Dec. 11, 1928. 1,695,196

I. MERLIS

CANE CUTTING ATTACHMENT FOR MILLS

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Fig. 2.

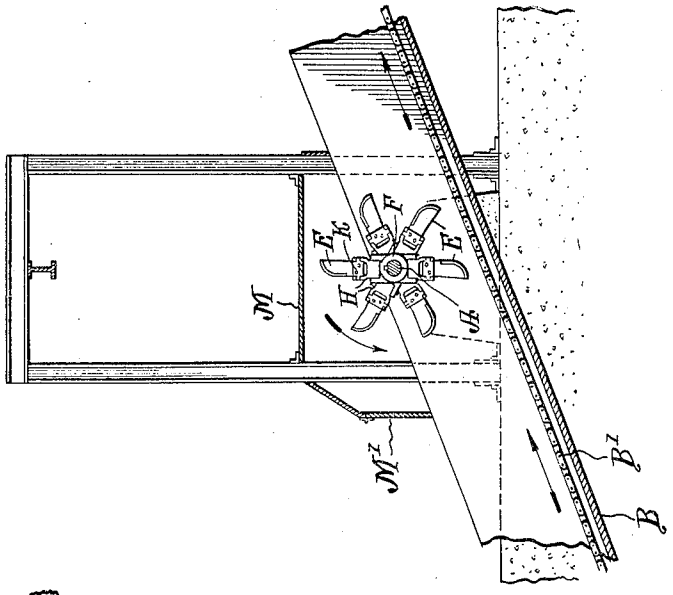
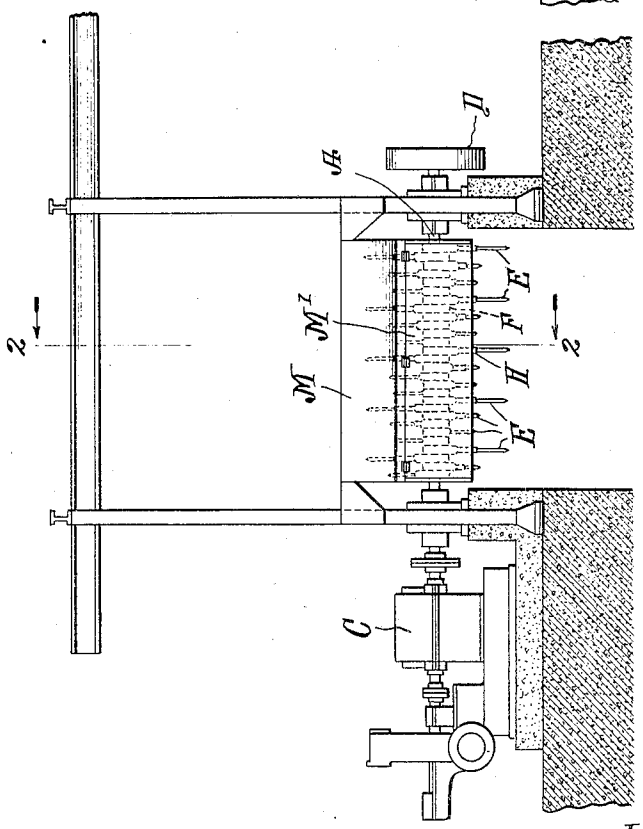


Fig. 1.



Inventor

I. Merlis

By Wilkinson & Giusta

Attorneys.

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Fig. 5.

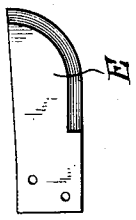


Fig. 6.

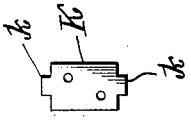


Fig. 4.

