July 6, 1926. 1,591,938

A. E. HARRISON

LINER FASTENING

Filed Nov. 18, 1922

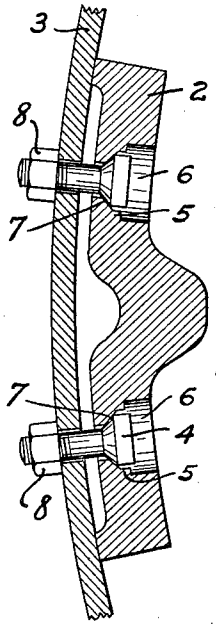



Fig. 1

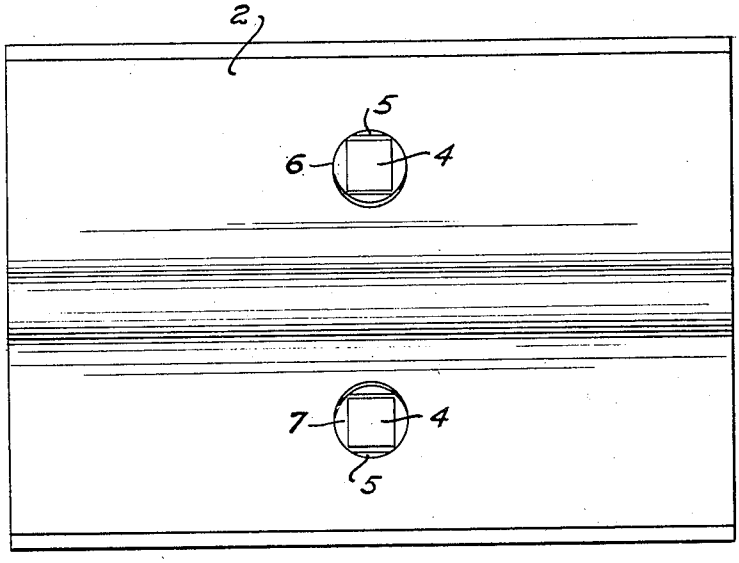



Fig. 2

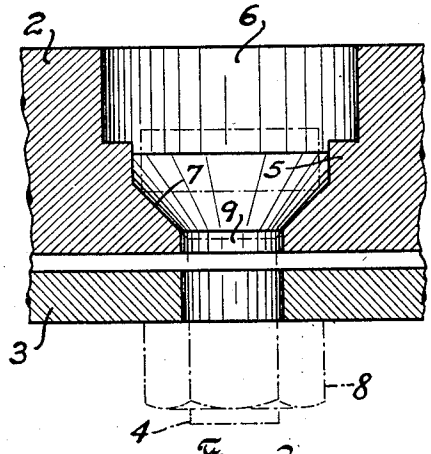



Fig. 3

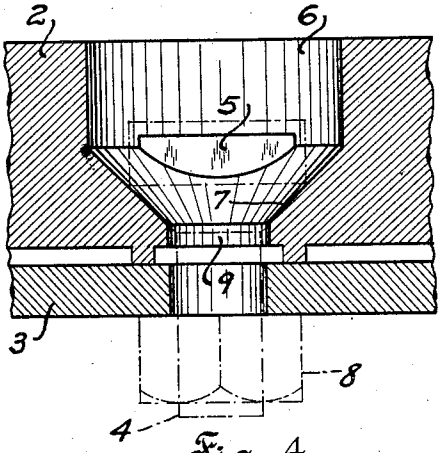



Fig. 4

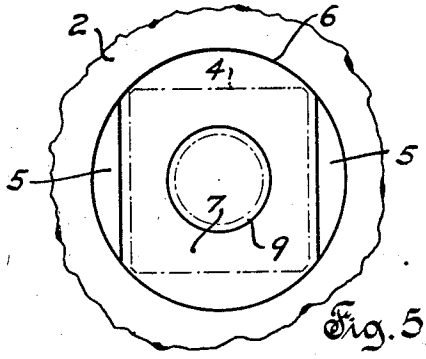



Fig. 5

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Patented July 6, 1926. 1,591,938

# UNITED STATES PATENT OFFICE.

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## LINER FASTENING.

Application filed November 18, 1922. Serial No. 601,930.

This invention relates in general to improved means for uniting elements, and relates more specifically to an improved method of manufacturing liner plates and to means for attaching or fastening such devices to adjacent structure.

An object of the invention is to provide an improved fastening which is simple in construction and efficient in use. Another object of the invention is to provide improvements in the construction of cast metal liners. A further object of the invention is to provide an improved liner for rotary drum comminuting mills and improved means for attaching such liners to the mill drum. These and other objects and advantages of the present invention will be apparent from the following description.

