

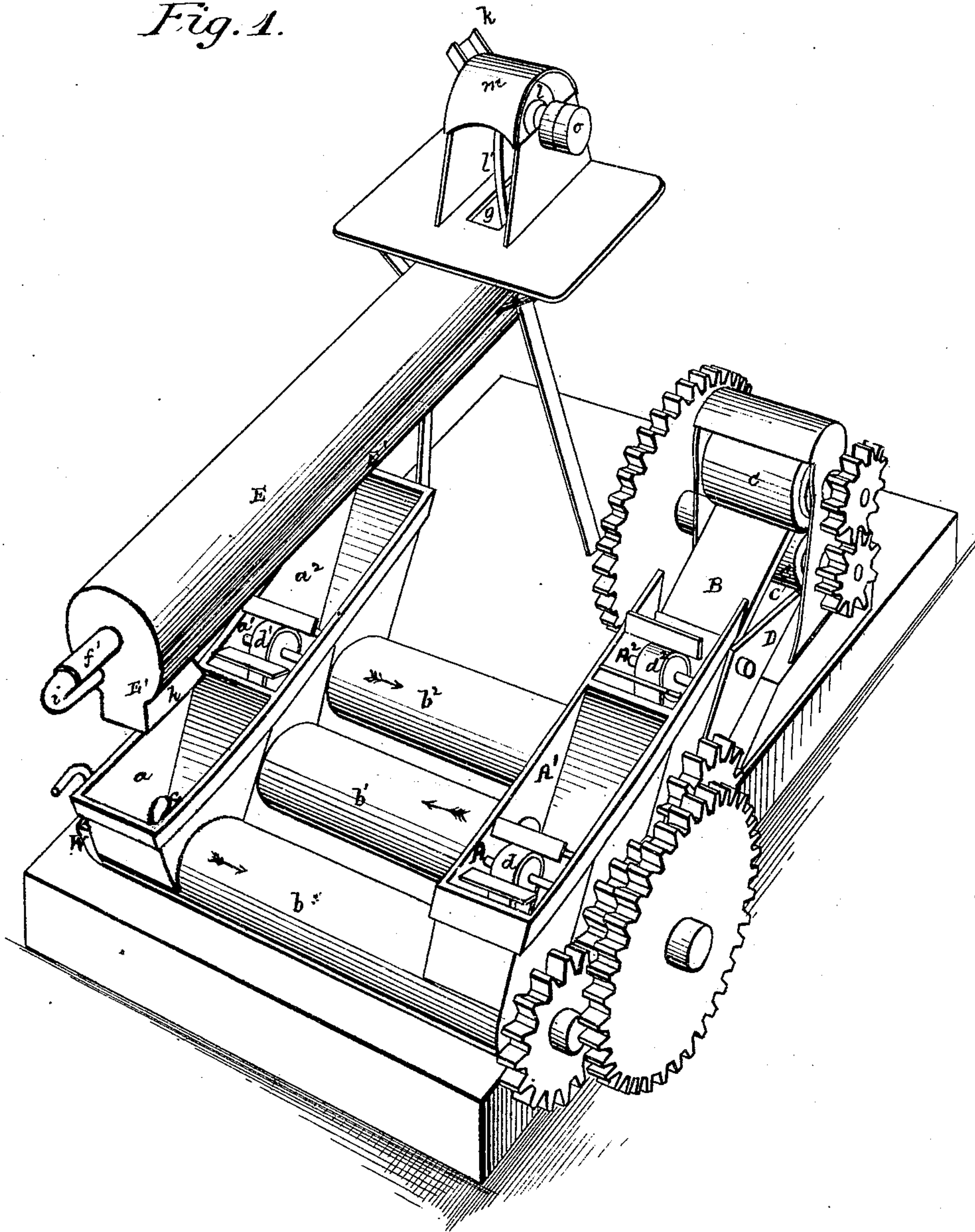
**M. S. BRINGIER.**

# Apparatus and Processes for Extracting Saccharine Matter from Sugar-Cane.

No. 140,461.

Patented July 1, 1873.