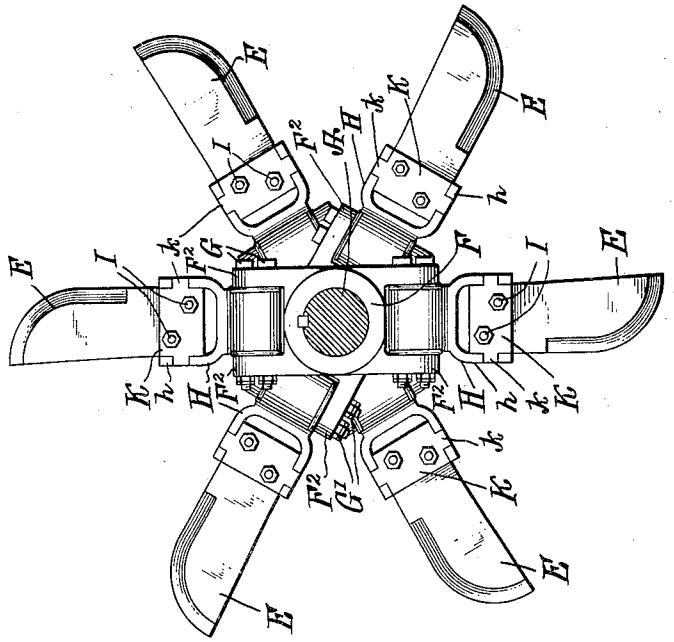
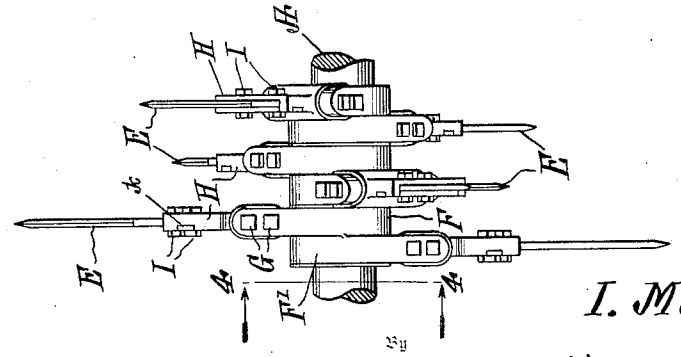


Fig. 3.