It has heretofore been common commercial practice to provide chilled cast metal liners for rotary drum comminuting mills and like apparatus. These liners are ordinarily attached to the shell or casing of the mill by means of a series of through bolts having heads which coact with the liners, the bolts passing through alined openings in the liners and the shell. In order to prevent turning and excessive wearing of the attaching bolts, it is preferable to use polygonal headed bolts and to locate the bolt heads within relatively deep recesses or sockets in the liners. The prior practice when using polygonal headed bolts, was to form the sockets in the liners of the same general shape as the bolt heads, the ordinary practice being to utilize square headed bolts coacting with sockets having square transverse cross-section slightly larger than the cross-section of the bolt heads in order to provide sufficient clearance to permit convenient insertion and removal of the bolts. In casting liners with such polygonal sockets especially when chills are used, the stresses set up in the casting, invariably produce cracks in the liners at the corners of the polygonal recesses, these cracks frequently enlarging during operation of the mill and causing the liner plates to break. The present invention contemplates the provision of means for permitting the use of polygonal headed clamping bolts and for eliminating objectionable cracking of the liner plates adjacent to the recesses therein.

A clear conception of an embodiment of the present invention and of the manner of constructing liners in accordance therewith, may be had by referring to the drawing accompanying and forming a part of this specification in which like reference characters designate the same or similar parts in the various views.

Fig. 1 is a transverse section through an improved comminuting mill liner, showing the same attached to a fragment of the mill shell.

Fig. 2 is an elevation of an improved comminuting mill liner.

Fig. 3 is an enlarged fragmentary transverse sectional view through an improved comminuting mill liner and the adjacent shell.

Fig. 4 is an enlarged fragmentary longitudinal sectional view through an improved comminuting mill liner and the adjacent shell.

Fig. 5 is an enlarged fragmentary elevation of an improved comminuting mill liner.

The type of comminuting mill to which the present improvement is especially applicable comprises a rotary cylindrical shell or casing 3 forming a comminuting chamber within which the material is reduced by impact and abrasion with freely tumbling comminuting bodies. The interior of the casing 3 is protected by a sectional lining comprising a plurality of linear plates 2 the general form or shape of which is capable of considerable modification. The liners 2 are attached to the casing 3 by means of a plurality of through bolts 4 preferably having square or otherwise polygonal heads and the bodies of which bolts penetrate the liners 2 and the shell 3 and are engaged by clamping nuts 8 located at the exterior of the casing 3. The polygonal heads of the clamping bolts 4 are preferably located within relatively deep recesses formed in the liner plates 2, the recesses being of sufficient depths to permit complete embedment of the bolt heads within the plates 2. As shown in detail in the drawing, each of the sockets or recesses in the plates 2 comprises a relatively large cylindrical portion 6, a relatively small cylindrical portion 9, and a tapered or frusto-conical portion 7 connecting and intersecting the portions 6, 9. Each of the

recesses is provided with a pair of parallel lugs or abutments 5 located between the cylindrical portion 6 and the tapered portion 7, the plane parallel side faces of the abutments 5 being spaced apart a distance which is slightly greater than the maximum widths of the heads of the clamping bolts 4, see Figs. 3 and 5. The clamping bolts 4 are provided with frusto-conical surfaces adapted to engage the tapered recess portions 7 and the heads of the bolts 4 when in operative position, are located relatively near to the bottom of the corresponding recesses in order to permit considerable wearing of the plate 2 without interfering with the bolts 4. The liners or plates 2 when formed as shown in the drawing with a space between the plates 2 and the shell or casing 3, are also preferably provided with local thrust lugs near the bolts 4 as shown in Fig. 4, in order to prevent undesirable distortion of the plates 2 and shell 3 when clamping is effected.

With this arrangement of elements, it will be noted that with a bolt 4 positioned as indicated in Figs. 3, 4 and 5 the abutments 5 effectively prevent turning of the bolts 4 especially when the nuts 8 are being applied thereto from the exterior of the mill. The clearances provided between the abutments 5 and the bolt heads and between the walls of the cylindrical portions 9 and the bodies of the bolts, permit ready insertion and removal of the bolt 4. By forming the upper portion 6 of the bolt holding socket circular, and of depth at least as great as the normal penetration of the chill, cracking of the liner plates 2 adjacent to the bolt holding sockets is entirely prevented. The abutments 5 are preferably located beyond the normal range of penetration of the chill and therefore have no effect in producing undesirable shrinkage stresses in the chilled castings. While the invention has been illustrated as being specifically applied to the liner plates of rotary drum comminuting mills it will be obvious that its application may be found advantageous in other classes of apparatus.

It should be understood that it is not desired to limit the invention to the exact details and mode of construction herein shown and described for various modifications within the scope of the claims may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:—

1. In combination, a shell having a perforation, a shell liner having a chilled wearing portion and a hole alinable with said perforation, said liner having a recess which is of circular cross-section throughout the chilled region of said liner and having therein an abutment adjacent to said hole and beyond said chilled region, and a bolt extending through said hole and said perforation, said bolt having a head located within said recess and cooperable with said abutment to prevent turning of said bolt.

2. In combination, a shell having a perforation, a shell liner having a chilled wearing portion and a hole alinable with said perforation, said liner having a recess which is of circular cross-section throughout the chilled region of said liner and having therein axially opposite abutments adjacent to said hole and beyond said chilled region, and a bolt extending through said hole and said perforation, said bolt having a polygonal head located within said recess and provided with opposite side surfaces cooperable with said abutment to prevent turning of said bolt.

In testimony whereof, the signature of the inventor is affixed hereto.

ALBERT E. HARRISON.