Sept. 8, 1931. W. M. HORTON 1,822,657

BOLT

Filed March 29, 1930

Fig. 1.

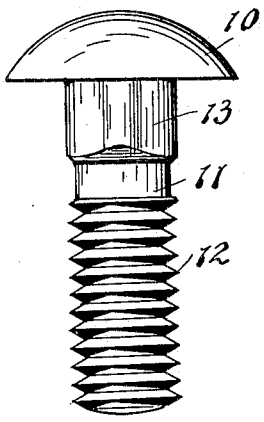


Fig. 2.

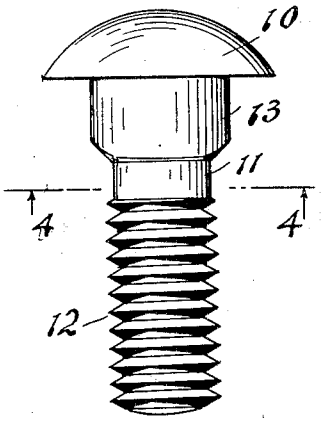
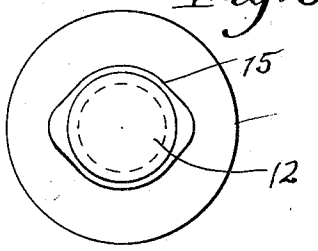


Fig. 3.



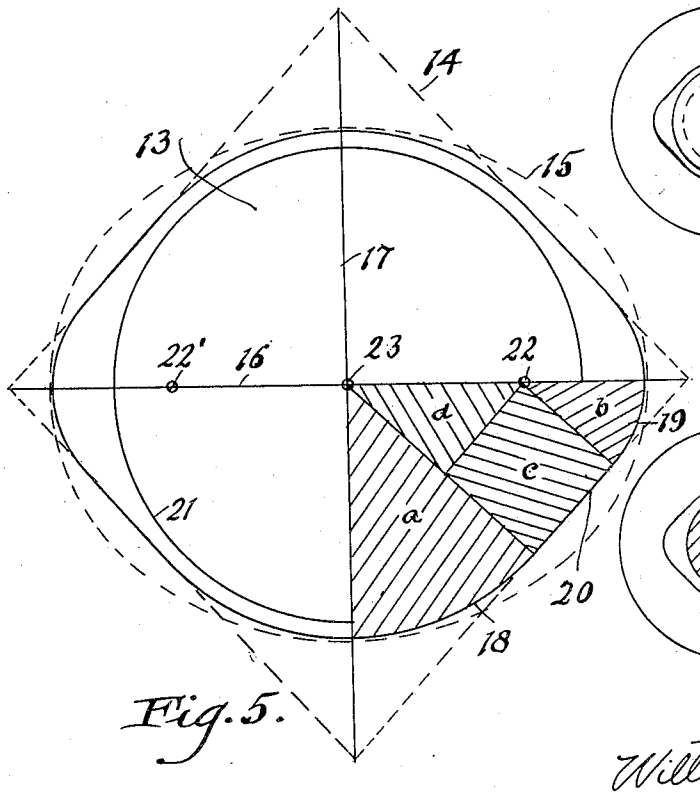
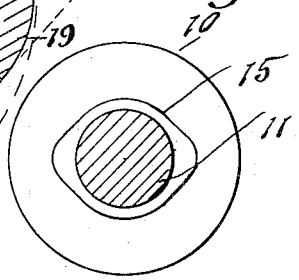


Fig. 5.

Fig. 4.



Inventor
William M. Horton
Kerr Hudson & Kent
attys.

Patented Sept. 8, 1931 1,822,657

UNITED STATES PATENT OFFICE

WILLIAM M. HORTON, OF CLEVELAND, OHIO, ASSIGNOR TO THE LAMSON & SESSIONS COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO

BOLT

Application filed March 29, 1930. Serial No. 440,123.

This invention relates to improvements in bolts, particularly bolts having a portion directly beneath their heads which is called the shoulder and which is of greater cross-section than the shank of the bolt, this shoulder being adapted to be engaged by the material into which the bolt is set in order to prevent turning of the bolt in its hole. The ordinary carriage bolt is of this general character.

