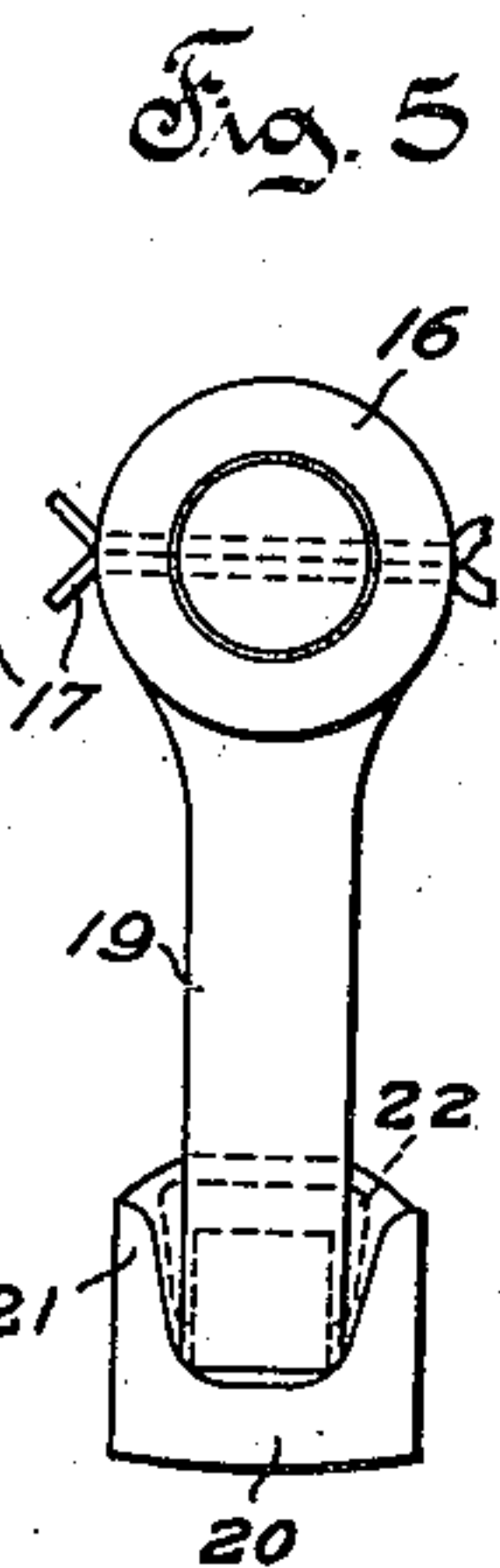