*Fig. 1.*



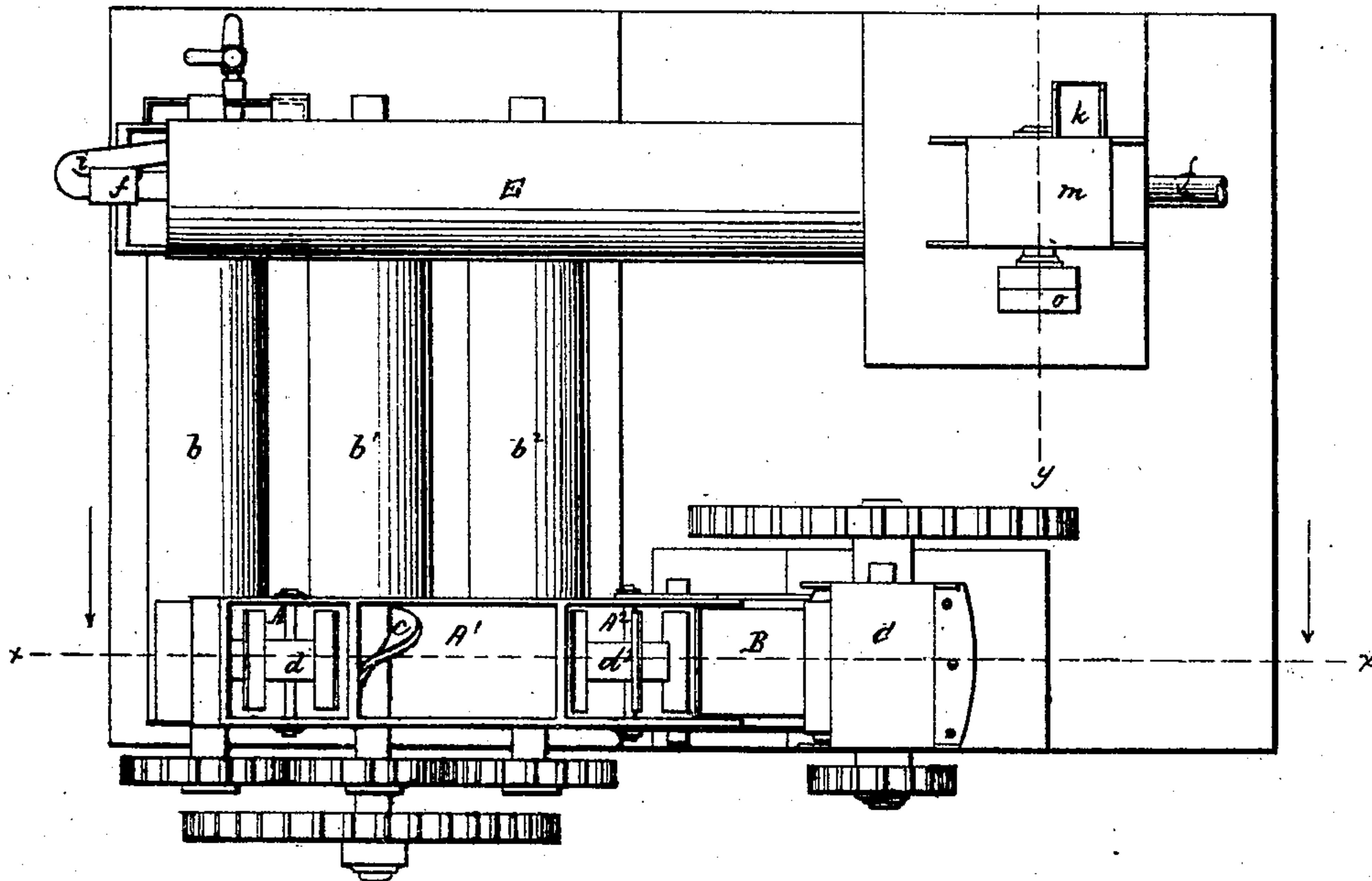
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