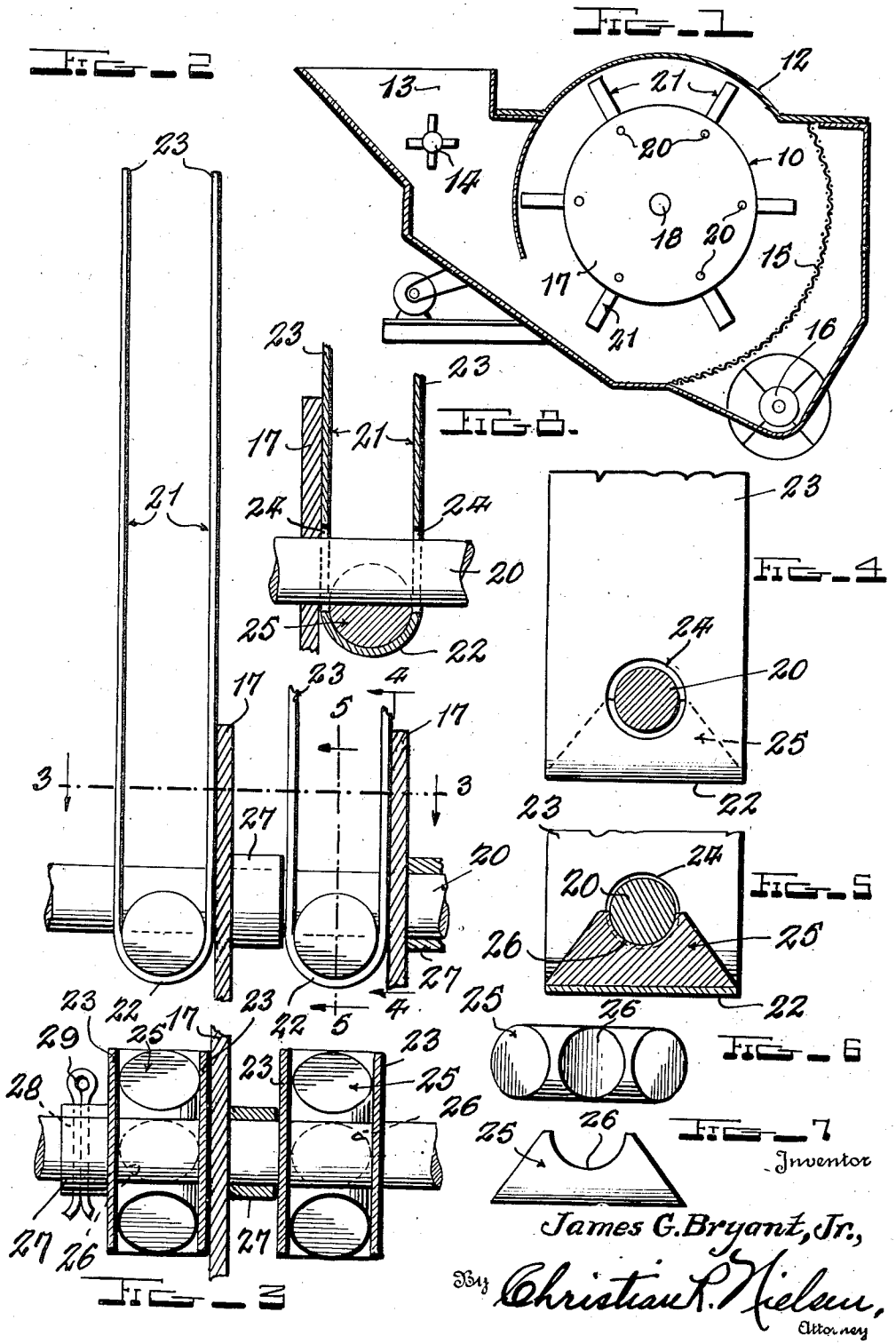
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DOUBLE HAMMER FOR HAMMER MILLS

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DOUBLE HAMMER FOR HAMMER MILLS

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2 Claims. (Cl. 241—195)

The invention relates to hammer mills, and particularly to improved hammer constructions and hammer mountings, of such nature that the durability of the mill part is greatly enhanced, both as to the hammers and particularly to the pins upon which the hammers are ordinarily suspended.

