Aug. 16, 1932. C. D. AMMON 1,871,489

COMBINATION HAMMER AND CUTTER FOR HAMMER MILLS

Filed May 22, 1930

Fig. 1

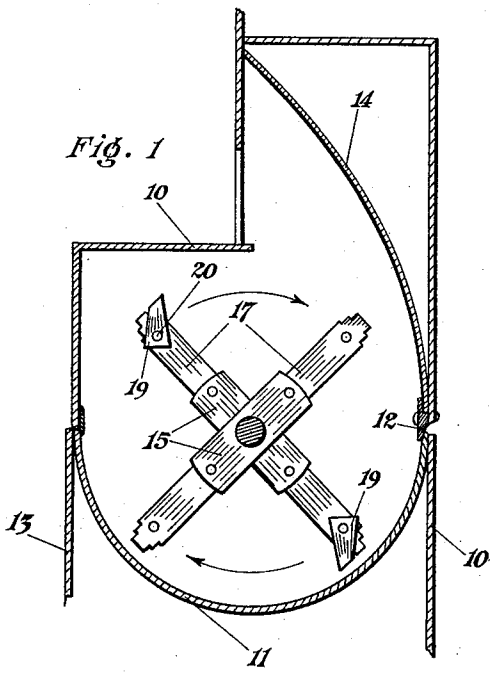


Fig. 2

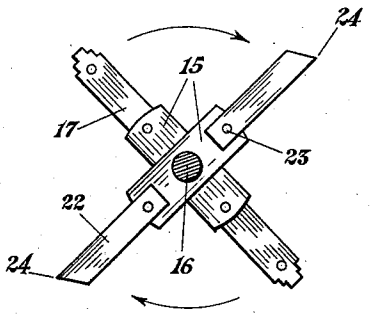


Fig. 4

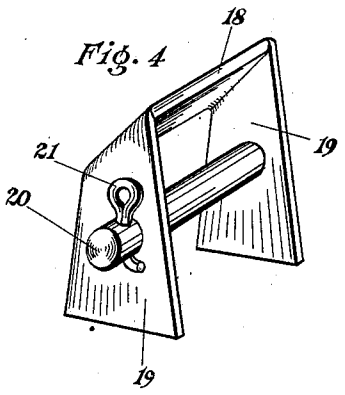
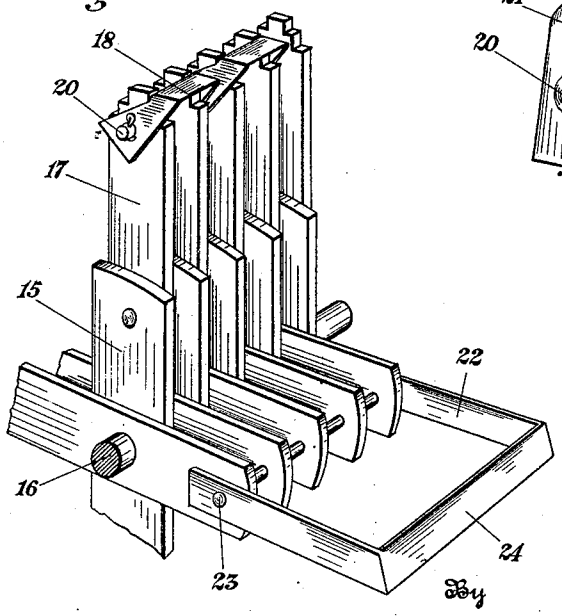


Fig. 3



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Patented Aug. 16, 1932 1,871,489

UNITED STATES PATENT OFFICE

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COMBINATION HAMMER AND CUTTER FOR HAMMER MILLS

Application filed May 22, 1930. Serial No. 454,620.

My invention relates to hammer mills and more particularly to the comminuting mechanism within the hammer mill.

The primary object of the invention is the provision of a cutter which is independent of the hammer but which cooperates with the hammer in comminuting the material by supplying both a cutting action and a hammering action on the material.

Another of my objects is the provision of cutters which are removable from the hammer mill and which are easily positioned in the mill when a cutting action becomes necessary or desirable.

Another of my objects is the provision of a shield or deflector of a shape which will cause the hammers to most readily and easily pull the material down into the mill and prevent it from bunching up in the upper part of the casing.

Having in view these objects and others which will be pointed out in the following description, I will now refer to the drawing, in which

Figure 1 is a vertical transverse sectional view of the upper portion of the hammer mill showing the use of the cutters on the hammers and showing also the position occupied by the shield for preventing the bunching of material.

Figure 2 is a view in elevation of the mill showing two rows of hammers alone and showing also a pair of stirrup cutters of a somewhat different form which are adapted to be substituted for half of the hammers, the hammers being arranged for the completion of the reducing action after the cutters have partially reduced the material.

Figure 3 is a view in perspective of a portion of the mill showing a modified arrangement of the hammers and cutters.

Figure 4 is a perspective view of one of the cutters which is adapted to be attached to the hammers to supplement the action of the hammers.

The improvements to which the present application relate are in the nature of accessories to be used in the hammer mills shown and described in the Patents No. 1,752,971 and No. 1,752,290 granted to me on April 1, 1930. Reference is made of these two patents as the structures shown in the patents have not been altered.