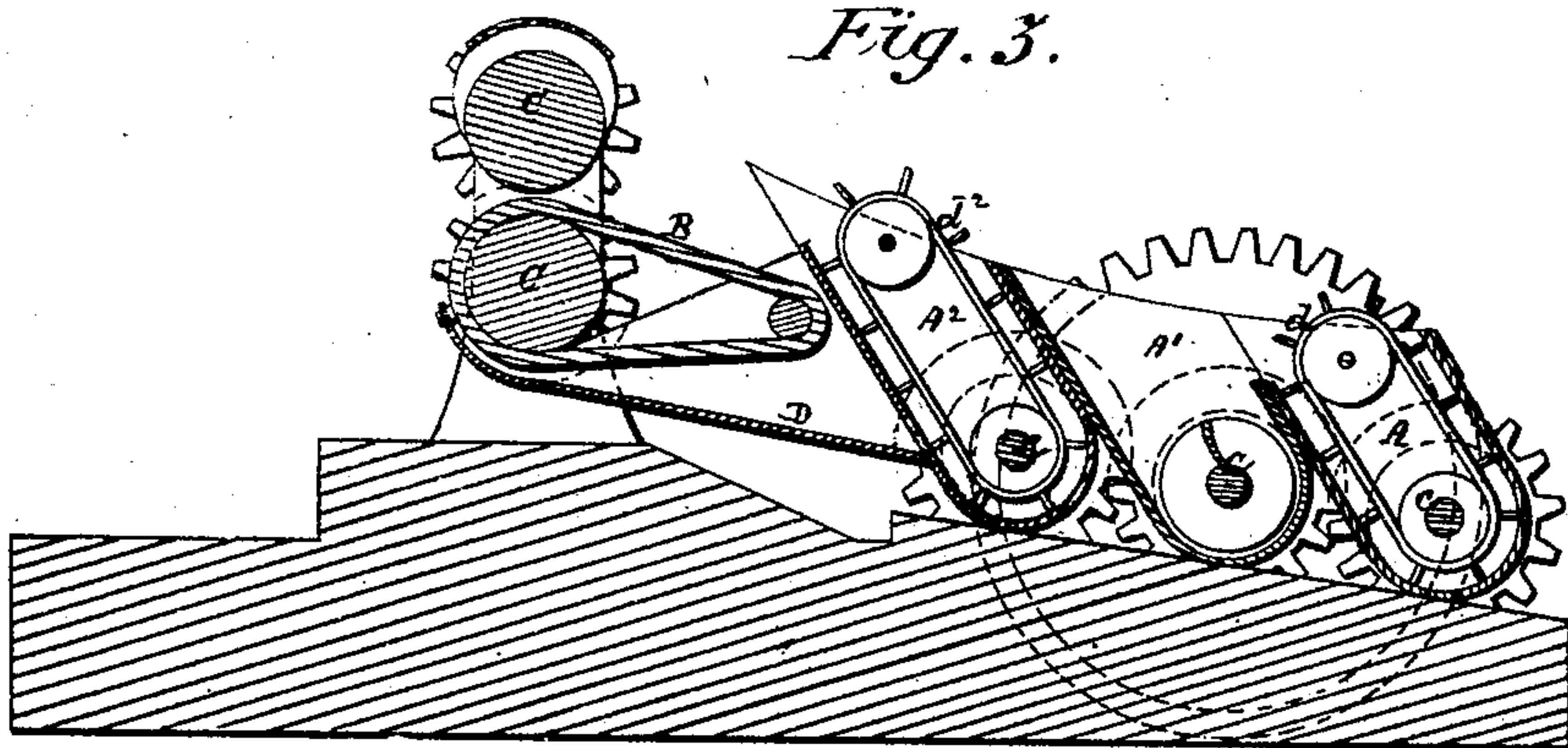
2 Sheets--Sheet 2.

