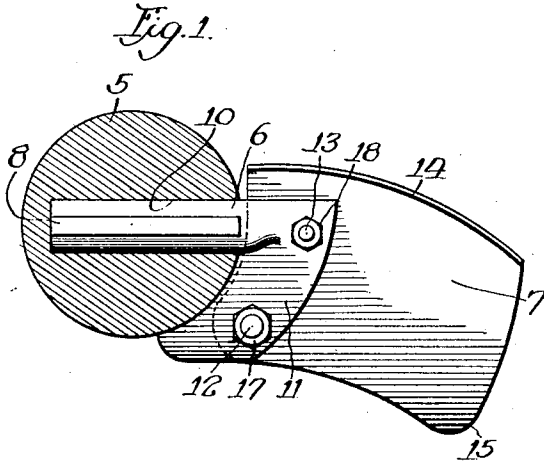
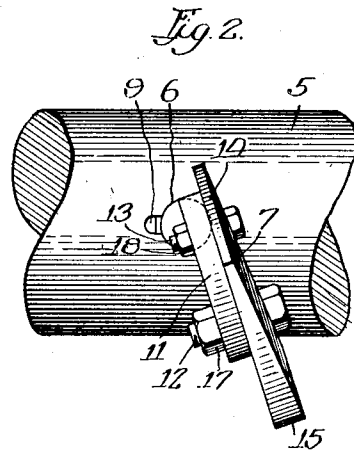
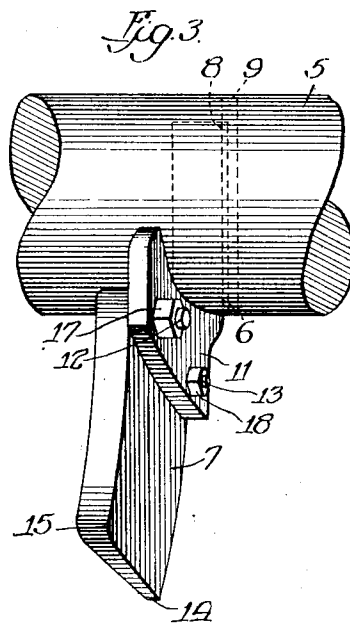
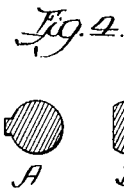


F. O. RUSH.
PUG MILL KNIFE.
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1,347,876.

Patented July 27, 1920.



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UNITED STATES PATENT OFFICE.

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PUG-MILL KNIFE.

1,347,876.

Specification of Letters Patent.

Patented July 27, 1920.

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To all whom it may concern:

Be it known that I, FRED O. RUSH, a citizen of the United States, residing at New Castle, in the county of New Castle and State of Delaware, have invented certain new and useful Improvements in Pug-Mill Knives, of which the following is a specification.

My invention refers to pug mills and particularly to the type of mill having a rotary shaft on which are mounted a series of knife blades for the purpose of disintegrating the material in said mill. My invention has to do with a particular form of knife blade for use in a mill of the character described.

In pug mills used for the purpose of acting on mud, clay and the like, it has been the custom to employ knives mounted on a rotating shaft which knives are placed at an angle to the direction of rotation so as to force the material in the mill toward the exit. In some instances it has been customary to mount knives or blades on the interior of the mill in staggered relation to the rotating knives. Experience has shown that whenever in the use of a mill of this sort an obstruction is encountered by the rotating knives, the knife blade is very often broken off and thus becomes a menace in the operation of the mill. It is thrown violently around and sometimes breaks other blades in the mill necessitating the shutting down of the mill for repairs. Also when a knife of this sort is broken it means the removal of the complete knife and the installation of a new one, a costly proceeding.

The primary object of my invention is to provide a novel knife so arranged on the shaft as to move in a circular direction with the blade being set at an angle to the direction of rotation and to overcome the objections experienced in the present day type of knife.

Another object is to provide a knife so connected to the shaft by a safety member that when an obstacle is encountered in operation, a portion of the fastening means will give way thus permitting the blade to swing out of engagement with the obstacle without breaking from the shaft attaching portion and without damaging the apparatus. Also in permitting repairs by the installing of another safety member all of which may be done without harming the knife blade in any degree and without removing the knife from the shaft.

A still further object is to provide a knife formed of two portions, one of which may be permanently secured in the shaft and the other portion removably mounted thereon and provided with a safety connecting member which will give way when an obstacle is encountered.

A yet further object is to provide a knife in which practically no labor will be expended in adapting it for service.

A still further object is to provide a knife which may be moved out of operative position without endangering the other knives or mill lining and which may be put into service by means of the installation of an inexpensive bolt, or the like.

These and other objects will be apparent from the drawings, wherein:

Figure 1 is an elevation of the preferred form of my knife as mounted on a shaft, the shaft being shown in section.

Fig. 2 is an end view of Fig. 1.

Fig. 3 is a rear view of the preferred form of knife, and

Fig. 4 shows in section two forms of shanks.

Shaft 5 is the usual shaft which is employed in mills of this character and may be mounted either vertically or horizontally. Attached to the shaft are a series of blades or knives and sometimes a series of blades or knives are secured to the inner lining of the mill in staggered relation to the blades on the shaft. As this construction is well known to those skilled in the art, I consider it necessary herein to show only a single knife as it is understood that several knives similar to the one shown are employed.

