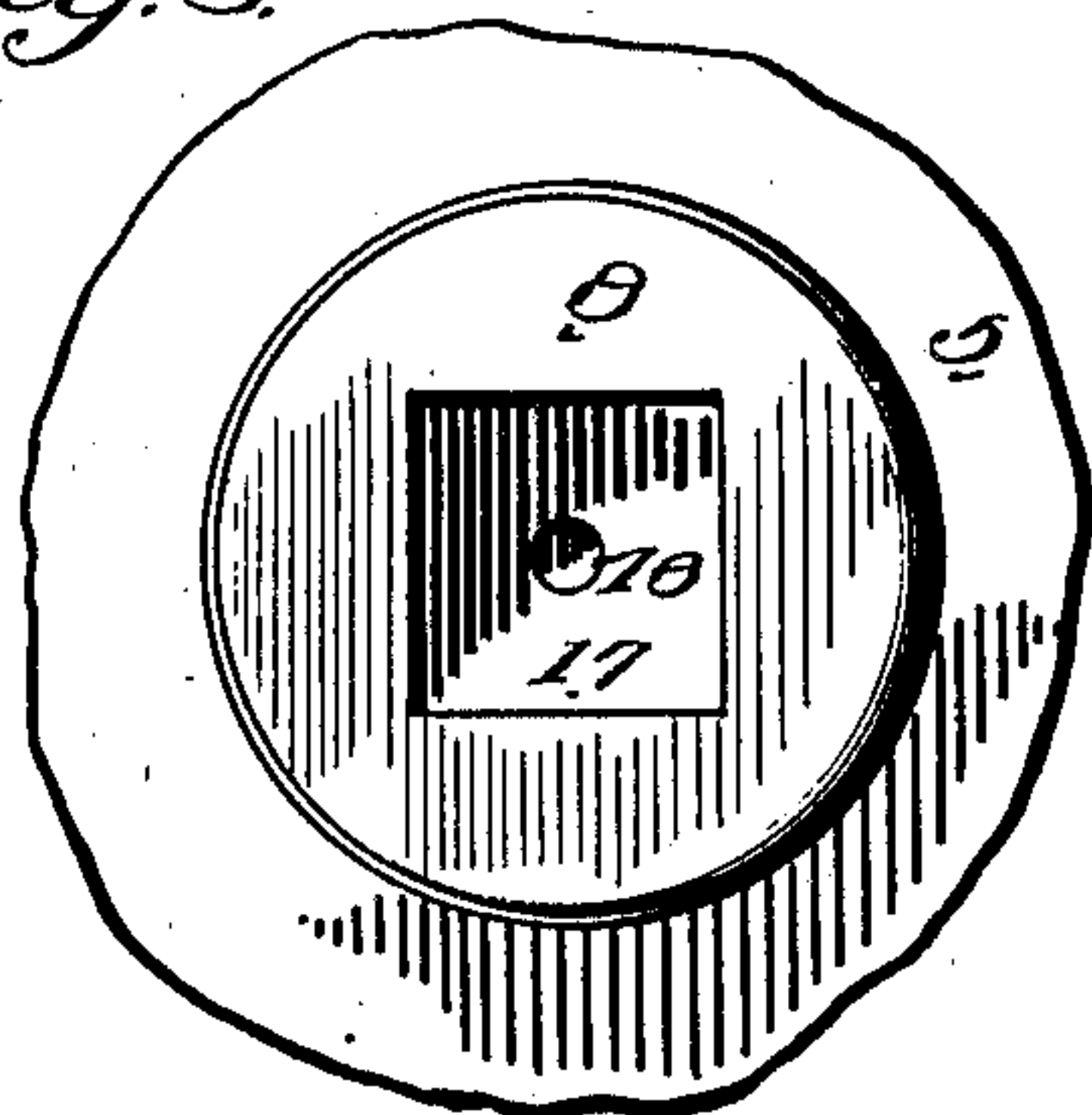