**M. S. BRINGIER.**  
**Apparatus and Processes for Extracting Saccharine**  
**Matter from Sugar-Cane**  
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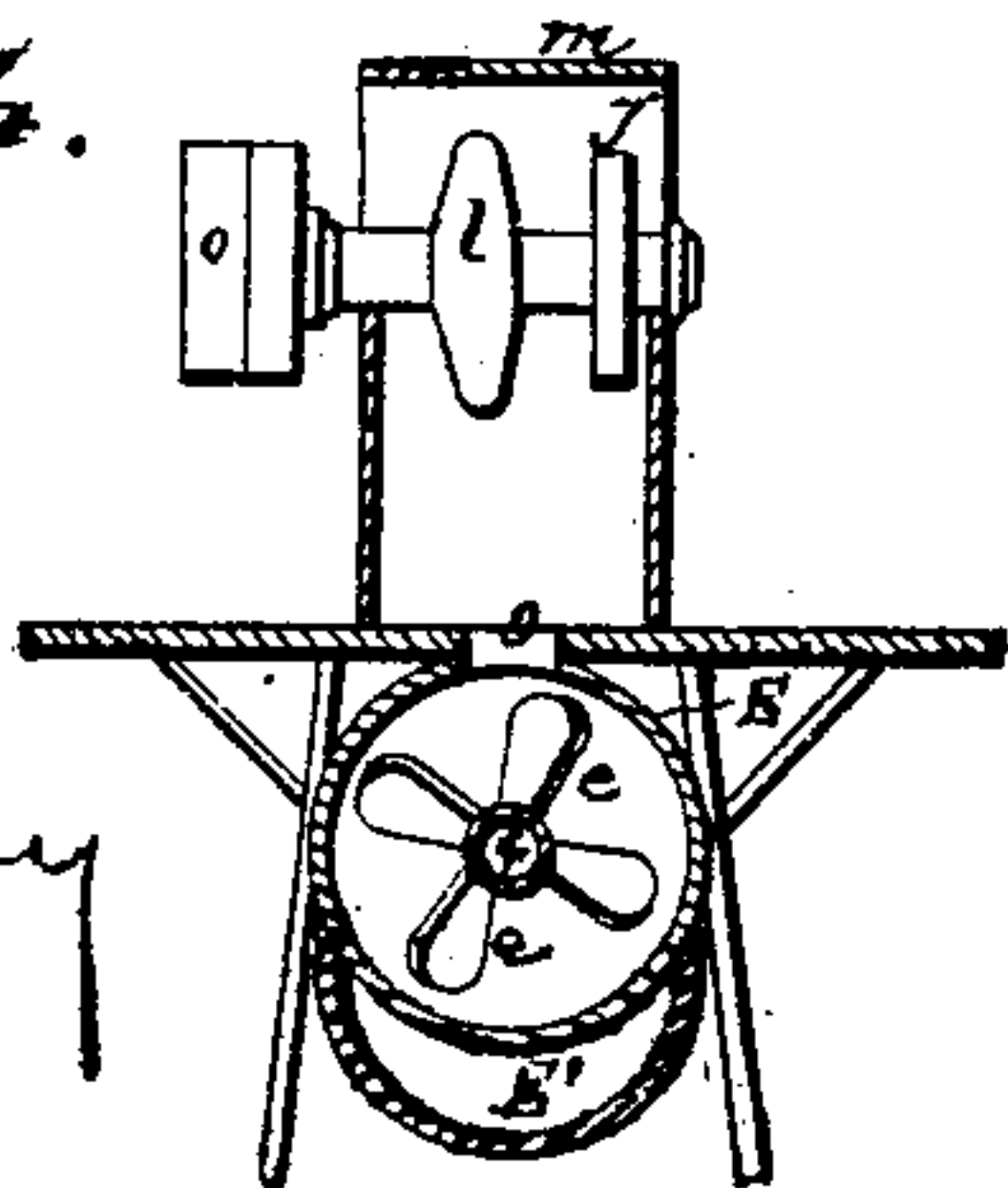
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



