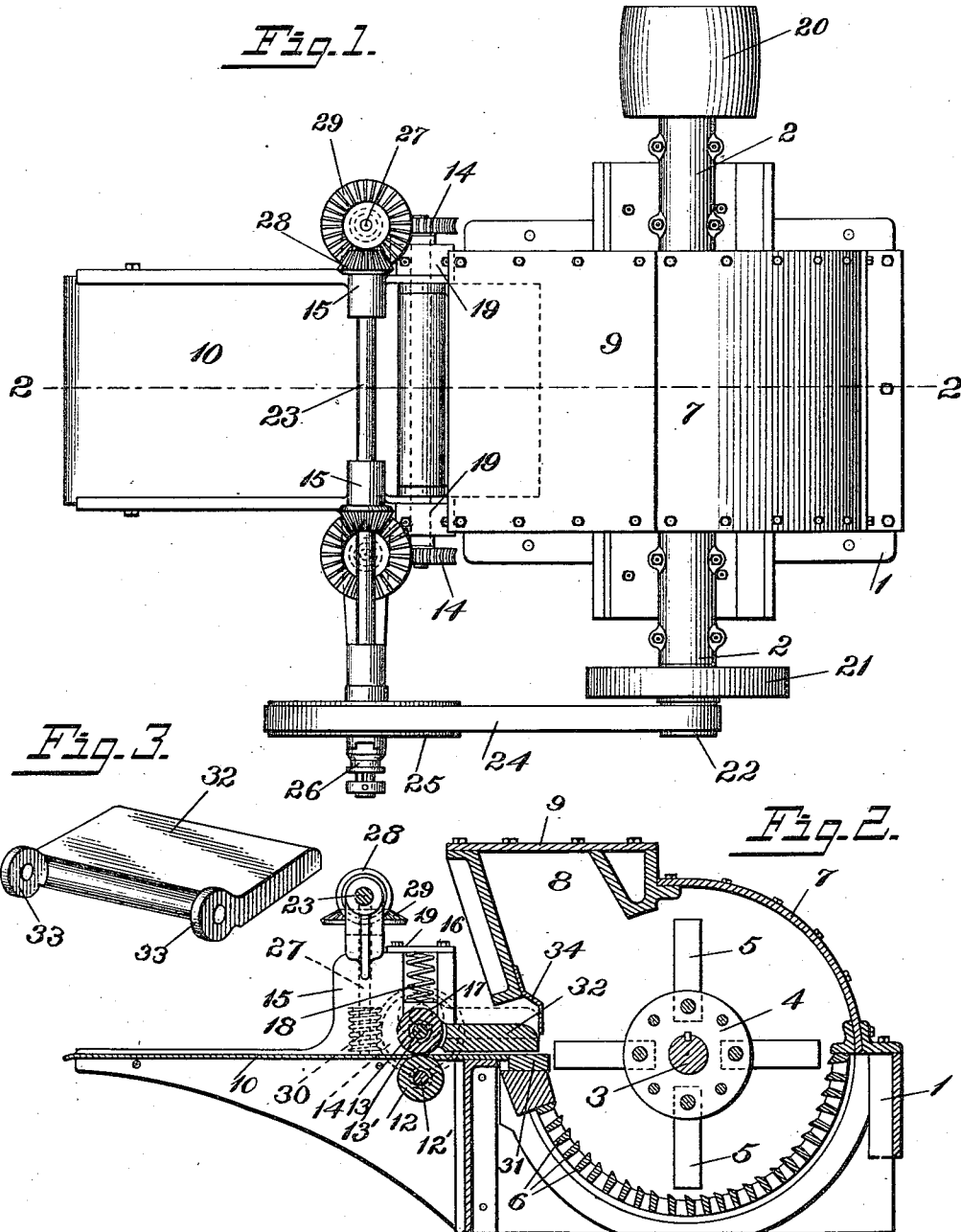


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PULVERIZER.

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UNITED STATES PATENT OFFICE.

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To all whom it may concern:

