J. R. SCHRADER.

LOCK NUT.

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1,034,371. Patented July 30, 1912.

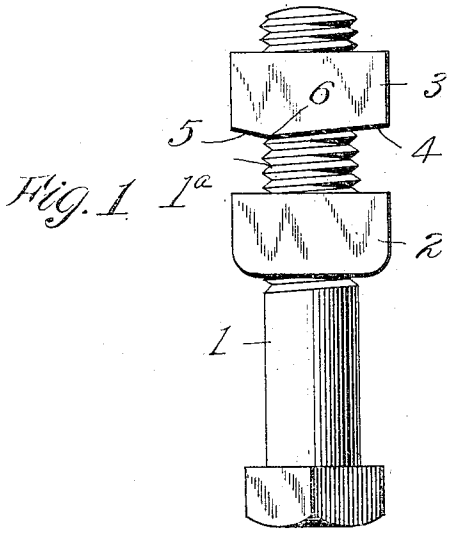


Fig. 1.

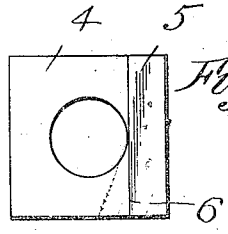


Fig. 3.

Fig. 2.

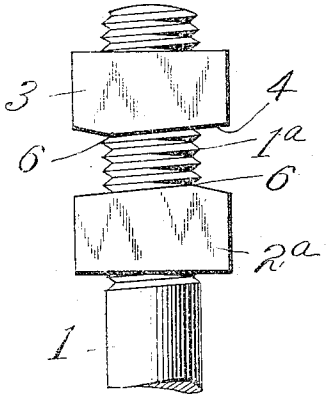


Fig. 4.

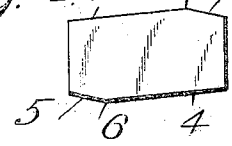
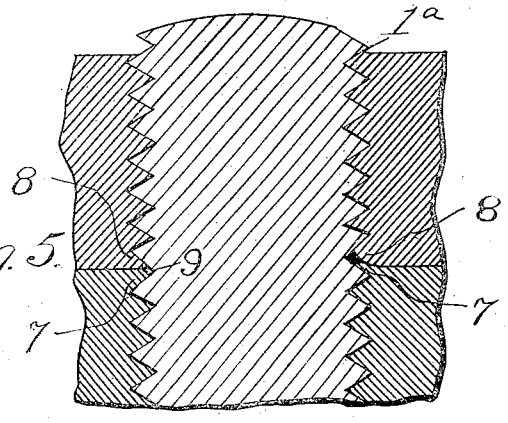


Fig. 5.



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UNITED STATES PATENT OFFICE.

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LOCK-NUT.

1,034,371. Specification of Letters Patent. Patented July 30, 1912.

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To all whom it may concern:

Be it known that I, JOHN R. SCHRADER, a citizen of the United States, and a resident of the borough of Bronx, city, county, and State of New York, have invented new and useful Improvements in Lock-Nuts; and in order that those skilled in the art or familiar with the same may understand, make, and use my invention, I give the following specification thereof, of which the accompanying drawings form part.

The object of my invention is to provide a lock nut, which also acts as a nut lock, of simple and inexpensive construction which may be readily manufactured and used with the ordinary tools and appliances and which requires no loose locking members, wedges or keys or other separate parts, and which may be applied to use in the same manner that the ordinary nut is applied to a bolt.

In the accompanying drawings, which illustrate nuts embodying my invention, Figure 1 represents in elevation an ordinary bolt having one of my improved lock nuts threaded thereon. Fig. 2 is a fragmentary view showing the threaded portion of a bolt with two nuts, each embodying my invention, threaded thereon. Fig. 3 is a face view of a nut embodying my invention. Fig. 4 is an elevation or edge view of a nut showing a modified form of the invention. Fig. 5 is a sectional view on an enlarged scale showing the action or effect of the lock nut in use.

Similar letters of reference are applied to corresponding parts in the several views.

Referring to the drawing, 1 represents an ordinary bolt provided with the usual threaded portion 1^a at its end.

In Fig. 1, 2 represents a nut of ordinary or usual form threaded on the bolt and 3 represents one form of my improved lock nut threaded on the bolt behind the nut 2 for the purpose of locking the latter against all tendencies and contingencies, such as vibration or the like, which would tend to loosen the latter.