It is well known and has been a serious handicap to the efficiency of such mills that the excessive amount of abrasive present in grain, and even without abrasive materials, the impossibility of lubricating the hammer mounting, has resulted in very rapid wear of the pins and hammers, requiring constant replacement, with the necessity for shut-downs and arduous work in the opening of the mill casing, and the removal and replacement of the worn parts. Construction of the mills has been greatly simplified with a view to economy in the hammer elements and their mountings, the present practice involving the use of hammers of flat metal stock, apertured and set upon cross pins with suitable spacers, the pins being set through a number of discs of large diameter mounted upon a rotary shaft, the shaft and discs comprising the rotor of the mill. These flat plate hammers rapidly cut into the cross pins upon which they are pivotally swung, and the openings in the hammers through which the pins are inserted wear to an eccentric form, so that before a satisfactory amount of service can be obtained from a hammer, which still has a substantial amount of material in the principal working parts, it must be replaced on account of excessive wear of the eye-portion or aperture through the hammer, by which it is suspended from the cross pin. Also, notwithstanding the fact that specially hardened steel of hard alloy stock is used in the cross pins, these become quickly cut and deeply grooved by the hammers, requiring great watchfulness in order to avoid the possibility that unforeseen conditions may result in more rapid wear than usual, with consequent breakage of a pin and serious injury to the mill by release of the hammers.

It is a further important aim of the invention to enable provision of a double hammer with a novel mounting, while still retaining advantages of alternate wide and narrow spacing of the hammers, or the hammers on successive pins may be arranged out of line with each other—that is, not in a common plane—and it is an important aim of my invention to present a double hammer in which the advantage of this offset practice may be continued.

As is well known, the trade has found that most effective work can be done with hammers of very thin plate stock, both on account of the fact that they work better upon the stock being ground, but also require less power for operation of the mill. But these narrow hammers cause wear of the cross pins greatly out of proportion to the relative thickness of the blades. By using hammers a quarter of an inch thick, it has been found that very little wear even on a soft steel pin is produced, but the best practice involves the use of sheet steel stock less than one-tenth of an inch thick, some mills using hammers which are slightly more than one-sixteenth of an inch thick. It is an important advantage of my invention that the very thinnest material may be used, yet the mill may be operated for long periods without appreciable wear on the cross pins.

A further important aim of the invention is to enable provision of a wide bearing support for hammers in such mills, yet avoiding objectionable weight in the material used and minimizing the number of parts required, as well as assembly operations in assembling the rotor and hammers, as well as in the renewals and replacements. By the manner of constructing my hammers, it is made possible to eliminate one-half of the number of spacers heretofore required, and more than one-half the weight of such spacers.

A further important aim of the invention is to present a novel bearing element for hammers of this kind, and a novel assembly relation to the bearing element and new hammer.

Additional objects, advantages and features of invention reside in the construction, arrangement and combination of parts involved in the embodiment of the invention, as will be more readily understood from the following description and accompanying drawing, wherein

Figure 1 is a formal cross sectional view of a mill embodying my invention, complete details of crusher and conveyor devices, as well as particulars of case construction being omitted, these not being essential to an understanding of my invention, which resides in the specific construction of the hammers and their mounting;

Figure 2 is a view of a portion of one of the cross bars of the mill, with two of my hammers mounted thereon.

Figure 3 is a section on the line 3—3 of Figure 2.

Figure 4 is a section across the pin, on the line 4—4 of Figure 2.

Figure 5 is a similar view on the line 5—5 of Figure 2.

Figure 6 is a detail elevation of one of the saddle bearings for my hammers.

Figure 7 is a side elevation of the saddle bearing.

Figure 8 is a cross section showing the hammer unit set to the left instead of to the right.

Referring more particularly to the drawing, there is illustrated conventionally a hammer mill comprising a rotor **10**, of conventional construction mounted revolubly in a case **12** of suitable form, the mill including a feeding hopper **13** in which a crusher feeder device may be included, indicated in part at **14**, the mill including also a screen **15** of suitable structure, and a discharge conveyor **16** of any usual form. The rotor, as is usual, comprises a multiplicity of large steel plate discs of substantial thickness, indicated at **17**, these discs being secured rigidly and permanently upon a drive shaft **18**, conventionally mounted and driven. A series of cross pins **20** are set removably through the discs in a concentric series spaced a short distance inwardly of the peripheries of the discs, a usual diameter for such disc being 26 inches, and the circle on which the pins are centered would properly be 23 inches in diameter in such case. The pins in such a mill may be of five-eighths inch steel. In the case of my mill, this steel need not be of as expensive an alloy as is required with the ordinary thin hammers, and may be hardened in any inexpensive way suitable for the material, or may be relatively soft, since by my method of mounting, there is but little wear manifest. Such mills are made in various widths, the discs being spaced apart in such a mill as illustrated approximately one and five-sixteenths inches, and my double hammer is made in a width coordinated with this spacing in a specific way to enable the effective staggering of the hammers on successive pins.

