

UNITED STATES PATENT OFFICE.

WM. H. CLARK, OF CINCINNATI, OHIO, AND R. R. JAMES, OF RISING SUN, INDIANA.

IMPROVEMENT IN SUGAR-CANE MILLS.

Specification forming part of Letters Patent No. 41,681, dated February 23, 1864.

To all whom it may concern:

Be it known that we, WILLIAM H. CLARK, of Cincinnati, in the county of Hamilton and State of Ohio, and REUBEN R. JAMES, of Rising Sun, in the county of Ohio and State of Indiana, have invented certain new and useful Improvements in Sugar-Cane Mills; and we do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, and letters of reference marked thereon, forming part of this specification.

Our improvements relate to mills of three rolls, which are set vertically in an iron frame and are usually operated by animal power, and they relate particularly to a fluted feed-roll in combination with a smooth master and delivery roll; also, to a vibrating conductor held in contact with the feed-roll by a suitable spring; also, to a hand-hole in the top plate; also, to the use of a bridge-piece across the juice-channel, permitting the latter to be extended across the track traversed by the cane, as will appear; also, to the employment of certain grooves cut in the top and bottom plates in the track or circle described by the ends of the rolls, or to grooves for a similar purpose formed in the ends of the rolls, or, if required, in both the plates and ends of rolls, as will be explained.

We will now proceed to describe our improvements in detail, referring to the accompanying drawings, in which—

Figure 1 is a perspective view of a cane-mill containing our improvements. Fig. 2 is a vertical section. Fig. 3 is an end view of a roll. Fig. 4 is a top view of a portion of the bottom plate; also representing a corresponding portion of the under side of the top plate.

Like letters of reference indicate like parts, so far as represented, in the different figures.

The cane-mill here represented is constructed with a cast-metal top plate, A, and bottom plate, B, between which the working parts of the machine are supported. These plates are connected by vertical stay-plates CC, the whole being firmly secured together by corner-bolts *a a*, &c.

D represents the master-roll; E, the feed-roll, and F the delivery-roll. The journals of these rolls are supported appropriately in boxes in the top and bottom plates, the shafts

of the rolls being represented extending through the top plate at *b b*, &c. The shaft of the main roll is prolonged up to receive the sweep-cap *c*, as shown.

The mill is operated by a team attached to the sweep *d*, which gives motion to the main roll. This is geared, as shown, with the minor rolls E and F, communicating a corresponding motion to them. The cane is fed to the mill through the feed box or throat *f*, and is first received between the main roll and the fluted feed-roll E. From thence the partly-pressed cane passes around in contact with the main roll until it enters between the latter and the roll F, where it is finally pressed.

It is common to employ between the feed and delivery roll a fixed plate or conductor, sometimes called the "returner." This is made with a sharp edge set against the face of the feed-roll and operates to separate the partly-pressed cane therefrom and conduct it along to the entrance between the main and delivery roll where it is finally pressed. This part of the machine is the source of considerable annoyance and difficulty in most sugar-cane mills. Its adjustment to the roll requires to be very accurate, otherwise a portion of the cane will enter and lodge between the edge above referred to and the face of the roll, and continue to accumulate until the passage through which the cane should freely pass becomes clogged and the operation of the machine arrested; but when nicely adjusted, the wear to which the edge in contact with the roll is exposed, together with the gradual receding of the roll, which always occurs when a mill is worked, causes a separation of the edge of the plate from the face of the roll and gives rise to the clogging above referred to. Again, when it becomes necessary to set up the feed-roll, as is frequently required, the conductor, being a fixed plate which is or should be in contact with the face of the roll, offers resistance and is frequently broken in the operation. Now, to obviate all difficulties growing out of this mode of constructing and arranging the conductor, we employ a self-adjusting plate, which is supported in pivots at its ends and so arranged that the dividing-edge adapts itself to the face of the roll accurately, being held in contact therewith by a suitable spring, as will appear.

The foregoing refers to the conductor when used in connection with the ordinary smooth feed-roll; but in our mill the feed-roll, as has been stated, is fluted; and hence the use of a conductor such as we have mentioned, the edge of which will enter the depressions in the roll and separate the cane effectually therefrom, is peculiarly appropriate. This conducting-plate is indicated by G, Fig. 2, one edge resting against the face of the fluted feed-roll E. A round pivot or journal is formed on each end of the conductor by which it is so carried as to be free to vibrate. The pivot at the upper end, *g*, is prolonged up through the top plate where it receives a suitable spring, *g'*, so arranged as to press the edge of the plate or conductor against the face of the roll and retain it in contact therewith.

i is a hand-hole in the top plate, affording access to the triangular space between the rolls, also to the ends of the rolls, for the purpose of removing therefrom small fragments of cane and trash which collect, and, if not frequently removed, ferment and become offensive. A small metal cap, *h*, covers the hand-hole. This is so made and adapted to the opening in the plate that its under face is flush with the under face of the plate, making, with the latter, a continuous plain surface, against which the cane on its passage through may rub without obstruction.