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# UNITED STATES PATENT OFFICE.

MARIUS S. BRINGIER, OF ASCENSION PARISH, LOUISIANA.

## IMPROVEMENT IN APPARATUS AND PROCESSES FOR EXTRACTING SACCHARINE MATTER FROM SUGAR-CANE.

Specification forming part of Letters Patent No. **140,461**, dated July 1, 1873; application filed June 24, 1873.

*To all whom it may concern:*

Be it known that I, MARIUS S. BRINGIER, of the parish of Ascension, State of Louisiana, have invented a certain new and useful Process of and Apparatus for Extracting Saccharine Matter from Sugar-Cane or other Vegetables, of which the following is a specification:

Before proceeding to describe my invention it is proper to premise that by the most approved method now practiced in the manufacture of sugar only about three (3) per cent. of sugar and three per cent. of molasses are obtained from sugar-cane grown in Louisiana or elsewhere in the United States, notwithstanding that there is about fourteen (14) per cent. of pure saccharine matter contained in the same. The reason why so great a loss is sustained, to state it very briefly, arises out of the fact that in expressing the juice that is subsequently evaporated or reduced to make the sugar and molasses that are actually obtained, the means employed are insufficient to break the cellular tissues or membranes which constitute the walls of the minute vesicles in which the saccharine is contained; and hence there cannot be a complete extraction or expulsion of the same. The juice is expelled, and carries with it a portion of the saccharine; but, as I have stated, more than one-half of the latter remains in the *bagasse*, which is either thrown away or consumed as fuel in the furnace of the sugar-mill.

It is the object of my invention to prevent as far as possible this loss, and to extract cheaply and thoroughly the saccharine from the cane. To this end my invention may be stated to consist in first cutting or dividing the cane or other saccharine substance into thin slices or chips; then heating or drying the same to destroy its vitality and to evaporate the juice, and then subjecting these thin, dried, or partly dried slices to a warm or cold water washing process, substantially as hereinafter described. The thin slicing of the cane is necessary, in order to get at and expose the cells or vesicles which hold the saccharine and juice. The drying process carries off the juice by evaporation to some extent, destroys the vitality of the slices, and leaves them in such condition as to be readily permeable, and to readi-

ly yield to the action of the water, which will carry off with it from the cane all but a very small per cent. of the saccharine contained in the latter.

By this process I am enabled to dispense with the ponderous pressure-rollers, as well as other expensive machinery that enters into the composition of the most approved existing sugar-mills. The machinery which I can use is simple and comparatively inexpensive.

One form of apparatus adapted to carry my invention into effect, and preferred by me for this purpose on account of its simplicity and effective action, is represented in the accompanying drawings, in which—

Figure 1 is a perspective view of said apparatus. Fig. 2 is a plan of the same. Fig. 3 is a section looking in the direction of the arrow on line *x x*, Fig. 2. Fig. 4 is a section on the line *y y*, Fig. 2.

*A a*, *A<sup>1</sup> a<sup>1</sup>*, and *A<sup>2</sup> a<sup>2</sup>* represent a series of open inclined receptacles communicating at their bases by means of horizontal cylinders or channels *b b<sup>1</sup> b<sup>2</sup>*, the receptacles *A a* being connected by cylinder *b*, *A<sup>1</sup> a<sup>1</sup>* by *b<sup>1</sup>*, and *A<sup>2</sup> a<sup>2</sup>* by *b<sup>2</sup>*, and above the upper part of the subdividing partitions between the receptacles *A<sup>1</sup>* on the one side and *a<sup>1</sup> a<sup>2</sup>* on the other, in Figs. 1 and 3. Each of the cylinders or channels contains an Archimedean screw, *c*, by which the sliced cane is fed along, the movement of the screws being effected by gearing, the direction of the movement of the cane produced by them being indicated by the arrows in Fig. 1. Each pair of receptacles *A a*, *A<sup>1</sup> a<sup>1</sup>*, &c., is on a different level from the others. *A<sup>1</sup> a<sup>1</sup>* and their horizontal channel *b<sup>1</sup>* are about six inches higher than *A a* and *b*, and so on, so that the water which enters the most elevated receptacle shall, by its own gravity or weight, freely descend from one set of receptacles to another, while the heated or dried slices, through the action of the Archimedean screws in the channels or cylinders *b b<sup>1</sup> b<sup>2</sup>*, and endless-chain elevators *d d<sup>1</sup> d<sup>2</sup>* in receptacles *A a<sup>1</sup> A<sup>2</sup>*, are made to ascend to the upper or discharge receptacle *A<sup>2</sup>*, from which the elevator *d<sup>2</sup>*, operating therein, throws them upon an endless rubber or other elastic carrier, *B*, passing between the pressure-rollers *C* to be compressed