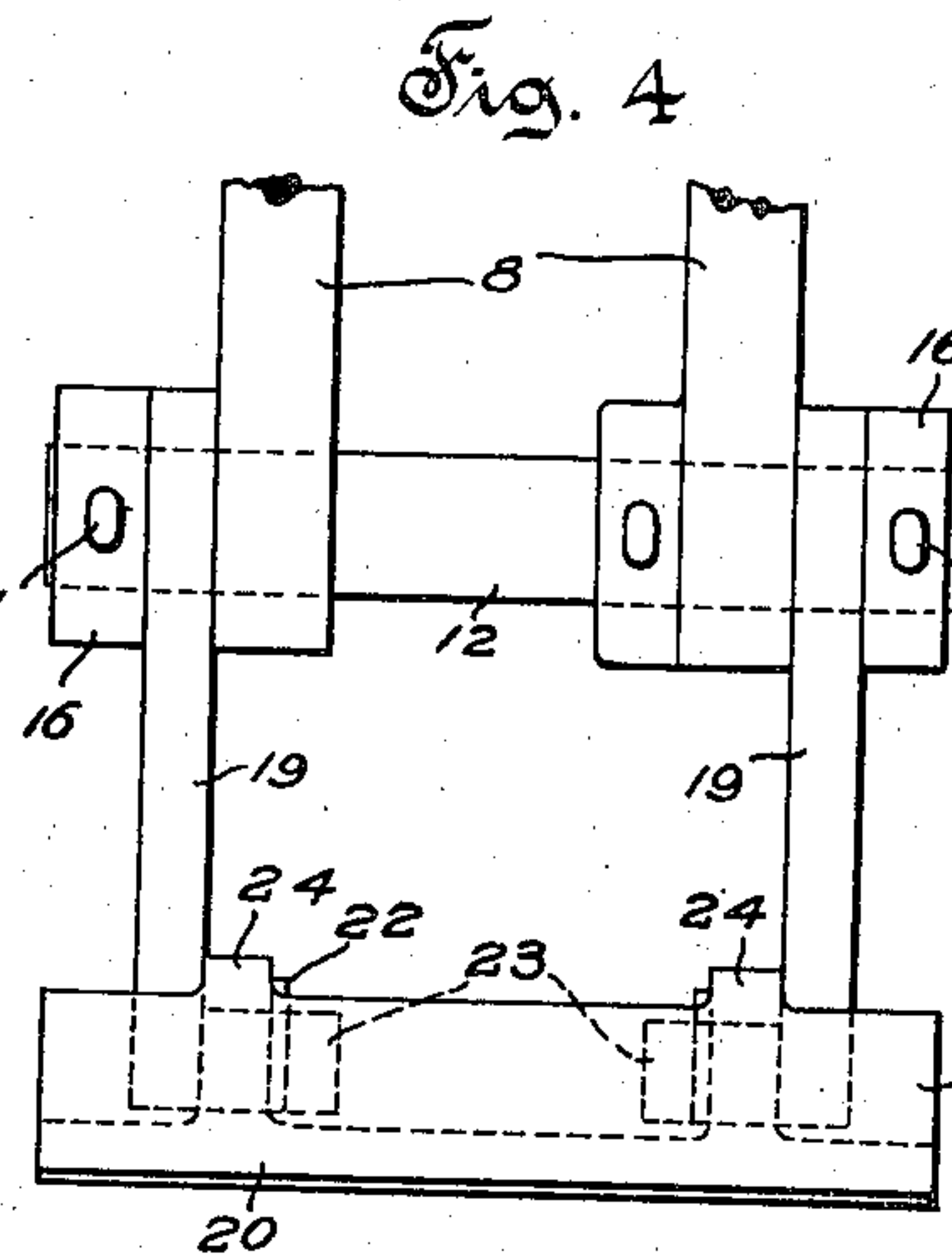
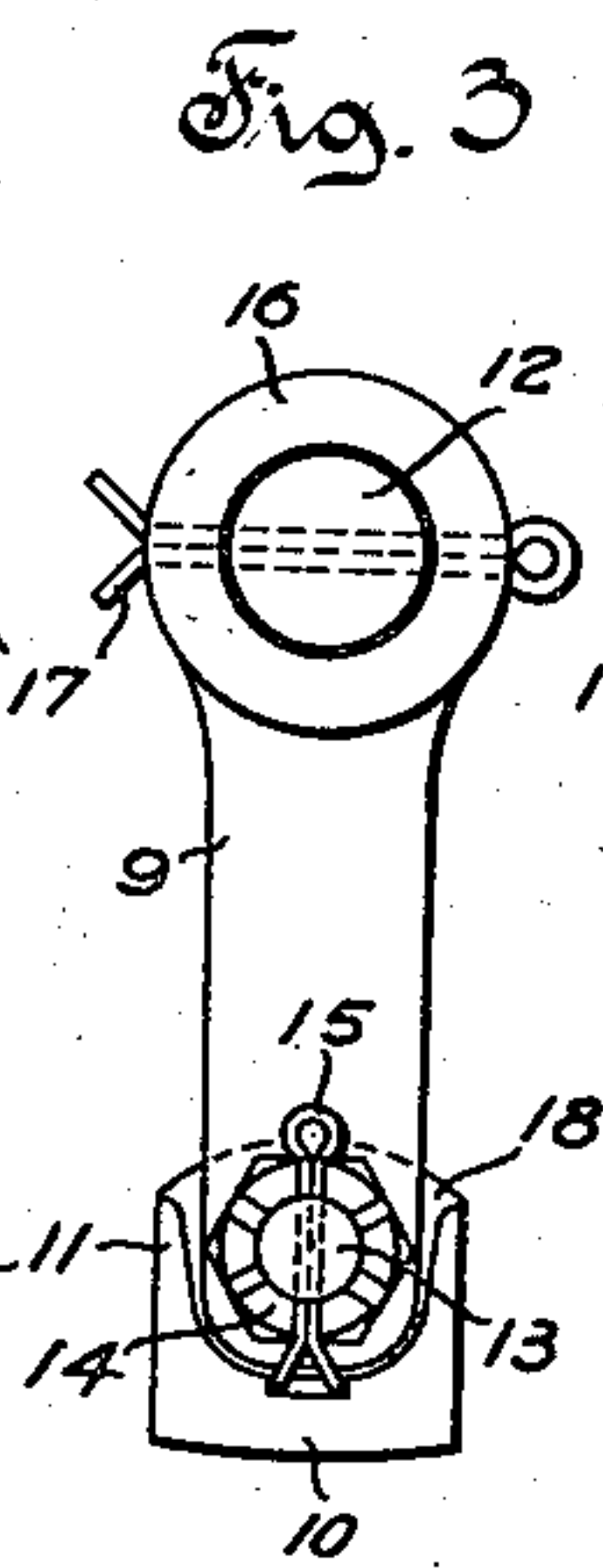