While in the several views of the drawing, my improved lock nut is shown of square form or outline, it is to be understood that this is only for convenience of illustration and that lock nuts embodying my invention may have all the forms, such as hexagonal, octagonal or other forms, in which ordinary nuts are manufactured, but in all embodiments of the invention the body of the improved lock nut is rigid as distinguished from flexible and resilient washers or similar nut locking devices. In fact, in carrying out my invention, I may take any ordinary nut and form it into one embodying my invention by cutting away or beveling its lower or working face at an angle to the axis of the bolt hole (and consequently also to the axis of the bolt), which angle is slightly greater than that of the pitch of the threads. This cut-away face is represented by the numeral 4, and constitutes the seating surface of the nut. The inclined face 4 of the nut so formed, by the cutting away or beveling as described, is such that it includes the full circumference of the bolt hole as will be more particularly explained later. I also cut away the lower or working face of the nut in a direction inclined opposite to that of the face 4 so as to form a second inclined face 5. This second face 5 is so cut away as not to intersect the bolt hole. At the intersection of the faces 4 and 5, formed by the cutting away of the nut as described, there is produced an angle or apex 6 which is substantially tangent to the bolt hole, and at this apex or angle the nut has its greatest thickness as will be apparent. The angle formed by the face 5 with the axis of the bolt or bolt hole may be any suitable or convenient angle, as the purpose of cutting away the nut to form this face is merely to give a clearance as will more fully appear later.

By forming the nut as above described, it will be seen that there are produced two oppositely inclined faces 4 and 5 on the working or lower face of the nut, one of which, 4, has a considerably greater area than that of the other, 5, and also includes and intersects the bolt hole. The inner boundary of this face 4 is, as will be apparent, formed by the apex line 6 which substantially coincides with the threads of the nut and bolt at its tangent point, the line 6 being, as above stated, substantially tangent to the bolt hole. This line is also common to both faces 4 and 5, the latter face, however, not including or not intersecting the bolt hole. It will be understood that while I have described the formation of these faces 4 and 5 as produced by cutting away the lower face of an ordinary nut, they may be formed in any desired manner, as by

ing, die forging, or by any other suitable manner to produce these faces or to produce a nut having these faces directly from the stock or raw material.

Before proceeding to describe the modified forms of the nut, I will explain the action of the same in use.

It will be understood that one large use of lock nuts is in railroad equipment, for fish plates in the track, or in the construction of steel rolling stock, where bolts are subject to constant shocks and vibration which tend to loosen the nuts and cause the same to work off the bolt. There are of course numerous other situations in which similar conditions occur and where a lock nut is required. In such situations, it is common first to screw the parts up as illustrated in Fig. 1 with a nut of ordinary construction, this nut being represented by the numeral 2. The lock nut is then run on the bolt behind the nut 2 and screwed up on it. When this is done with the nut 3 of my invention, the angle or apex line 6 will first make contact with the upper face of the first nut 2, and the lock nut 3, as the same is forced on, will tend to seat itself on the lower nut 2 until the face 4 coincides with the upper face of the lower nut. As the face 4 is cut at a different angle from the pitch of the threads, the first or lower thread of the nut 3 will work into the same bolt thread as is already occupied, or partly occupied, by the uppermost thread of the nut 2, so that when the nut 3 is screwed home, the result as appearing in a section of the bolt and nuts through the bolt axis appears as shown in Fig. 5, with two nut threads 7 and 8 forced into one bolt thread 9, the two nut threads being those of the separate nuts. This action necessarily deforms or expands or upsets the bolt threads at the places indicated, with the result that both nuts 2 and 3 are securely locked or prevented from becoming loose when subjected to vibration or other causes tending to slacken the nuts. The deformed threads 9 of the bolt are behind the nut 2 and consequently this nut is prevented from loosening or tending to unscrew, and the same is true of the nut 2, except that the deformed thread is near the advanced face of the nut. Actual tests under railroad conditions have substantiated the secure locking of the nuts and a section of bolts used in tests give the appearance indicated in Fig. 5 with two nut threads forced into one bolt thread.