by the said rollers so that the remaining juice, however feeble which they yet contain, may be extracted. This juice I prefer to conduct back to receptacle  $A^2$  by means of an ordinary gutter or channel properly inclined and connected for that purpose, as shown at D, Fig. 3. E is a heating or drying chamber, of any size and suitable material, provided with a double bottom or steam-jacket,  $E'$ , and contains a series of inclined feeding arms or blades,  $e$ , (seen in Fig. 4,) secured upon a horizontal revolving shaft,  $f$ , running through the whole length of the chamber and supported through the heads of the same.  $g$  is the feeding-throat of the heating or drying chamber;  $h$ , its open discharge-throat; while  $i$  is a steam-pipe extending directly from the end  $f'$  of the hollow shaft  $f$  into the jacket  $E'$ , from which jacket the steam is allowed to escape in any suitable manner either in the air or to heat the water employed to dissolve the saccharine substance of the sliced cane. Steam is supplied to pipe  $f$  from any convenient source. Immediately above the feeding-throat  $g$  of the heating or drying chamber stands a revolving circular jack plane or cutter,  $j$ , protected by a circular guard,  $m$ , consisting of a circular disk of metal provided with a series of adjustable knives or blades which can be adjusted to cut the canes as rapidly as desirable, and to any suitable thickness. When it is desired to work with this device the cane or other saccharine substances are supplied by an ordinary carrier to the hopper  $k$  of the cutter. The cutter-disk, with its knives or blades, is then made to revolve by applying power to its driving-pulley  $o$ , and the material containing the saccharine substance, drawn with great force toward the revolving disk by the action of the knives, is as rapidly reduced or cut into thin slices or shavings as it can be supplied to the blades; and of their own weight these slices or shavings drop through the open feeding-throat  $g$  into the heating or drying chamber. While this is going on, steam being allowed to circulate within the space  $E'$  of the chamber and through the hollow shaft  $f$ , heats or dries the slices or shavings and destroys their vitality as they are stirred and propelled toward the open discharge-throat  $h$  by the revolving wings or blades on shaft  $f$ . To accelerate this heating or drying process, as well as to drive out the vapor generated within the chamber by the heated or drying material, air at ordinary temperature or in a heated state may be forced through the chamber in a sufficient quantity and with sufficient force by means of a blower on the cutter-shaft, as indicated at  $l$ . The pipe conducting the air from the blower into the drying-chamber is indicated at  $u$ . The heated and dried slices or shavings carried along by the blade or wings  $e$  finally fall from the discharge-throat  $h$  of the heating or drying chamber into the open receptacle  $a$  directly below said discharge-throat. They are taken there up by the revolving Archimedean screw  $c$  located in that receptacle and in the cylinder  $b$ ,

and are conveyed through the said cylinder into the inclined receptacle A, from which they are raised by the endless-chain elevator  $d$  of the said receptacle and thrown into the adjoining inclined chamber  $A^1$ , above the partition which divides them, from which vessel  $A^1$ , as they are thrown in, the revolving Archimedean screw of the cylinder  $b^1$  conveys them into the opposite receptacle  $a^1$ , where they are again raised by the elevator  $d^1$  and dropped into the adjoining receptacle  $a^2$ , from which receptacle the Archimedean screw of the cylinder  $b^2$  picks them up and carries them into the receptacle  $a^2$ . There they are raised by the elevator  $d^2$  and thrown upon the elastic or flexible carrier or apron B and conveyed to the rollers C to be compressed, so that the liquid extracted shall be restored to the receptacle  $A^2$  to be used over again, if desirable. In the mean time, and while the slices or shavings are ascending from one receptacle to another, and before they reach the upper receptacle  $A^2$ , water at any temperature not exceeding  $180^\circ$  Fahrenheit, in any suitable quantity, from a tank or reservoir, is admitted by suitable means into the said receptacle  $A^2$ . In proportion as the water is supplied to this receptacle it flows and descends through the cylinder  $b^2$  into the receptacle  $a^2$ . Meeting the ascending slices on its downward way, it penetrates through them, readily dissolves the saccharine matter which they may contain, passes over the partition separating the receptacles  $a^2$  and  $a^1$ , trickles or flows through the slices therein contained, washes out their saccharine matter, then penetrates through the slices in the cylinder  $b^1$  into the receptacle  $A^1$ , and, flowing over the top of the partition that separates that receptacle from the receptacle A, it enters the latter, and from the receptacle A it passes through cylinder  $b$  into the last receptacle  $a$ . It drains through perforations in receptacle  $a$  into a reservoir, W, from which, after having met in its descent with a continuous fresh supply of ascending saccharine matter, and after having acquired a proper degree of density, it may at will be withdrawn in a continuous stream. The larger the number of receptacles employed the more will the concentration of the juice be. Therefore the juice may by my device be concentrated to  $25^\circ$  Baumé or upward.