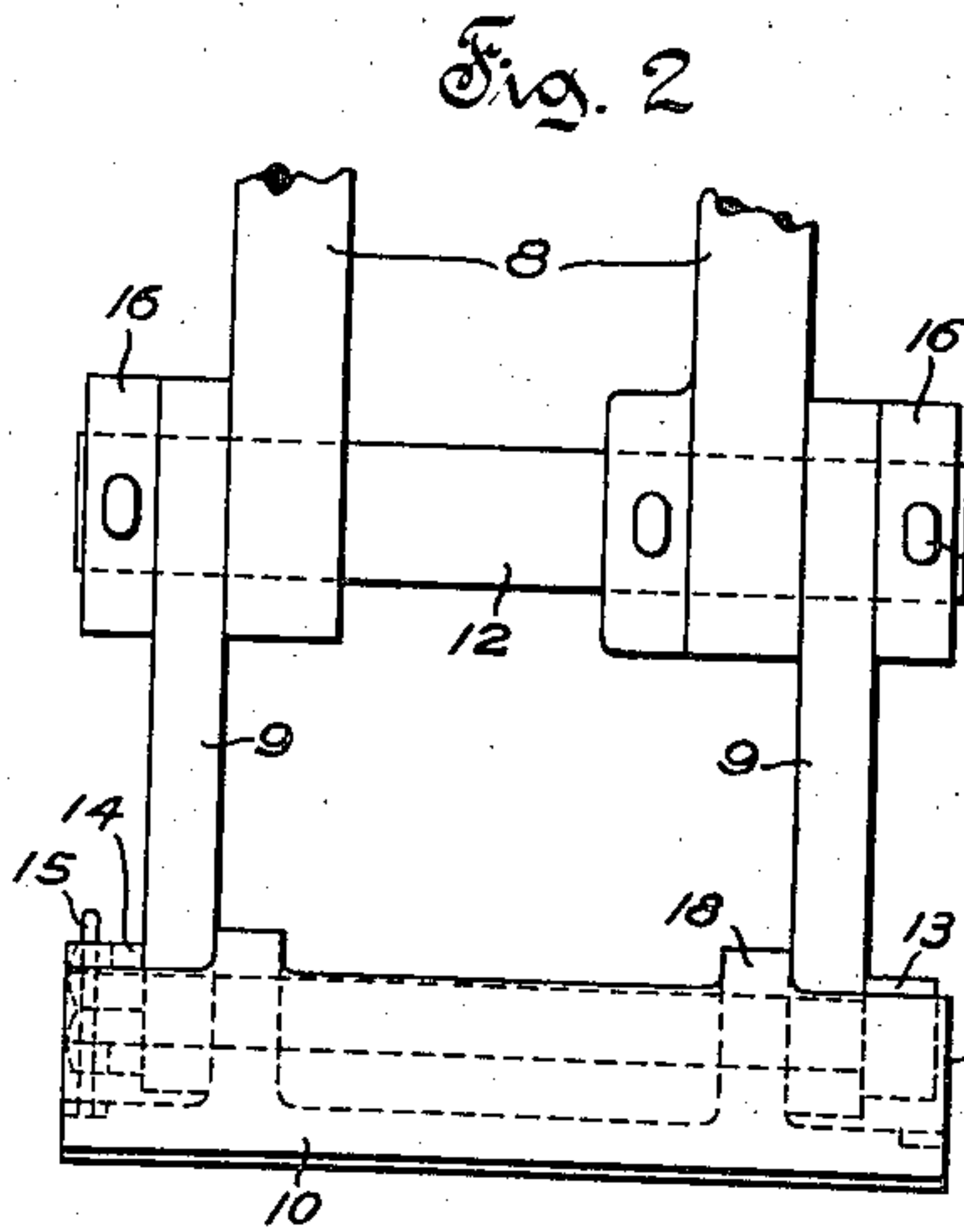