The face 5 formed on my nut is an important feature of the invention since thereby the deflection or bending over of the bolt is avoided, as the angle or apex line 6 where the greatest thickness of the nut occurs is thereby located, not at the outer edge of the nut, but at a point which coincides with the threads, this line being, as above explained, tangent or substantially so therewith. The result is that the deforming effect is limited to the threads of the bolt and the bolt itself is not bent or deformed. Should the nut have its greatest thickness at its outer edge, this edge would first make contact with the lower nut and would form a fulcrum against which the lock nut would work in seating itself on the lower nut and the leverage being thereby greater than where the fulcrum is at the threads of the nut and bolt, the bolt is bent or deflected. This defect becomes so great, especially as greater force is required to screw up the lock nut, that the end of the bolt may be sheared off. Even where the strain is not so great as to shear the bolt, fissures or cracks will appear in the bolt which, when exposed to the weather, become rusted and are serious elements of danger to the bolt. By making the clearance surface 5 as described in accordance with my invention, all the objections above indicated are eliminated.

In Fig. 2 I have shown the lower or first nut 2^a having its upper face formed similarly to that of the lower face on the nut 3. That is, as to their meeting faces, the nuts 2^a and 3 in Fig. 2, are alike. This gives an additional or increased locking effect as the nut 3 may be turned on the bolt relatively farther than in the case shown in Fig. 1 and the forcing of the two nut threads into one bolt thread as described and illustrated in Fig. 5 is more extensive so that practically this effect is secured around the whole circumference of the bolt. Also there is greater resistance to any unscrewing tendency on account of the interlocking effect of the two angles 6—6 on each of the nuts 2^a and 3.

In Fig. 4, I have shown a nut having both the upper and lower faces formed as described, each face having the inclined surface of larger area 4 and the smaller clearance surface 5. For commercial use the form of nut shown in Fig. 4 is preferable since all the nuts employed on a given work may be uniform in construction and no time is lost and no mistakes can occur through the selection of the wrong nut for the lock nut or through the improper placing of the same, as it is immaterial in a nut so formed which face forms the upper or lower face, since both faces are alike.

It will be observed that nuts embodying my invention are simple and inexpensive in construction, possess no loose wedges or locking parts and require no machining or fitting or elaborate process for manufacture or use.

Having described my invention and the manner of using the same, what I claim is:

1. A rigid lock nut provided on its working face with a seating surface and a ful-

crum disposed substantially tangent to the bolt hole to effect a distortion of the bolt threads.

2. A rigid lock nut having its working face cut away to leave a fulcrum disposed substantially tangent to the bolt hole, and formed with a seating surface.

3. A lock nut having one of its faces formed with two angularly disposed surfaces each of said surfaces inclined to the axis of the bolt hole, one of said surfaces intersecting the bolt hole throughout its circumference, the other angular surface oppositely inclined to the first mentioned angular surface.

4. A lock nut having one of its faces inclined to the axis of the bolt hole, said inclination being at an angle slightly greater than the pitch of the threads, and a surface on said face oppositely inclined thereto, the line of intersection between said inclined surfaces being tangent to the bolt hole.

5. A lock nut having angularly disposed surfaces on one of its faces, the intersecting edges of said surfaces forming a salient angle, the apex of said angle being tangent to the bolt hole.

6. The combination with a bolt, a nut of ordinary construction and a lock nut, said lock nut being formed with oppositely inclined surfaces on its working face, one of said surfaces being a seating surface which coincides with the surface of the ordinary nut when the lock nut is screwed home, the lowermost thread of the lock nut engaging the same bolt thread as is engaged by the uppermost thread of the ordinary nut.

7. A lock nut having each of its faces formed with two oppositely inclined surfaces, the angle formed by said surfaces on each face of the nut being in a line substantially tangent to the threads.

8. A lock nut having each of its faces formed with a surface inclined to the axis of the bolt hole at an angle slightly greater than the pitch of the threads, each of said surfaces intersecting the bolt hole throughout its circumference, and each face of said nut being provided with an oppositely inclined surface making a salient angle with the first mentioned surface.

9. The combination with a bolt, a lock nut and an abutment against which said lock nut works when screwed home, the face of the abutment and the face of the lock nut being similarly formed and each having a surface inclined to the axis of the bolt hole and intersecting its whole circumference, each of said nut and abutment faces also having a surface oppositely inclined to the first mentioned surface and forming a salient angle therewith, the apex of said angle being tangent to the nut and bolt threads.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."