Be it known that I, WILLIAM K. LIGGETT, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Pulverizers, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to improvements in pulverizing machines of the class wherein each mechanism comprises a casing, a rotary element within the casing having a shaft which carries hammer supports whereon are pivoted several series of "swinging hammers," that is, hammer bars each pivoted on an axis supplemental to the shaft axis and parallel thereto, together with a screen in the lower half of the peripheral part of the casing, and a breaker bar, anvil bar or cutter bar situated in that part of the casing which is in or near the horizontal planes of the rotary shaft. Materials to be treated in, and pulverized by, machines of this class are of varying constitutions and conditions. A pulverizing machine may be required at one time to pulverize a material of one constitution and characterized by peculiar qualities, and then, at intervening times, be required to work upon materials of other constitutions. If, at times, it is called upon to treat substances of a tough, fibrous character in the form of sheets, such as scrap paper, old magazines, pamphlets, old newspapers, old books, paper pulp laps, or the like, they cannot be delivered to the pulverizing devices in the ordinary way, that is, cannot be fed rapidly, under the action of gravity, down a chuteway of the ordinary sort, for the advance of such sheets must be checked, controlled and subject to regulation. The edges of the sheets or laps must be gradually advanced to points within the circles of rotation of the hammers, and the parts of the sheets which lie outside of the advancing front edge parts must be held down firmly so that said edges (even when many sheets are lying packed close together) will be torn into small pieces, and the parts outside of the front edge parts must not be displaced or thrown upward as the blows are imparted to the edge parts.

The grate or screen section of the casing must be formed in such way that the pieces torn off by the hammers will be immedi-

ately cut and further comminuted in reducing them to a pulpy condition.

One of the objects of the invention is to provide a swing hammer pulverizer of the class referred to with a feeding device supplemental to the ordinary gravity chuteway feed, so that the mechanism can be used when required to feed materials of the class specified by thrusting them in on approximately horizontal lines across the planes of the casing walls to an anvil bar or cutter bar which lies close to the circles of rotation of the hammers, and also devices which will hold the material firmly in relation to the said bar while it is being gradually thrust forward, provision being made for uniformly holding the material that is being advanced, regardless of variations in thickness or other conditions.

In the drawings, Figure 1 is a plan view of the machine. Fig. 2 is a vertical sectional view on the line 2—2 of Fig. 1. Fig. 3 is a perspective view of the presser bar.

In the drawings the numeral 1 indicates the main frame of the pulverizer on which are formed the bearings 2 in which is supported the main shaft 3 of the pulverizer rotor. On this shaft are mounted a series of plates 4 between which are horizontally pivoted hammer bars 5. This mechanism constitutes the rotor of a swing hammer pulverizer such as is well known and needs no further description. Located in the lower portion of the main frame is a series of pulverizer bars 6 against which the material is ground by the hammers of the rotor, the grade to which it is desired to pulverize the material depending upon the spacing of the bars. The upper parts of these bars project above their curved carriers, as shown in Fig. 2, and the upwardly projecting parts are sharpened, having their top surfaces beveled in a direction opposite to that of the rotation of the hammer bars. The upper half of the casing consists of a detachable cover 7 in the upper portion of which is located a mouth 8. This is provided so that the machine may also be used for pulverizing material dropped by gravity in through the top of the casing. In the present arrangement of parts this mouth is covered by a plate 9.

A horizontal table 10 is positioned at one side of the pulverizer in alinement with an opening 11 in the casing. A feeding roller

12 carried by the shaft 12' is positioned directly below the table and with its upper surface approximately tangential to the surface of the feeding table. That is to say, this roller does not project through the table, but is so arranged that the mass of in-moving material, for example, layers of heavy pulp lap, are advanced continuously on the same lines, the bottom surface of the layer moving along the table surface on substantially straight lines. Directly above this is mounted a second feeding roller 13 carried by the shaft 13' upon the ends of which are secured the driving worm wheels 14. Up-
standing brackets 15 are formed at each side of the table support and are provided with upward opening slots 16 in which are slidably mounted the bearings 17 in which the upper roller shaft is journaled. Coil springs 18 are placed above the journals 17 and are held downward by means of plates 19 fastened across the upper ends of the opening 16. The upper feeding roller is in this manner resiliently pressed downward against the lower feeding roller.

The rotor pulverizer is driven by any suitable means as, for example, the belt pulley 20 positioned on one end of the shaft 3. Upon the other end of the shaft 3 is mounted a fly wheel 21 and pulley 22. A transverse shaft 23 is journaled in the upper ends of the brackets 15 and is rotated by means of a belt 24 which passes around the pulley 25 and the pulley 22. The pulley 25 is secured to the shaft 23 by means of a clutch 26. Two vertical shafts 27 are journaled on the outer faces of the upright brackets 15 and are connected at their upper ends with the transverse shaft 23 by means of beveled gears 28 and 29. Worms 30 are secured at the lower ends of the vertical shafts and are so positioned as to mesh with the roller driving worm gears 14. The worms are of sufficient length so as not to become disengaged from the worm wheels when the upper roller is moved upward and away from the lower roller.