It may be remarked that it is the custom in operating mills made without flanged rolls to so feed the cane to the mill as to allow a considerable portion of the ends of the rolls to run naked. This is necessary in order to prevent the cane in spreading between the rolls from passing over the ends and escaping uncrushed. In our mill the rolls fill the entire space between the plates, the latter serving to some extent as flanges, and it is designed to feed the cane through the entire length of the rolls. Its tendency to spread or expand laterally is thus arrested by the inner faces of the plates, and it becomes necessary to present an even, uninterrupted surface along which the cane travels, otherwise a portion of cane in contact therewith would be obstructed and speedily accumulate until the passage of the whole would be interrupted and the operation of the mill suspended.

We are aware that openings have been made in the end plates of cane-mills for the purpose of introducing and adjusting the conductor; but in such cases no cap has been employed, and the construction did not contemplate the purpose provided in the cap *h*, herein described, forming, as has been stated, with the under face of the end plate a continuous plain surface against which the cane in its passage through may rub and pass without obstruction.

At *j*, Fig. 2, is seen a circular depression in the bottom plate. This represents transverse the channel by which the juice is conveyed from the mill to an appropriate receptacle. Its direction or course is outwardly between

the two minor rolls to the edge of the bottom plate, where it discharges. It is desirable that the juice, as it is expressed from the cane and leaves the rolls, should fall, if possible, directly into the juice-channel without first spreading over the bottom plate, where it takes up the dirt and impurities which collect thereon. We therefore make this juice-channel broad and sufficiently deep to receive all the juice which may be produced, and we also extend the channel into and entirely across the triangular space between the rolls; but the cane as it passes through from the feed-roll to the delivery-roll crosses this channel and is liable to be arrested and become entangled in the space. To prevent this we employ a bridge piece or plate, *k*, the face of which is level with the face of the plate. This affords an even surface for the passage of the cane, while the juice is at the same time allowed to fall almost directly into the juice-channel.

It is found that in mills of this kind where no flanges are employed on the rolls fragments of cane tend to work into the narrow space between the ends of the rolls and the top and bottom plates, greatly obstructing the operation of the machine, and frequently accumulating in such quantity, and wedging into the space with such force, as to break the mill. To prevent this, or more properly to cause the fragments of cane to discharge themselves from this space as they are carried around by the rolls, we form in the top and bottom plates slight grooves cut in an appropriate directions, as represented in Fig. 4, where *m* indicates the grooves. The operation of these grooves is such that as the cane or fragments are carried around by the roll, they are directed outwardly, by the direction of the grooves, beyond the periphery of the rolls. Grooves may also be formed in appropriate directions in the ends of the rolls, as shown in Fig. 3, where *n* represents the grooves. These will operate in conjunction with the grooves in the plates, and thus effectually prevent the accumulation of substance in the narrow space.

In reference to the fluted feed-roll herein described, it is proper to remark that it has been common to cut, with a chisel or other tool, slight grooves or creases in the face of the delivery-roll of sugar-mills, and in some instances in both the delivery and main rolls. These are for the purpose of giving adhesion to the cane as it passes through between the rolls, receiving final pressure, and to prevent the mass from stopping between the rolls while the latter continue to revolve. Grooves or creases for this purpose have not been made in the feed-roll for the reason that the difficulty they are designed to obviate only pertains to the passage of the cane between the main and delivery rolls. Moreover, this device does not accomplish in any respect the purpose contemplated by our invention, and is in no respect identical with it. Our invention relates solely to the feed-roll, and consists

in constructing it with regular flutes the function of which is to cause a rupturing of the woody fiber of the cane at short intervals, to allow the juice more readily to escape from the cane when exposed to final pressure between the main and delivery rolls, both of which are left plain and smooth; also, to facilitate the first entrance or introduction of the cane to the mill. We therefore regard the construction and function of the fluted feed-roll herein described as being entirely unlike the device consisting of casually-cut grooves or creases in the other two rolls before mentioned; and we desire to disclaim the latter or any other device employed for the purpose specified in connection therewith.

Having fully described our improvements in sugar-cane mills, what we claim as new, and desire to secure by Letters Patent of the United States, is the following:

1. In combination with the regular main pressure-roll D and delivery-roll F, the use of the fluted feed-roll E, when arranged and operating in connection with the former in the manner and for the purposes herein described.

2. The hand-hole *i* in the end plate and cap *h*, when the latter is so constructed and adapted to the plate as to form, in connection therewith, a plain face on the inner side, as and for the purpose specified.

3. The vibrating or self-adapting conductor G, in combination with either a plain or fluted feed-roll, for the purpose described.

4. In combination with the juice-channel *j*, extending into the triangular space between the rolls, the bridge-plate K, for the purpose specified.

5. The grooves *m* in the end plates and the grooves *n* in the ends of the rolls, either separately or in combination, for the purpose described.

In testimony whereof we have hereunto set our hands.

WM. H. CLARK.

R. R. JAMES.

Witnesses to signature of Wm. H. Clark:

WM. CLOUGH,

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Witnesses to signature of R. R. James:

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