Inventor

I. Merlis

Wilkinson & Giusta

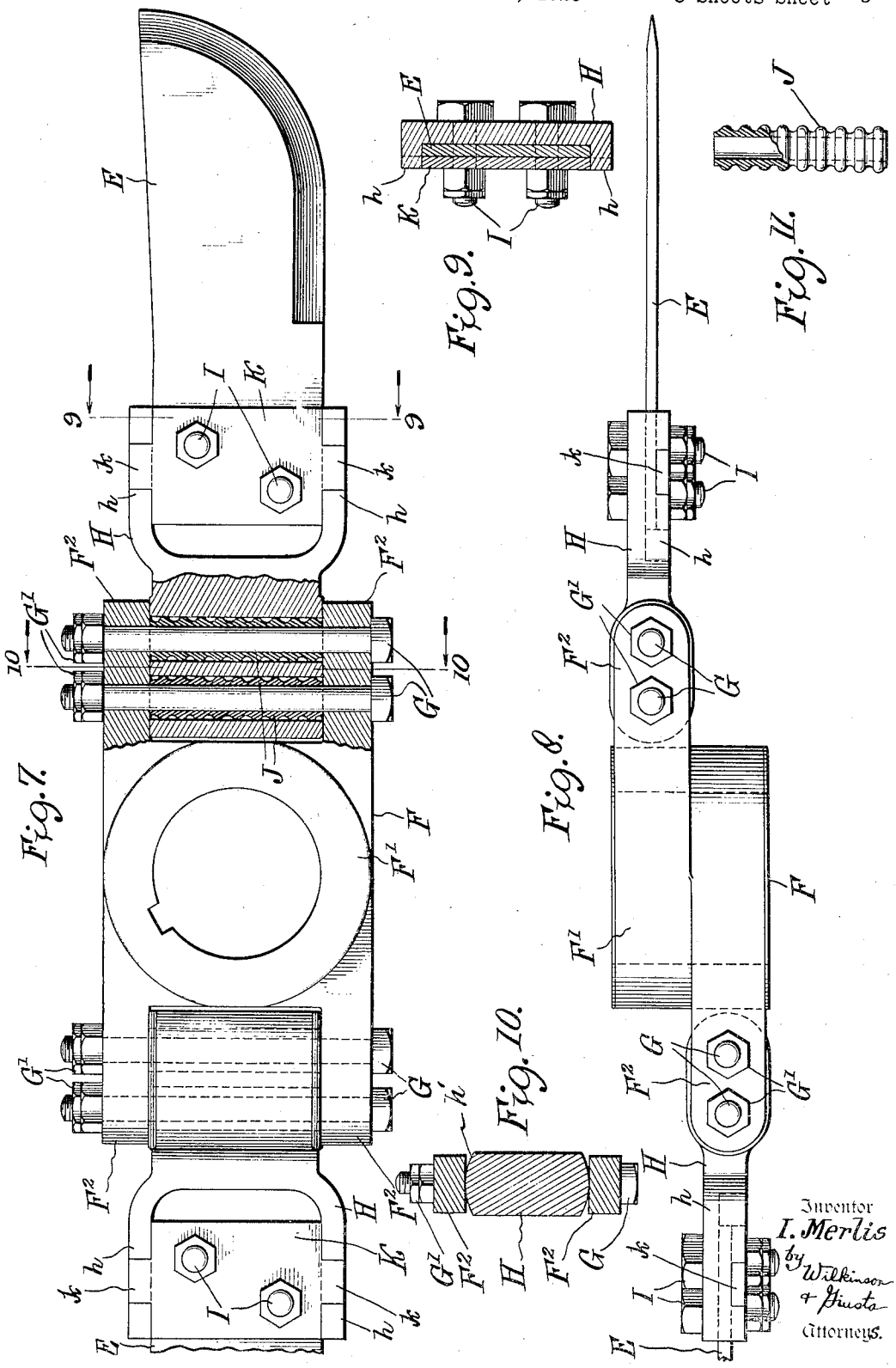
Attorneys.

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I. MERLIS

CANE CUTTING ATTACHMENT FOR MILLS

Filed March 22, 1928 3 Sheets-Sheet 3



Patented Dec. 11, 1928. 1,695,196

UNITED STATES PATENT OFFICE.

IRA MERLIS, OF NEW YORK, N. Y., ASSIGNOR TO KELVIN ENGINEERING CO., INC., OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

CANE-CUTTING ATTACHMENT FOR MILLS.

Application filed March 22, 1928. Serial No. 263,838.

My present invention relates to improvements in cane cutting attachments for mills.

In the present practice of the manufacture of sugar from sugar cane, very large mills are employed which call for a heavy feed of cane stalks to the mill, and these stalks are fed very irregularly to the carrier, sometimes in a layer of three or more feet thick and seven feet wide; and the individual stalks occupy almost endless varieties of situations in the mass both in the horizontal plane and the planes approaching the vertical.

The position of the various stalks in the stratum is complicated from the fact that many of the stalks are often crooked, as when feeding cane that had been previously blown down in the field; moreover, the mass of cane stalks are of irregular depth, owing to the mechanical devices used in feeding the cane to the carrier.

It has been found in practice that the mass of cane carried by the carrier may be more evenly distributed, and that the mill will operate more efficiently if the individual stalks be cut up into short lengths or split longitudinally before the cane is subjected to the grinding process.

For this reason, it has been found desirable to feed the cane to crushers, where it is broken up before reaching the mill; and this action of the crushers is greatly facilitated if the cane itself be cut up into short lengths before reaching either the crushers or the mill.

To accomplish this purpose, rapidly revolving rotary cutters are used transversely of the carrier, in which a series of staggered knives, carried by a rapidly rotating shaft, are caused to cut into the stratum of cane stalks as said stratum moves toward the mill. In this operation, the cane stalks are cut into small pieces making the feed more uniform, and in better shape to be fed to the crushers and mills, and increasing the capacity of the mill and the extraction of the juice thereby.