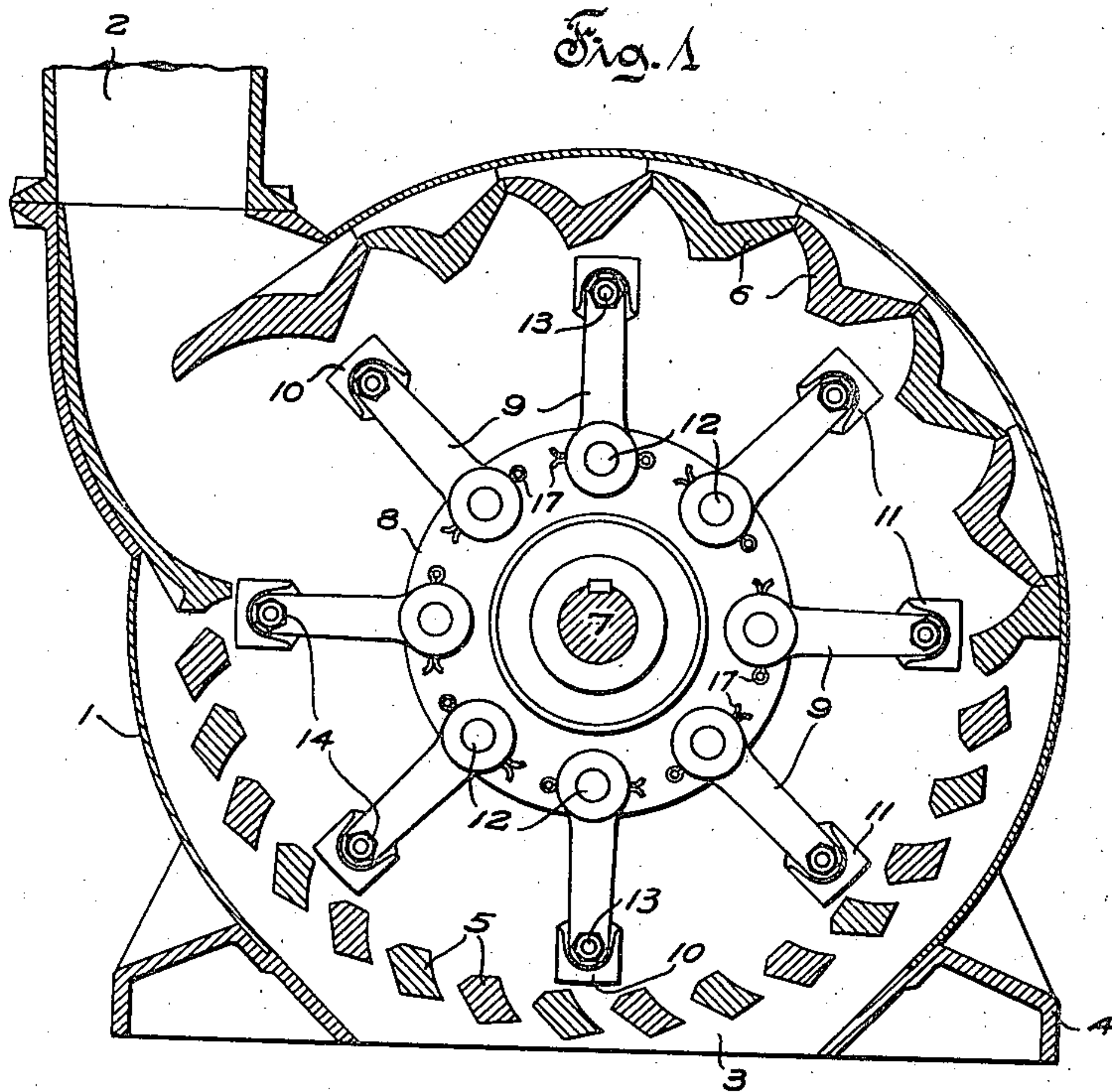