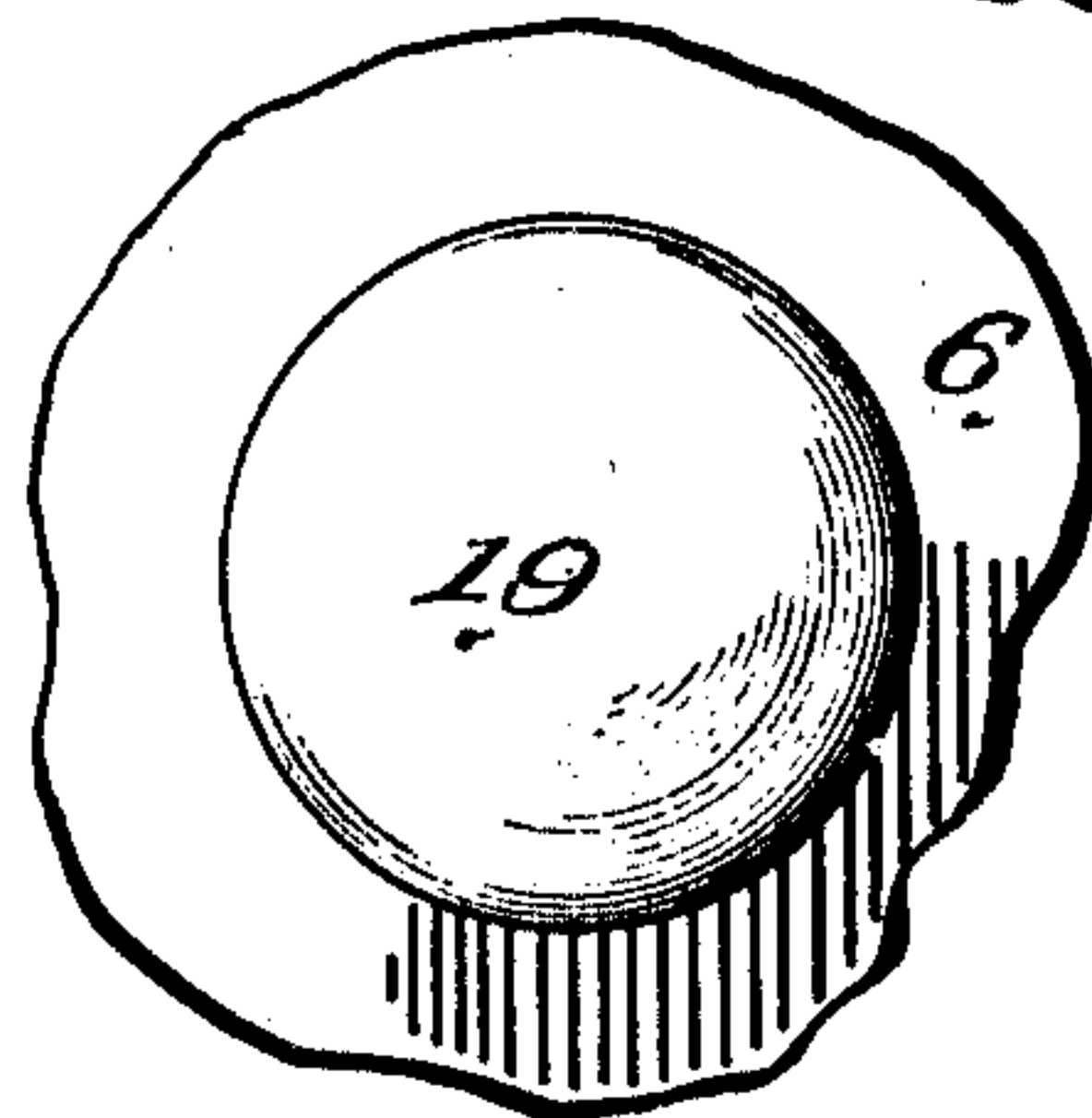