These cutters usually consist of knives arranged in transverse series spirally or otherwise and projecting at right angles from the rotating shaft upon which they are mounted. The rind of the cane is very hard and the knives in the act of cutting the cane are subjected to lateral bending stresses when striking glancing blows, or when the cane is unevenly disposed on the carrier; also when the cane is carried to the knives in a jerking or uneven speed, the knives receive a blow, which due to the uneven disposition of the cane on the carrier, causes a side thrust to act on the knives, producing bending stresses in a lateral direction. The above conditions result in breakage of knives, the break usually occuring near the shank of the knife. As the knives get dull the forces acting on them are increased resulting in still more frequent breakages. The breakage of knives may cause great damage to the mills when broken pieces of the knives pass with the cane between the rollers.

The objects of the present invention are to overcome the disadvantages mentioned above and to provide a cutter whose knives will function efficiently and without breakage from the above mentioned causes.

With these objects in view, the invention is related mainly with the construction of the knife holders and the manner of connecting the knives to the said holders, and a construction is provided wherein the connection at the shank of the knives, where the knives are fastened to the holder, will absorb the effect of the lateral forces and act as a cushion, thus relieving the knife blade of the stresses caused by these lateral forces.

My invention will be more fully understood after reference to the accompanying drawings, in which like parts are indicated by similar reference symbols throughout the several views, and in which

Figure 1 shows a cross-section through the cane carrier, and a front elevation of the rotary cutter, and the means for driving same, parts being omitted for the sake of clearness in the drawings.

Figure 2 shows a section along the line 2—2 of Figure 1, parts being omitted for the sake of clearness in the drawings.

Figure 3 is an enlarged detail view showing a portion of the shaft carrying the knives, with three pairs of oppositely disposed knives mounted thereon in staggered relation.

Figure 4 shows a section along the line 4—4 of Figure 3, and looking in the direction of the arrows.

Figure 5 is a detail view showing one of the knives detached from the apparatus.

Figure 6 is a detail view showing one of the washers, which may be used in securing the knife in place.

Figure 7 is a sectional elevation on a larger

scale, showing the mode of connecting the two oppositely disposed knives together, and mounting the same on the shaft, parts being broken away.

Figure 8 is a plan view of the parts shown in Figure 7,

Figure 9 is a section along the line 9—9 of Figure 7, and looking in the direction of the arrows.

Figure 10 shows a section, on a smaller scale, along the line 10—10 of Figure 7, and looking in the direction of the arrows; and

Figure 11 is a detail view showing a preferred form of elastic bushing for use on the device, parts being broken away.

A represents a shaft which is journalled transversely of the carrier B, which carrier is provided with the usual slatted conveyer B'. This shaft may be driven in any convenient way, as by means of a steam turbine C, for instance of the De Laval type; or if desired, an electric motor or steam engine of sufficient power may be used to give the necessary speed of rotation to the shaft A. This shaft is provided with a suitable fly wheel D.

Keyed on this shaft are a series of knife holders arranged in staggered relation, and carrying the knives E. These knife holders are carried by housing blocks F, having a hub portion F' and oppositely disposed jaws F^2, see Figures 7 and 8. These housing blocks are slipped over the shaft and held thereon in staggered relation, and the diverging arms are perforated to receive a plurality of bolts or rivets G, which may be held in place by lock nuts G', or they may be riveted in place if desired.

Mounted between the jaws F^2 on opposite sides of the housing blocks F are the knife holders proper H, to which the knives are attached, as by means of bolts or rivets I. Each knife may be attached directly to the knife holder, but in order to reinforce the shank of the knife, washers K may be provided, see Figures 6, 7, and 9, which washers are perforated to receive the bolts or rivets I, and have lugs *k* engaging the notches in the side ribs *h* of the knife holder, as shown most clearly in Figure 7.