Hammer mills exceed in efficiency all other forms of mills for two reasons. The action of the hammers on the grains pulverizes the grain more effectively and at a lower cost than do other kinds of mills. The hammer mill is the only kind of mill which will handle fibrous material in addition to grains. This advantage is especially important to the farmer who desires to not only grind his grain but to also reduce corn cobs, corn stalks, hay and other such fibrous materials into a form where it can be readily fed to and be digested by the animal. While the hammer mill is quite successful in reducing fibrous material such as that of corn stalks, it requires considerable power to make the initial reduction and it is usually very difficult to feed long, stiff and bulky material into the mill so that the hammers can act upon it. I have found that the action of the hammers in a hammer mill is indispensable in reducing corn stalks and similar fibrous food material but that the best results depend on a cutting action which is supplemented by the action of the hammers. I am aware that knives alone have been used in mills for reducing fibrous food material and I am also aware that hammer mills have been extensively employed for the same purpose. I believe, however, that I am the first to employ a cutting action supplemented by a hammering action to reduce fibrous food material to a physical consistency where it will be thoroughly digested by the animal and to do such work with the minimum of power required by a cutter alone.

The hammer mill consists of a casing 10 which is substantially identical with the casing described in my prior Patent No. 1,752,971. It is provided with a screen 11 which is seated in its back portion under a clip 12, the screen being forced into position and held there by means of a swinging door 13, these parts being all similar to those shown in Patent No. 1,752,971. The only modification involved in the casing in the present instance is the construction of the

clip 12. This clip is provided with a cut-away portion providing a recess between the clip and the rear wall of the casing for receiving the lower end of the guard or shield 14. The guard or shield 14 is readily removable but its function is important during the reduction of fibrous food material which would otherwise tend to lump and to ball up in the upper portion of the mill casing.

The reel 15 is also similar to the reel described in my prior two patents. The plates are arranged in crisscross relation and they are secured to a shaft 16 through which the reel is driven. The reel is provided with four sets of hammers 17 which are pivotally secured at their inner ends to the reel plates. The hammers 17 are symmetrical, being provided with apertures at both ends so that the hammers may be reversed in position when one side becomes battered or otherwise injured.

In carrying out my invention I provide a stirrup cutter of the form shown in Figure 4. This is made of very hard material with a bevel cutting edge at 18. Both legs 19 are provided with apertures for receiving a pin 20 passing through the apertures in the free end portions of the hammers 17. The pins 20 are provided each with a pair of apertures for receiving the cotter pins or other fastening devices 21. The cutter element is designed to fit over two or more of the hammers in the manner shown in Figure 3.

When it is desired to employ the cutters on the reel it is simply necessary to open the casing and to turn the reel by hand in order to bring a row of hammers 17 into convenient position. The cutters may then be quickly attached and the reel is then turned through half a revolution in order to bring the opposite hammers into position for fastening cutters to them. The reel will then present the appearance as shown in Figure 1 with two opposite sets of hammers supplied with cutters while the remaining two sets of hammers are left free for independent hammering action. When the number of hammers in a row is an odd number and when the cutters are designed to be attached to pairs of hammers, it is desirable that the free hammers of the two opposite rows of hammers be on opposite ends of the reel.

When the device is arranged as above described the material will first be engaged by the cutters which reduce the material to a small size. The cut up material is then engaged by the hammers which follow the cutters and which reduce the material to a fine consistency under the battering action of the hammers.

The mechanism as above described has been given rigid tests to determine its efficiency in reducing fibrous food material into digestible form. In carrying out this test, very tough fodder was soaked for several hours in water and then wrung out. It was then fed through the hammer mill and it was found that the fodder was reduced to a finely comminuted form. The action of the cutters alone, however, would merely chop this same fodder into coarse particles with the fiber unshredded, while the action of the hammers alone is very inefficient in reducing the material.

Other forms or combinations of the cutters and hammers may be employed. In the arrangement shown in Figure 3, one or more stirrup cutters 22 may be secured to the reel by means of pivot pins 23, replacing an equal number of rows of hammers. This cutter is provided with a cutting edge at its forward extremity at 24, the manner of attachment being best shown in Figure 3 and the arrangement being best shown in Figure 2. When thus used the cutters 22 will cut up the fibrous material and this cutting action will be completed by the battering action of the hammers 17. It is to be understood, however, that both forms of cutters are supplemental to the hammers 17. Either form of cutter may be used alone or the two may be used together or both may be dispensed with when the material fed into the mill is of a non-fibrous nature.

Having thus described my invention in such full, clear, and exact terms that its construction and operation will be readily understood by others skilled in the art to which it pertains, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A reel for hammer mills having swinging battering members in combination with cutting members each releasably secured to a plurality of said battering members.

2. A hammer mill having hammers swinging on a hammer reel, and a cutting knife releasably secured to a plurality of said hammers.

3. A hammer mill having hammers swingingly mounted on a hammer reel, and a cutting knife spanning a plurality of said hammers at the free extremities thereof and releasably secured thereto.

4. In a combined hammer and cutting mill, a reel, independent sets of hammers pivotally mounted on the reel, and stirrup cutters movably mounted on the sets of hammers for swinging therewith and for movement independently thereof.

5. A hammer mill having a casing, a reel in the casing, hammers carried by the reel, an arcuate screen in the casing beneath the reel and hammers, said casing having a pocket portion extending above the downwardly movable side of the reel, and a curved shield removably positioned in the upper part of the casing and extending downwardly therein to the downwardly movable side of the

reel to cut off the pocket portion of the casing from the reel.

6. In combination with a hammer mill having hammers therein, stirrup cutters extending across and pivotally connected to a plurality of the hammers.

7. In a combined hammer and cutting mill, a casing, a reel in the casing, a set of hammers pivotally mounted on the reel, a plurality of cutters adapted to be mounted on selected hammers and having cutting portions, and means for removably and pivotally connecting cutters to the selected hammers for maintaining the cutting edges of the cutters substantially in line with the outer ends of the hammers for cooperation therewith and with the casing.

In testimony whereof I affix my signature.

CHARLES D. AMMON.