Fig. 4.



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FLEXIBLE STAY-BOLT.

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To all whom it may concern:

Be it known that I, JAMES W. KEELEY, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Flexible Stay-Bolts, of which the following is a specification.

This invention relates to flexible stay bolts for connecting the inner and outer sheets of steam boilers.

The object of the invention is to provide a flexible stay bolt of simple and durable construction, capable of being used on either flat, oval or round surfaces of steam boiler sheets which will enable the sheets effectually to resist internal steam pressure, particularly on that class of boilers which work under a high pressure of steam, such as locomotive boilers.

A further object of the invention is to provide a flexible stay bolt, the construction of which is such as to insure at all times a uniform tensile strain, instead of a lateral strain, common to stay bolts now in use.

A further object of the invention is to provide a flexible stay bolt including a tapered plug adapted to be screwed or otherwise fastened into the outer or shell sheet and provided with a reduced neck defining a spherical head for engagement with a correspondingly shaped socket in the adjacent end of the bolt, thus forming in effect a universal joint between the plug and bolt and permitting lateral movement of one relative to the other, incident to the expansion and contraction of the boiler sheets.

A further object of the invention is to provide the tapered plug with a tell tale hole, one end of which extends through the neck to a point near the top of the spherical head of the bolt, while the other end thereof opens through the outer face of said plug, thus to permit the escape of steam and water and thereby notify the attendant in case of the breakage of a bolt.

A further object of the invention is to construct the tapered plug in such a manner that the outer face thereof will lie substantially flush with the adjacent face of the outer shell or sheet, so as not to interfere with the running board, springs, or other portion of a locomotive, and also to permit the same to be used back of frames, pads, or other rigging.

A still further object of the invention is

generally to improve this class of stay bolts, so as to increase their utility, durability and efficiency.

Further objects and advantages will appear in the following description, it being understood that various changes in form, proportions and minor details of construction may be resorted to within the scope of the appended claims.

For a full understanding of the invention and the merits thereof, reference is to be had to the following description and accompanying drawings, in which:

Figure 1 is a transverse sectional view of a boiler showing in elevation a flexible stay bolt constructed in accordance with my invention. Fig. 2 is a longitudinal sectional view of the stay bolt. Fig. 3 is a front elevation looking at the face of the tapered plug. Fig. 4 is a similar view showing the threaded end of the bolt after the metal has been upset or riveted.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

The improved flexible stay bolt forming the subject matter of the present invention is principally designed for use in connection with steam boilers and the like, and by way of illustration is shown applied to a steam boiler of the ordinary construction, in which 5 designates the outer or shell sheet, and 6 the inner or fire-box sheet, said sheets being spaced apart to form an intermediate water and steam compartment 7.

The device comprises a removable plug 8 having its side walls tapered and threaded at 9 for engagement with the threads of a correspondingly shaped opening formed in the outer or shell sheet 5. The inner end of the tapered plug 8 is reduced to form a contracted neck or stem 10 defining a spherical head 11, which latter projects a short distance within the compartment 7, as shown, for pivotal connection with the stay bolt 12. One end of the stay bolt 12 is threaded in the inner or fire-box sheet 6 and is provided with a terminal squared portion 14 for engagement with a wrench or other suitable tool, by means of which the stay bolt may be screwed into said inner sheet. The opposite end of the stay bolt 12 is provided with a spherical socket 15 corresponding to and adapted to receive the head 11 of the tapered plug 8, thus to form in effect a universal

joint between the plug and the stay bolt and permit the lateral movement of one relative to the other, incident to the expansion and contraction of the boiler sheets. The walls of the socket 15 at the extremity of the bolt 12 are preferably thickened and slightly rounded, as indicated at 16, so as to reinforce and strengthen the socket and at the same time present a smooth bearing surface for engagement with the neck 10, thus to allow free pivotal movement of the stay bolt without wedging or binding action between the parts.

It will here be noted that the outer face of the tapered plug 8 is flat, and disposed substantially flush with the outer face of the shell or sheet 5, so that it can be used back of frames, pads, or other rigging, and also so as not to interfere with the spring arrangements, driving wheels, running boards, and the like, of locomotives to which it may be applied. The outer flat face of the tapered plug 8 is also preferably provided with a square opening 17 for the reception of a wrench, of any suitable construction, thus to facilitate removal or replacement of the plug when necessary. The plug 8 is provided with a longitudinally disposed tell tale hole 18, one end of which extends through the contracted neck of said plug to a point near the base of the spherical head 11, while the other end thereof intersects the socket or recess 17, and communicates with the atmosphere, so as to permit the ready discharge of steam or water from the compartment 7 and thus notify the engineer or attendant in case of breakage of the stay bolt.

After the threaded end of the stay bolt 12 has been screwed into the inner or fire-box sheet 6, and the tapered plug threaded in the outer or shell sheet with the head 11 thereof seated in the socket 15, the squared end 14 of the bolt is severed and the excess metal upset and forced into engagement with the inner boiler sheet, as indicated at 19, so as to prevent accidental displacement of the bolt.