Upon each of the pins **20**, between each two mutually adjacent discs, a double hammer **21** is provided, which is formed of a strap of hardened steel plate bent midway of its length so that its opposite end portions are brought into parallel relation, the bend constituting a semi-circular bight **22**, the two hammer arms **23** thus formed being spaced apart comewhat more than half the space between two of the discs, so that the extreme faces of the hammers are spaced apart $\frac{15}{16}$ of an inch, or a little more than two-thirds the width of the space between two discs. The two hammer arms are centrally apertured at **24**, immediately adjacent the bight portion, these apertures being circular and of a diameter somewhat greater than that of the cross pin, so that the hammer may be hung from the pin with a clearance entirely around the pin between the edges of the opening and the pin, these openings being immediately adjacent the base of the semi-circular bight **22** in a mill of the character and size indicated herein. The hammer arms may have a length of approximately six and one-half inches to the centers of the openings **24** and a customary width in such hammers is one and three quarters inches. On account of the improved wear characteristics of my hammer and mounting, I have found that it is advantageous to use sheet steel stock of approximately one-sixteenth inch thickness for the hammer, this having a further advantage in enabling more rapid, effective and economical hardening of the hammer. The space between the hammers and the bight and around the openings **24** is thus approximately slightly more than three-quarters of an inch. Set snugly in the bight of each hammer, there is a piece of steel stock having a diameter of approximately three-quarters of an inch, and having in one side a semi-circular saddle bearing recess of such radius as to fit snugly around the cross rod **20**. The rod pieces **25** may be termed saddle blocks in view of the nature of the bearing which they afford upon the cross rod in use. The saddle blocks are simply set loosely in the bight of the hammer units and are securely retained therein when the rod is inserted through the apertures **24** while the saddle bearing **24** is aligned to receive the cross rod therethrough. One hammer unit is mounted between each two discs, as before mentioned, and at one side of each hammer unit a spacer washer or collar **27** is disposed loosely around the cross pin, so as to hold the hammer unit close to one of the discs **17**, and spaced from the other by the collar **27**. On one pin the hammer units are usually disposed closely adjacent the respective discs in one direction, and on the next pin are disposed closely adjacent the discs in the opposite direction, and by this means hammers of adjacent pins are thrown out of line so that they may more effectively engage feed stock and the like being ground, and for other reasons. Each pin adjacent one end is formed with a transverse bore **28** and one of the collars **27** is likewise apertured to aline with the bore through the pin, a cotter pin **29** being engaged commonly through the collar and cross pin, as in Figure 3, so as to hold the cross pin against possibility of displacement longitudinally.

In the assembly of the device, a hammer unit with one of the saddle blocks **25** set in its bight portion and the recess **26** of the hammer unit **21** approximately aligned with the apertures **24**; and after the pin is suitably started through a disc **17**, the hammer unit is held suspended with its hammer arms extended vertically upward and the apertures **24** of the saddle bearing **26** aligned with the pin, while the latter is moved longitudinally through the hammer unit. A collar **27** may be engaged upon the pin before or after insertion of the pin through the hammer unit. This operation is repeated between each two discs as the pin is inserted, until the hammer units are mounted between each two mutually adjacent discs, after which, the proper collar with apertures being disposed around the pin adjacent one end, the cotterpin **29** is inserted therethrough. Removal of the hammer units may be effected by a reverse procedure, as may be readily appreciated.

The depth of the saddle bearing recess **26** in the saddle block **25** is such that when initially emplaced, the cross pin will be located nearer that side of the aperture **24** which is nearest the extremities of the hammer arms, and therefore, under centrifugal force, as the weight of the hammers is thrown radially outward, the saddle bearing comes to rest upon the cross pin with the edges of the openings **24** spaced well away from the cross pin, so that even under considerable vibration, there is no possibility of abrasion of the cross pin by the hammer, and the load of the hammer unit is sustained upon a broad surface in the saddle bearing recess extended some distance longitudinally and circumferentially upon the cross pin.

The saddle blocks are cut diagonally at each end, their end surfaces sloping longitudinally of the block away from adjacent the sides of the bearing recess **26**, and when the device is assem-

bled as described, the longer part of the saddle block is extended through the bight of the hammer, so that the bight portion of the hammer is supported throughout the width of the hammer unit, and liability of springing or sagging and distortion of the hammer is thus safeguarded against.

While I have disclosed my invention with great particularity, as to the specific form and proportions of elements, it will, nevertheless, be understood that this is exemplary, and that various modifications in the size, proportions and materials of parts may be made without departing from the spirit of the invention, including substitution of equivalents and differences in combinations, all as may be included within the scope of the following claims, wherein

I claim:

1. A hammer unit for hammer mills comprising a metal strip bent into U shape, forming a bight and providing a pair of hammer arms, said arms having transversely aligned apertures adjacent the bight and spaced therefrom, a saddle block fitted in the bight and having a semicircular recess aligned with said apertures to receive a cross pin commonly therethrough.

2. A hammer unit for hammer mills comprising a metal strip bent into U shape, forming a bight and providing a pair of hammer arms, said arms having transversely aligned apertures adjacent the bight and spaced therefrom, a saddle block fitted in the bight and having a semicircular recess aligned with said apertures to receive a cross pin commonly therethrough, the bearing portion of said recess being of such dimensions as to space the cross pin from contact with the aligned apertures.

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