At 31 a bar is arranged in approximately the horizontal planes of the axis of rotation of the hammers. It serves as a shear bar, or cutter bar, when material is being fed horizontally into the mechanism and an anvil bar on which occurs the first breakage of solid friable material when it is fed down through the vertical chuteway. The material being fed across the table comes in contact with the swing hammers of the pulverizer at the edge of the cutter bar, this being located at points adjacent the ends of the hammers. Between the rollers and the edge of the cutting bar I have positioned a presser bar 32 which normally lies flat against the cutter bar and table. The rear ends of this bar are provided with ears 33 through which is passed the shaft 13' on

which the upper feed roller 13 is mounted. The lower edge of the presser bar 32 is positioned tangential to the feed roller 13. By thus mounting the presser bar pivotally upon the axis of the movable roller and with its lower surface tangential thereto, I have provided an arrangement of parts which is found to be very advantageous in connection with a swing hammer pulverizer.

The pressure bar rises and falls with the upper roller, being directly connected thereto, and the lower surface of the bar will be held tangential to the lower part of the roller, in whatever position the latter may be. When the layer of material is thin, the bottom surface of the pressure bar is approximately tangential also to the upper part of the lower roller. Its entire under-surface is active in respect to resting upon the material, and, being a heavy mass of metal, maintains the forward end of the advancing mass under solid compression, so that it will not be thrown upward when the front edge portion is struck by the hammers.

A shield 34 is placed in the upper part of the opening 11 so as to prevent material flying around within the pulverizing casing from finding an exit at this point. It also serves as a guide and retainer for the material which is passed down the vertical chuteway.

When the material is of such nature that it can be dropped through the passage at 8 the above described devices which are used for horizontal feeding serve as part of the casing wall and prevent the escape of material along the horizontal lines of the holder plate 32. When this feeder plate is in use its lower surface remains substantially parallel to the feed table, the holder moving up or down to correspond to the thickness of the mass which is advancing under it; and it will be seen that at all lines between the vertical plane of the contact lines of the two rollers and the anvil part or narrow exposed part of the bar 31, the material has a weight upon it over the whole distance; and this weight supplemented by the force of the spring 18 insures that the outer part of an object (such as for instance a magazine or book) will not be thrown up under the reactionary effect of the blows from the hammers at the front edge. And as the plane of the holding plate 32 is tangential to the bottom surface of the roller the latter and the plate constitute a continuous holder which can follow the surface of the advancing mass and firmly hold in position that portion which is under the displacing influence of the hammer bars.

The wall section or shield 34 of the casing is shaped to provide a chamber or recess which permits the inner end of the plate 32 to rise and fall without hindrance, the pas-

sageway to the interior being controlled by the inner edge surface of the plate.

The concave with the screen is, as shown in the drawings, and as usual in such machines, removable, it having been the common practice to provide each of such pulverizer mechanisms with screens differing one from the other and interchangeably usable for different purposes. The screen illustrated in the drawings is the one specially adapted for use when the machine is employed for reducing to pulpy, or similar, condition materials of the sorts above specified. The small pieces that are torn off from the lumps are rapidly carried downward by the hammer bars whose ends rotate in close proximity to the sharp edges of the screen bar 6, and such pieces are rapidly torn into smaller and smaller pieces as they are carried across the screen bar, the latter being, as above described, sharpened and projected upward to assist in comminuting the material.

I am aware that various arrangements of presser bars have previously been used in connection with pulverizers. The swing hammer type of pulverizer differs, however, from the ordinary type in that the hammers, when contacting with the material at the edge of the cutter bar, are free to swing upward and pass over the material, this tendency being overcome, however, by the centrifugal force depending upon the speed of rotation and the weight of the hammers. In my machine I provide a heavy presser bar pivotally mounted upon the axis of the movable feed roller and in this way insure material being fed through the rollers being held securely against the cutter bar of the

swing hammer pulverizer. By positioning the presser bar so that the lower surface is tangential to the movable roller, and mounting it so that it constantly retains this relation even when large chunks of material raise the upper roller a considerable distance from the lower roller, the proper feeding of the material upon the presser bar without clogging is insured.

What I claim is:—

The combination of the pulverizing rotor, having the shaft, and the series of sets of eccentrically pivoted swing hammer bars, the casing around the rotor, the breaker bar or cutter bar adjacent to the horizontal plane of the axis of the rotor and adjacent to the circles of rotation of the hammer bars, means for feeding material horizontally through the casing to said bar comprising the table, the fixed feed roller having the upper part of its surface tangential to the plane of the table, the vertically yielding roller, and the weighted holder plate hinged to the vertically yielding roller and adapted to rise and fall therewith and with its operative face held tangential to the lower part of the surface of said roller and moving in parallelism with the feed table and having its front edge spaced from the planes of the circles of rotation of the hammer bars, but adapted to hold down the material at lines between the feed rollers and the bar, substantially as set forth.

In testimony whereof I affix my signature, in presence of two witnesses.

WILLIAM KELSEY LIGGETT.

Witnesses:

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DUDLEY T. FISHER.