It is well known that flexible stay bolts of the ordinary ball and socket type generally break at the head, due to defective material, or to crystallization or brittleness, caused by the constant working to which stay bolts in a high pressure locomotive boiler are subjected. Another defect found in the ordinary type of ball and socket flexible bolt is the fact that when the bolts are used in bad water districts they often become rigid, due to the incrustation which collects in the joint between the sections of the flexible bolt. With a bolt constructed in accordance with this invention, incrustation is practically impossible, as the flexible portion of the bolt is actually in the water space, and the jaws of the socket of the bolt

portion pry and dislodge any incrustation that might collect and retard its movement, thus insuring at all times perfect flexibility.

It will here be noted that the outer walls of the jaws of the socket 15 are disposed within the lines of the tapered plug 8, so that said plug forms in effect a housing for the socket, while the tell tale hole is of sufficient depth to span the junction of the jaws 16 and neck 10 without materially weakening the spherical head of the plug.

By making the bolt in this manner, said bolt is subjected to a direct tensile strain instead of a lateral strain, thus materially increasing the efficiency of the stay bolt and also lengthening the life thereof.

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

1. The combination with a pair of boiler sheets, of a stay bolt engaging one of the sheets and provided with a spherical socket, and a plug engaging the other sheet and having a spherical head fitting within the socket.
2. The combination with a pair of boiler sheets, of a stay bolt engaging one of the sheets and provided with a spherical socket, and a plug engaging the other sheet and having a spherical head fitting within the socket, there being a tell tale hole formed in the plug and having one end thereof opening through the outer face of the plug and its other end terminating short of the end of the head.
3. The combination with a pair of boiler sheets, of a stay bolt having one end thereof threaded for engagement with one of the sheets and its other end provided with a spherical socket, and a plug engaging the mating sheet and provided with a spherical head fitting within said socket, said plug being pierced by a tell tale hole opening through the outer face of the plug.
4. The combination with a pair of boiler sheets, of a stay bolt having one end thereof provided with means for engagement with one of the boiler sheets and its other end formed with a spherical socket, and a tapered plug seated in the other sheet and having its outer face disposed substantially flush with the outer face of said sheet and its inner face provided with a spherical head fitting within the socket, said plug being provided with a wrench receiving opening and having a tell tale hole formed therein and intersecting said opening.
5. The combination with a pair of boiler sheets, of a stay bolt engaging one of the sheets and provided with a terminal spherical socket, and a tapered plug threaded in the other sheet and having a reduced neck defining a spherical head fitting with said socket, there being a tell tale hole formed in the neck of the plug and opening through the outer face thereof.

6. The combination with a pair of boiler sheets, of a stay bolt having one end thereof provided with a squared end and external threads for engagement with a correspond-
5 ingly threaded opening in one of said sheets and its other end formed with a spherical socket, the jaws of which are thickened at the free ends thereof and rounded, and a tapered plug threaded in the other sheet and
10 having its inner face provided with a reduced neck fitting against the thickened portion of the jaws of the socket and defining a spherical head seated in said socket, said plug being provided with a tell tale opening,
15 one end of which communicates with the atmosphere, while the other end thereof extends through the neck to a point near the base of the spherical head.

7. A flexible stay bolt, including a body
20 portion having one end thereof threaded and its other end provided with a spherical socket, and a tapered plug having a reduced neck defining a spherical head adapted to fit within the socket to form a universal con-
25 nection between the parts, there being a tell tale opening formed in the plug and having one end thereof extending through the neck

to a point near the base of the head and its other end communicating with the atmosphere.

8. A flexible stay bolt, including a body
30 portion, having one end thereof externally threaded and provided with a terminal squared portion and its other end formed with a spherical socket, the walls of which
35 are thickened and rounded at the free end of the socket, a tapered externally threaded plug having its outer face flat, and its inner face formed with a reduced neck defining a
40 spherical head adapted to fit within said socket to form in effect a universal connection between the parts, the outer face of
said plug being provided with a wrench receiving recess, and the neck thereof formed
45 with a longitudinal tell tale hole intersecting the wrench receiving recess, the exterior walls of the socket being disposed within the lines of the plug.

In testimony whereof, I affix my signature in presence of two witnesses.

JAMES W. KEELEY. [L. S.]

Witnesses:

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JAMES F. McPHILLIPS.