The carriage bolt of usual construction presents certain disadvantages both as to the article itself and as to the methods and tools for producing the same. Bolts are usually upset from wire of round cross-section, there being a die which is shaped to form the round shank and the square shoulder, and a hammer having therein a cavity shaped to form the head of the bolt. The die opening corresponding to the shoulder necessarily has square corners. During the use of the die, scale and dirt collect in these corners, and under the heat resulting from the upsetting of the metal, this foreign material is hardened to such an extent that it becomes, in effect, a part of the die. Such foreign material prevents the formation of sharp corners on the blanks, the appearance of which is thereby spoiled to a greater or lesser extent, and in practice this is considered sufficiently serious to require the refinishing or the scrapping of the dies. Another disadvantage in respect to the article itself is that considerable force is required to drive the square shoulders of carriage bolts into wood or other compressible material, and such material is weakened thereby, the fibers of wood, for instance, being broken by the pointed corners of the shoulder.

With regard to the manufacture of carriage bolts, the square opening in the die is not only difficult to make but, when the die is hardened, the metal around the corners of this square opening is weakened, and when the die has been in use for a time, and before it is otherwise worn out, cracks are apt to start from these weakened points.

One of the objects of the present invention, therefore, is the production of a shouldered bolt which, when the shoulder is driven into wood or other material, has a resistance against turning equal to that of the carriage bolt, and which is nevertheless capable of being driven with considerably less effort than a carriage bolt and with considerably less damage to the material into which it is driven.

Another object is the provision of a bolt of this character which shall be devoid of sharp corners and which shall present a good appearance even when made in a die that has been used for a considerable length of time.

A further object is the provision of a bolt which shall permit of the use of dies devoid of sharp corners and hence not subject to cracks nor to filling up with scale and the like, such dies giving long service with a consequent low die cost.

Another object is the provision of a bolt which shall permit the use of a die, the shoulder portion of which may be formed by drilling three holes and connecting the peripheries of these three holes by milling flats along the sides of the shoulder portion, thereby effecting a considerable saving in the cost of production over that of a die with either a square hole or an elliptical hole.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which:

Figs. 1 and 2 are elevational views taken at right angles to each other, showing a bolt embodying the present invention;

Fig. 3 is an end view of the same;

Fig. 4 is a cross-section taken substantially on the line 4—4 of Fig. 2; and

Fig. 5 is a diagrammatic view, on an enlarged scale, illustrating the form of the shoulder portion of the bolt.

In the drawings, the bolt is shown with an unslotted head 10 of a form commonly used upon carriage bolts. The shank of the bolt may have an unthreaded portion 11 and a threaded portion 12, the relative lengths of these portions being a matter of choice. In the case illustrated, the threads have been formed by rolling the shank of the blank be-

tween dies, the blank being formed in such case with a shank having a diameter equal to the pitch diameter of the threads. This detail affects the relative diameters of the portions 11 and 12 but is of no importance in so far as the present invention is concerned.

The shoulder 13, as indicated in Fig. 5, conforms to some extent to a parallelogram 14. The four sides of the parallelogram are of equal length, but the angles may be equal or two of them may be greater than the other two. The shoulder 13 also approaches to a certain extent an ellipse 15, the perimeter of the shoulder touching the ellipse at the extremities of its major and minor axes 16 and 17 respectively. In Fig. 5, the lower right-hand quarter of the shoulder is divided up, for convenience in computing area, into sectors *a* and *b* of circles, a rectangle *c* and a triangle *d*. The radius of the circle 18, of which the sector *a* is a part, is one-half the length of the minor diameter 17 of the ellipse 15, and the radius of the circle 19, of which the sector *b* is a part, is of the order of one-fourth the diameter 17, this exact proportion being preferred. The perimeter of the shoulder includes a straight portion 20 lying between the points where the two arcs 18 and 19 are tangent to that side of the diamond 14. In this figure, the circle 21 represents the outer diameter of the threaded portion 12 of the bolt. Since the center of circle 18 is at the intersection of the two axes of ellipse 15, and since this intersection lies in the axis of the bolt, the two circles 18 and 21 are concentric. It is quite within the scope of the invention to make the circles 18 and 21 coincident, which means that the smaller diameter of the shoulder will be the same as the outer diameter of the threads, but I prefer to have the circle 18 of slightly greater diameter than the circle 21, this difference in diameter being preferably a certain arbitrary constant, as for instance 20/1000 of an inch for bolts of ordinary size. This slight overhang of the shoulder beyond the threads of the bolt is of advantage where the shoulder is to be driven or fitted into a hole formed in a piece of metal to receive it. If the overhang is omitted, and the fit of the shoulder into its hole is sufficiently close to require the driving of the bolt into place, then the threads of the bolt are almost certain to be damaged. The 20/1000 overhang is sufficient to provide clearance for the threads and yet is not sufficient to require any material added force for driving the bolt into wood or other similarly compressible material.