C. S. LINCOLN.  
 ROTARY IMPACT PULVERIZER.  
 APPLICATION FILED SEPT. 15, 1913.

1,166,698.

Patented Jan. 4, 1916.



Witnesses  
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# UNITED STATES PATENT OFFICE.

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## ROTARY IMPACT-PULVERIZER.

1,166,698.

Specification of Letters Patent.

Patented Jan. 4, 1916.

Application filed September 15, 1913. Serial No. 790,366.

*To all whom it may concern:*

Be it known that I, CHARLES S. LINCOLN, a citizen of the United States, residing at Wauwatosa, (Milwaukee,) in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Rotary Impact-Pulverizers, of which the following is a specification.

This invention relates to improvements in the construction of rotary impact pulverizers, and more specifically to improvements in the construction of hammers or bails for such pulverizers.

An object of the invention is to provide a pulverizer hammer or bail which is simple in construction, efficient in operation, and readily renewable at a minimum cost, when worn.

It has been found with the prior constructions of pulverizer hammers or bails, that unless very sensitive and complicated devices for permitting outward adjustment of the gradually wearing bail ends were provided, the percentage of the metal originally in the bail and necessarily discarded when the bail had become worn so as to make it unfit for further service, was very high. With the present invention this percentage of waste material is reduced to a minimum while the effectiveness of the bail during normal operation is not affected. The use of bails constructed in accordance with the present invention furthermore permits ready renewal of the wearing portion of the bail, thereby minimizing the time lost in making repairs. In the bails of the present invention, the construction is such that the connection between the beater portion of the bail and the suspending arms thereof, is effectively protected against injury during normal operation of the machine.

A clear conception of several embodiments of the invention 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.

Figure 1 is a transverse section through a rotary impact pulverizer. Fig. 2 is an enlarged elevation of one of the bails disclosed in Fig. 1, showing fragments of the bail suspension means. Fig. 3 is an enlarged end view of one of the bails of the pulverizer as disclosed in Fig. 1. Fig. 4 is an en-

larged elevation of another form of bail, showing fragments of the bail suspension means. Fig. 5 is an enlarged end view of the form of bail disclosed in Fig. 4.

The rotary impact pulverizer, see Fig. 1, consists essentially of a series of rapidly rotatable elements which are located within the housing or inclosing casing 1. The casing 1 is provided with suitable feed inlet and discharge openings 2, 3, and is mounted upon the casing base 4. The upper casing liners 6 are formed with involute impact surfaces and are secured within the casing 1 adjacent the upper portion of the circular path of movement of the bail ends. The spaced bars 5 have involute impact surfaces thereon and are located adjacent the lower portion of the circular path of movement of the bail ends. The bars 5 are secured to the casing 1 and are spaced so as to permit discharge of pulverized material between them.