The novelty of my invention lies in the employment of a shank portion 6 and a separable blade 7, both of which may be castings and preferably of alloy steel such as manganese steel, the shank 6 having an elongated member or shaft 8 for insertion in an appropriately arranged opening in the shaft 5. If desirable the member 8 may be truly circular in section and provided with a keyway as shown at 9 in Fig. 2. I have preferred to cast the key integral with the body member 8. A yet further modification would be the employment of the member 8 slightly flattened on one portion to engage a correspondingly flattened portion of the opening 10 in the shaft 5. The shank 6 is cast with an enlarged head member 11 having two

apertures 12 and 13 therein, the aperture 12 being larger in diameter than that of 13, the purpose of which will be explained later. The rear portion of the head member 11 is formed to conform to the periphery of the shaft 5 and when inserted in place to abut thereagainst thus forming a tight fit therebetween. In practice I have found that but little grinding is necessary to secure the proper fit. The blade 7 is made wedge shape in transverse section to provide an advance edge 14 and a rear edge 15. The cutting or advance edge 14 is arcuate in contour so that as the blade is rotated with a shaft a draw-cut is effected. For attaching the blade 7 to the head 11 of the shank portion 6 apertures are provided therein for registering with the apertures 12 and 13 in the head 11. Bolts 17 and 18 are inserted in said registering apertures and drawn tight by the usual nuts. In the forward hole 13 I prefer to employ a bolt or safety member 18 that is smaller in diameter than the bolt 17. The end of the wedge 7 adjacent the shaft 5 when mounted on the head 11 is spaced therefrom and is curved slightly as shown by dotted lines in Fig. 1. I prefer to arrange the bolts 17, 18 at substantially the same distance from the center or axis of the mill shaft 5 so that the strain on the bolts will be more evenly divided.

It will be observed that the shank member 6 may be formed of cast metal and inserted in the aperture 10 of the shaft 5 without the necessity of having to cut away any metal to bring the member 8 to the proper size and shape for interfitting with said aperture 10. By forming the key integral with the member 8 or making the member 8 with the flattened surface as shown in B in Fig. 4, it is possible to make a shank that requires practically no machining to make it adaptable for use.

In the operation of the device, blade 7 is mounted on the head 11 by the bolts 12 and 13 and rotated with the shaft 5. When an obstacle is encountered by the cutting edge of the knife if it is such an obstacle which under ordinary circumstances would break the blade, it will break the safety member or bolt 13, thus causing the blade 7 to swing about the pivot and out of the way of the obstacle, the blade being swung back until its curved rear edge 15 rests against the shaft 5. It will thus be observed that it is possible to continue the operation of the mill without removal of the blade 7 from the mill and without damage being done to any of the blades on the shaft or to those mounted on the interior of the lining of the mill, or even doing any damage whatsoever to the lining of the mill itself and still be possible to have the effectiveness of the blade in the operation of the mill. When the mill is stopped the blade may be brought into op-

erative position very easily by swinging it back in the position of the full lines in Fig. 1, and inserting another bolt 18 through the registering apertures 13. It will be noted that when the breakable or smaller bolt 13 is in position, the blade will move in advancing position, *i. e.*, with the edge 14 against the material in the mill. Whenever the bolt 13 breaks, the blade 7 will swing back with the rear edge against the shaft 5, thus presenting the edge 14^a as the advancing or active edge. The blade will still perform its function in the mill, but will be in a slightly different or following relation to the shaft 5 and the other blades. In no event, however, will it become inoperative or loosened from the portion 11.

It will be observed that I have provided a novel pug mill knife which is provided with a safety member to enable the knife to be swung out of operative position without becoming disconnected from its shaft attaching shank, thus moving it into a position where no damage will be done to the other knives in the mill nor to the lining thereof and which will permit of a quick replacement in position by the installation of a small bolt.

I do not wish to limit my invention to the exact form shown and described as I am aware that such a device is susceptible of modification and such modifications I consider as coming within the spirit and scope of my invention.

I claim:

1. A pug mill knife comprising in combination a blade and a separate shank, said shank having an irregular integrally formed portion for nonrotatively mounting said shank in the mill shaft, and means including a plurality of members arranged at substantially the same distance from the axis of the shaft for securing the blade to the shank.

2. A pug mill knife comprising in combination a blade and a separate shank, said shank having a portion integrally formed therewith for nonrotatively mounting said shank in the mill shaft, the shank having a portion made to conform to and abut part of the surface of the shaft whereby to remove some of the strain from the shank to the shaft, and means for securing the blade to the shank.

3. A pug mill knife including in combination a blade and a separate shank member, the shank member having an elongated portion with integrally formed means for nonrotatively mounting the same in engagement with the mill shaft and having an enlarged head portion, part of the inner edge of said head portion being curved and adapted to conform to and engage said shaft, and a blade secured to said head member at a plurality of points, the secur-

ing means being inserted near the lower end of blade.

4. A pug mill knife including in combination a blade and a separate attaching member, said attaching member having a shank irregular in cross section adapted to engage a similarly shaped aperture in the mill shaft, said attaching member having also an enlarged head portion adapted to abut said mill shaft, and means for attaching said blade to said enlarged portion at a plurality of points.

5. A pug mill knife including in combination a blade and a separate attaching member, said attaching member having a shank irregular in cross section adapted to engage a similarly shaped aperture in the mill shaft, said attaching member having also an enlarged head portion adapted to

abut said mill shaft, and means for attaching said blade to said enlarged portion at a plurality of points, near the end of the blade.

6. A pug mill knife including in combination a blade and a separate attaching member, said attaching member having a shank portion of irregular cross section adapted to engage a similarly shaped aperture in the mill shaft, and means for securing said blade to said attaching member at a plurality of points, the attaching member nearer the shank being weaker than the member farther from the shank.

Signed at New Castle, State of Delaware this fourteenth day of September, A. D. 1917.

FRED O. RUSH.