I do not, therefore, limit myself to any particular number of receptacles, elevators, cylinders, Archimedean screws, or heating or drying chambers, as the same may be varied according to circumstances. Nor do I limit or confine myself to closed cylinders  $b$ ,  $b^1$ , and  $b^2$ , or to closed heating or drying-chambers, as the upper parts of the same may be partially open, or they may be left entirely open, if desirable to do so, without interfering in the least with their effective operation.

It is proper to observe that in practice the elevators  $d$ , &c., consisting of endless chains and horizontal blades or scoops, as shown in the drawing, are operated by the movement of the Archimedean screws through the agency



of sprocket-wheels on the screw-shafts properly arranged to sustain the chains. I wish it well understood, also, that the pressure-rollers C are not indispensable in the operation of my device. Any other suitable press may answer as well, and both, if desirable, may be dispensed with, but I prefer, whenever convenient, to make use of them, in order that the juice—however weak it may be—of the nearly-exhaustive slices may be run back into the apparatus.

Instead of inclined receptacles or displacement-chambers A *a*, A<sup>1</sup> *a*<sup>1</sup>, and A<sup>2</sup> *a*<sup>2</sup>, and of inclined elevators *d* *d*<sup>1</sup> *d*<sup>2</sup>, as shown in the drawing, the same may be made and placed straight or vertical, and, instead of chain-elevators, short Archimedean screws may be substituted for them with the same result; but I prefer the inclined displacement-chambers with the inclined chain-elevators, although I reserve the right to use the other arrangement whenever deemed advisable to do so.

It will be understood that the various moving parts of the above-described apparatus are driven by suitable power through the medium of gearing, belting, or other appropriate means.

Having described my invention, and the manner in which the same is or may be carried into effect, what I claim, and desire to secure by Letters Patent, is—

1. The process herein described of extracting the saccharine from sugar-cane and other vegetable substances, the same consisting in, first, thinly slicing said substances, then heating or drying them, and then subjecting them to the action of a current of water, either hot or cold, caused to move in a direction opposite to that in which the slices or shavings of said cane or other substance are moved through the washing apparatus, substantially as shown and set forth.

2. The combination of the heating or drying

chamber with the displacement apparatus, consisting of a series of vessels connected together, substantially as described, and provided with feed screws or worms, or their equivalents, whereby the material fed from the drying-chamber is caused to pass in one direction through the apparatus, to meet water passing through the same in an opposite direction, as and for the purposes set forth.

3. In combination with the heating or drying chamber, the cutting apparatus and feed-hopper, arranged and operating to cut the cane into slices and deliver it to the drying-chamber, as shown and described.

4. The combination, with the heating-chamber, of a blower or air-forcing apparatus, arranged to discharge air into said chamber, substantially as and for the purposes set forth.

5. The herein-described displacement apparatus, consisting of two oppositely-arranged series of upright or inclined vessels or receptacles connected by horizontal cylinders or channels, in combination with rotary feed-screws or their equivalents, in the said cylinders, and elevators or their equivalents in the said vessels, under the arrangement and for operation substantially as shown and set forth.

6. In combination with the displacement apparatus, the endless apron for carrying off the exhausted sliced cane or other substance, the rollers for pressing the water from the same, and the gutter or trough for catching said water and conveying back to the displacement apparatus, as shown and described.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

M. S. BRINGIER.

Witnesses:

ARTHUR BARBARIN,  
AMÉDÉE DUCATEL.