The main shaft 7 is rotatably mounted in suitable bearings formed in or supported by the side walls of the casing 1 in the usual manner, and has the spaced suspension members or disks 8 fixed thereto. The suspension disks 8 are provided with equally spaced openings in which the bail suspension pins 12 are mounted and reversibly secured by means of cotter pins. The pins 12 are arranged parallel to each other and have outwardly projecting ends which serve as pivots for the inner ends of the bail arms 9. Retaining collars 16 are secured to the ends of the suspension pins 12 by means of cotter pins 17 and serve to retain the bail arms 9 in their proper positions upon the pins 12.

In the form of bail disclosed in Figs. 1, 2 and 3, the outer ends of the parallel and normally radial bail arms 9 are provided with holes through which the bail cross-bar suspension bolt 13 passes. The bail cross-bar 10 is provided with longitudinal flanges 11 on the side thereof facing the shaft 7 and has a pair of transverse projections 18 which span the recess formed between the flanges 11. These transverse projections 18 are spaced so as to bring them directly adjacent the ends of the bail arms 9, and have openings therethrough which register with the openings in the outer ends of the bail arms 9. The bolt 13 passes through the openings in the projections 18 and is secured in place by means of a lock nut 14 which is fixed to



the bolt 13 by means of a cotter pin 15. The bail cross-bar 10 is readily removable from the ends of the arms 9 by removal of the bolt 13 and may be secured to the arms 9 in reverse position since the construction of the cross-bar 10 is such that it is symmetrical about a radial plane passing centrally there-through.

In the form of bail disclosed in Figs. 4 and 5, the parallel radial bail arms 19 are formed with hooked ends 23 which extend in directions substantially at right angles to the planes of the bail arms 19. The bail cross-bar 20 is provided with a pair of longitudinally extending flanges 21 having a recess formed between them. A pair of spaced transverse projections 24 span the recess between the flanges 21 and have transverse openings corresponding in shape to the shape of the hooked bail arm ends 23, therein. With the bail assembled, the hooked ends 23 of the arms 19 extend through the corresponding openings in the projections 24 and are prevented from leaving these openings by means of U-shaped retaining clips 22 which fit into parallel recesses formed in opposite sides of the hooked ends 23. The bail cross-bar 20 is readily removable from the bail by removing the cotter pins 17 and the clips 22 and sliding the bail arms 19 along the pin 12. The bail cross-bar is also reversible relative to the arms 19, since it is formed symmetrical about a radial plane passing centrally therethrough.

During the normal operation of the device the material to be pulverized is fed into the inclosing casing 1 through the feed inlet opening 2. The shaft 7 and elements carried thereby are rotated at a high rate of speed in a clockwise direction. The rapid rotation of the shaft 7 causes the bails to assume a radial position as shown in Fig. 1. The material entering through the feed inlet opening 2 is fed into the path of the rapidly revolving bail cross-bars 10 and is thrown by the impact against the involute surfaces of the liners 6 and bars 5. Due to the involute formation of these surfaces the material is redirected toward the rapidly advancing cross-bars 10 and the particles are thus pulverized by impact upon themselves and upon the cross-bars 10, liners 6, and bars 5. Upon being pulverized to a proper degree of fineness, the material is withdrawn from the casing 1 through the spaces between the bars 5 and the discharge opening 3.

Due to the successive impingements of the material particles against the advancing sides of the bail cross-bars 10, it becomes necessary after a time to reverse these bars so that the trailing sides may be likewise utilized until worn. This reversal of the bars is accomplished with the form of bail disclosed in Figs. 1, 2 and 3, by removal of

the lock nuts 14 and the bolts 13. Reversal of the bail cross-bars 20 disclosed in Figs. 4 and 5 is accomplished by removal of the collars 16 and the retaining clips 22. After the bail cross-bars 10, 20, have become worn to a degree making them unfit for further service, they may be readily replaced by new bars 10, 20.