The shanks of the knife holders H are preferably curved slightly top and bottom, as at *h'*, see Figure 10, to permit a slight twisting movement in a direction at right angles to the plane of the knife.

The shanks of each of the knife holders H are perforated to receive the bushing J, which may be of rubber, leather, or other suitable material, preferably of rubber, through which bushing the bolts G may be conveniently inserted, as shown in Figure 7, and thus a yielding bearing is provided for the base of the knife holder, which will yield when lateral or twisting strains are impressed upon the knife, as will be hereinafter more fully described.

The bushings J may be in the form of cylindrical rubber sleeves, but are preferably corrugated, as shown in Figure 11.

As will be seen, each housing block is provided with a pair of knife holders, carrying oppositely disposed knives. The number of these holders on the housing block would depend on the carrier.

For instance, on a seven-foot carrier, there would be about forty of these knives. These knives are arranged in staggered relation, so as to make the cutting more uniform and to distribute the load on the driving mechanism, this distribution of the load being also assisted by having a fly wheel of suitable weight.

Where an electric or other rotary motor is used, the revolving parts of the motor would also serve as a fly wheel.

The motor should be of sufficient power to rotate the shaft carrying the knives at a speed of from 200 to 600 revolutions per minute.

The knives are maintained in normal planes at right angles to the axis of the said shaft, and when striking a glancing blow, the rubber bushings yield laterally in either direction, and hence the hub end of the knife is free to move laterally on the elastic bushing. The knives actually float on the bushing, and consequently, the lateral bending stresses are reduced to such an extent as not to subject the knife to any destructive lateral bending or twisting stresses which cause breakage of knives in the ordinary rigid type of construction. The bushings permit a lateral movement of the knives when subjected to a lateral or torsional force, and then return the knives to their normal position relative to the shaft by the elasticity of the bushing aided by the centrifugal force of rotation. The advantage of these bushings is that they are elastic, and the shank of the knife is cushioned, and the bushings absorb the shocks caused by the lateral or torsional forces.

It will be seen that, with the construction herein described, a twisting motion of the knife is effected under lateral torsional stress occasioned by the knife approaching the cane stalks at different angles, these stalks lying in almost every conceivable direction on the carrier.

The centrifugal force will tend to bring the knives back to their positions at right angles to the shaft aided by the elasticity of the bushings, and the shocks due to the twisting motion are cushioned by the rubber bushing, and the knives, therefore, will not break.

The twisting motion, just referred to, is conveniently effected by a pair of bolts G for each knife, but three or more of these bolts may be used, if desired. By using a plurality of bolts, the knife holders are held more securely in place, and yet the yielding movement is permitted, and the knives are prevented from breaking incident to the lat-

eral or twisting strains previously described.

Obviously, the knives may be removed from the housing blocks and sharpened from time to time, if desired, or a new knife when needed may be placed in the appropriate holder.

While I have shown washers K giving support to the shank of each knife, these washers may be omitted, if desired, and the holder secured by means of bolts and nuts or rivets.

Also the holder may be made integral with the knife, as for instance, by forging them together or casting them as one unit. Obviously the housing blocks may be provided with tenons to engage jaws in the knife holders, should such reversal of parts be deemed desirable.

In order to prevent the scattering around of chips of cane stalks, trash, or other solid matter thrown off by the revolving knives, the cutter is preferably enclosed in a suitable box or casing M, preferably provided with a hinged door M'.

While I have illustrated and described one embodiment of the invention in its preferred form it will be obvious that various changes might be made in the construction, combination, and arrangement of parts, which could be used without departing from the spirit of my invention, and I do not mean to limit the invention to such details except as particularly pointed out in the claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States is:—

1. A rotary cutter attachment for sugar cane mills comprising a rotary shaft mounted transversely of the cane carrier, with means for rapidly rotating said shaft, a series of knives mounted radially on said shaft in staggered relation, with means comprising elastic means, for holding said knives on said shaft, to permit a yielding twisting movement to the shank of each knife blade, thereby protecting said knife against breaking under glancing blows.