It will be noted that the lower sides of the shoulder beyond the shank of the bolt are beveled. This bevel is of advantage in that it facilitates the upsetting of the metal in the formation of the shoulder, and also in that it acts as a wedge to compress the material into which the bolt is driven.

When a die for the production of the bolt is to be made, the workman first drills holes at the centers 22 and 22′ of a radius equal to the radius of circle 19. He then drills a third hole centered at 23 of a radius equal to the radius of circle 18. The flats 20 are then milled off, which is a relatively simple operation, most of the material having been removed by the drilling operations. Thereafter the hole for the shank of the bolt is drilled, this hole being also centered at 23 and having its periphery in the circle 21.

From the above description and from the illustration in Fig. 5, it will be apparent that the volume of the shoulder, as I construct it, is considerably less than what the volume would be were the shoulder formed with the cross-section of either the parallelogram 14 or the ellipse 15. It does not have the deleterious effect upon the material into which it is driven that it would have if the parallelogram shape were employed, and yet it has been found that it performs the function of a shoulder (prevention from turning) quite as effectively as does a square shoulder. My bolt is particularly desirable where the shoulder must enter a metal member, because it is easier to produce and maintain tools for punching the necessary hole than it is to produce and maintain tools for punching a square hole. Furthermore, the square holes tend to concentrate strains at the corners thereof, and thereby weaken the material more than is the case where rounded holes to receive my bolts are used.

While in the foregoing description and in the accompanying drawings I have disclosed one particular embodiment of the invention more or less in detail, I desire it to be understood that such detailed disclosure has been resorted to primarily for the purpose of fully illustrating the invention in accordance with the requirements of the statute, and is not to be construed as amounting to a limitation upon the scope of the invention.

Having thus described my invention, I claim:

1. A bolt having a head and a threaded portion, and a shoulder between the head and threaded portion, said shoulder having four longitudinal flat surfaces the opposite ones of which are parallel, and four cylindrical surfaces interposed between the flat surfaces, the common center for two of said cylindrical surfaces lying outside the circles of the two remaining surfaces.

2. A bolt having a head and a threaded portion, and a shoulder between the head and threaded portion, said shoulder having four longitudinal flat surfaces the opposite ones of which are parallel, and four cylindrical surfaces interposed between the flat surfaces, two of said cylindrical surfaces having their axes in the principal axis of the bolt and

two of them having their axes parallel with but spaced from the axis of the bolt.

3. A bolt having a head and a threaded portion, and a shoulder between the head and threaded portion, said shoulder in cross-section having major and minor axes at right angles to each other, the perimeter of the shoulder at these axes meeting an ellipse formed upon the same axes, the perimeter of the cross-section of the shoulder on either side of said axes being formed as arcs of circles, the adjacent arcs being connected by straight lines.

4. A bolt having a shoulder for preventing rotation, said shoulder being shaped in cross-section as a parallelogram modified by arcs of circles interposed between the straight sides of the parallelogram, the radius of two opposite arcs being substantially one-half that of the two remaining arcs, and the straight sides being tangent to the circles.

In testimony whereof, I hereunto affix my signature.

WILLIAM M. HORTON.