It should be noted that by forming the bail cross-bar 10, 20, with the transverse ribs or flanges 11, 21, thereon, a cross-bar of great strength is produced while at the same time an effective shield for the connections between the arms 9, 19, and the cross-bar 10, 20, is provided. It is however, not intended to limit the present invention to a cross-bar 10, 20, having a plurality of flanges thereon, since the necessary strength might be secured by providing only a single flange 11, 21, of suitable thickness. The protection of the connection between the bail arms 9, 19, and the bail cross-bar 10, 20, might also be held by use of a single flange 11, 21, but such construction would only afford protection to this connection for revolution of the bail in one direction.

The formation of the bail cross-bars 10, 20, with a longitudinal recess therein, permits formation of a bar of the requisite strength and also greatly reduces the percentage of waste material when the cross-bars have become worn so as to make them unfit for further service. The fact that only the cross-bar 10, 20, is necessarily renewable and that this cross-bar is made reversible after excessive wear has occurred on one side thereof, furthermore reduces the percentage of wasted metal. The bail arms 9, 19, and cross-bars 10, 20, are formed of rough castings and need very little machining prior to assembling.

The means for securing the pins 12 to the suspension disks 8, readily permits rotation of these pins through arcs of 180 degrees after their bail arm suspending surfaces have become excessively worn through constant oscillation of the bails on the pin ends. Use of the collars 16 and cotter pins 17 also permits ready removal of the bail arms 9, 19, from the ends of the pins 12 and forms an efficient means for preventing displacement of the arms 9, 19, during normal operation of the machine.

It should be understood that it is not desired to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

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

1. In a pulverizer, a casing, a rotatable shaft within said casing, radial arms spaced longitudinally of said shaft, means for suspending said arms from said shaft, a longitudinally recessed cross-bar, and means



located entirely within the recess of said cross-bar for detachably securing said bar to said arms.

2. In a pulverizer, a casing, a rotatable shaft within said casing, and a bail suspended from said shaft, said bail comprising a plurality of spaced radial arms and a longitudinally flanged cross-bar detachably secured to the ends of said arms.

3. In a pulverizer, a casing, a rotatable shaft within said casing, and a bail suspended from said shaft, said bail comprising a plurality of spaced radial arms and a cross-bar longitudinally flanged to form an intermediate recess, detachably secured to said arms.

4. In a pulverizer, a casing, a rotatable shaft within said casing, radial arms spaced longitudinally of said shaft, a recessed cross-bar, means for detachably securing said arms to said cross-bar within said recess, and means for suspending said arms from said shaft and for locking said securing means.

5. In a pulverizer, a casing, a rotatable shaft within said casing, and a bail suspended from said shaft, said bail comprising a plurality of spaced arms, a cross-bar longitudinally flanged to form an intermediate recess, transverse projections spanning said recess, and means for securing said arms to said projections.

6. In a pulverizer, a casing, a rotatable shaft within said casing, radial arms suspended from said shaft, each of said arms having a projection extending longitudi-

nally of said shaft, and a cross-bar secured to said projections.

7. In a pulverizer, a casing, a rotatable shaft within said casing, radial arms suspended from said shaft, each of said arms having a projection extending longitudinally of said shaft, a cross-bar longitudinally flanged to form an intermediate recess, and means for securing said cross-bar to said projections within said recess.

8. In a pulverizer, a casing, a rotatable shaft within said casing, radial arms spaced longitudinally of said shaft, each of said arms having a projection extending longitudinally of said shaft, means for suspending said arms from said shaft, a cross-bar longitudinally flanged to form an intermediate recess, and means for suspending said cross-bar from said projections within said recess, said suspension means serving to lock said securing means.

9. In a pulverizer, a casing, a rotatable shaft within said casing, an arm having an integral projection extending longitudinally of said shaft, means for suspending said arm from said shaft, and a beater portion having a portion engaging said projection.

In testimony whereof the signature of the inventor is affixed hereto in the presence of two witnesses.

CHAS. S. LINCOLN.

Witnesses:

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Rob. E. STOLL.