2. A rotary cutter attachment for sugar cane mills comprising a shaft, a series of knives mounted radially on said shaft in staggered relation, with means, comprising elastic means, for holding said knives on said shaft, to permit a yielding twisting movement to the shank of each knife blade, thereby protecting said knife against breaking under glancing blows, when in use.

3. A rotary cutter attachment for sugar cane mills comprising a rotary shaft mounted transversely of the cane carrier, with means for rapidly rotating said shaft, a series of housing blocks rigidly connected to said shaft in staggered relation, each block being provided with two pairs of oppositely disposed jaws, a series of knife holders having their shanks projecting between said jaws, a plurality of bolts securing each holder to said jaws, a yielding elastic bushing interposed between each of said bolts and the corresponding knife holder whereby a yielding twisting engagement is provided between the knife holder and the housing block, and means for securing each knife to its holder.

4. A rotary cutter attachment for sugar cane mills comprising a shaft, a series of housing blocks rigidly connected to said shaft in staggered relation, each block being provided with two pairs of oppositely disposed jaws, a series of knife holders having their shanks projecting between said jaws, a plurality of bolts securing each holder to said jaws, a yielding elastic bushing interposed between each of said bolts and the corresponding knife holder, whereby a yielding twisting engagement is provided between the knife holder and the housing block, and means for securing each knife to its holder.

5. A rotary cutter attachment for sugar cane mills comprising a rotary shaft mounted transversely of the cane carrier, with means for rapidly rotating said shaft, a series of housing blocks rigidly connected to said shaft in staggered relation, each block being provided with two pairs of oppositely disposed jaws, a series of knife holders having their shanks projecting between said jaws, a plurality of bolts securing each holder to said jaws, rubber bushing interposed between each of said bolts and the corresponding knife holder, whereby a yielding twisting engagement is provided between the knife holder and the housing block, and means for detachably securing each knife to its holder.

6. A rotary cutter attachment for sugar cane mills comprising a rotary shaft mounted transversely of the cane carrier, with means for rapidly rotating said shaft, a series of knives mounted radially on said shaft in staggered relation, with means for holding said knives on said shaft, to permit a yielding twisting movement to the shank of each knife blade, said means comprising a plurality of fastening bolts with elastic yielding bushings enclosing same.

7. A rotary cutter attachment for sugar cane mills comprising a shaft, a series of knives mounted radially on said shaft in staggered relation, with means for holding said knives on said shaft to permit a yielding twisting movement to the shank of each knife blade, said means comprising a plurality of fastening bolts with elastic yielding bushings enclosing same.

8. A rotary cutter attachment for sugar cane mills comprising a shaft, a series of housing blocks rigidly connected to said shaft in staggered relation, each block being provided with two pairs of oppositely disposed jaws, a series of knife holders having their shanks projecting between said jaws,

a plurality of bolts securing each holder to said jaws, a yielding elastic bushing interposed between each of said bolts and the corresponding knife holder, whereby a yielding twisting engagement is provided between the knife holder and the housing block, and a washer with bolts and nuts for securing each knife to its holder.

9. A rotary cutter attachment for sugar cane mills comprising a shaft, a series of housing blocks rigidly connected to said shaft in staggered relation, each block being provided with oppositely disposed engaging arms, a series of knife holders, a plurality of bolts securing each holder to one of said arms, a yielding elastic bushing interposed between each of said bolts and the corresponding knife holder, whereby a yielding twisting engagement is provided between the knife holder and the housing block, and means for securing each knife to its holder.

10. A rotary cutter attachment for sugar cane mills comprising a rotary shaft mounted transversely of the cane carrier, with means for rapidly rotating said shaft, a series of knives mounted radially on said shaft in staggered relation, with means comprising bolts and elastic bushings therefor for holding said knives on said shaft, to permit a yielding twisting movement to the shank of each knife blade, thereby protecting said knife against breaking under glancing blows.

IRA MERLIS.