UNITED STATES PATENT OFFICE.

LOUIS GATHMANN, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO GUANICA CENTRALE, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

METHOD OF PRODUCING SUGAR.

1,068,758. Specification of Letters Patent. Patented July 29, 1913.

No Drawing. Application filed February 21, 1911. Serial No. 609,999.

To all whom it may concern:

Be it known that I, LOUIS GATHMANN, a citizen of the United States, residing at Washington, in the District of Columbia, have invented a certain new and useful Improvement in the Method of Producing Sugar, of which the following is a full, clear, and exact specification.

The invention which forms the subject matter of this application relates to a new and useful method for producing sugar primarily designed for the treatment of cane and sugar beets, although applicable to such other materials as may possess similar properties and be susceptible of responding to the same process.

Under the conditions heretofore obtaining in this industry, the active operations of raw sugar factories or mills are practically confined to the season during which the cutting of the cane is feasible, from which it results that such mills, so far as the grinding of cane is concerned, are partly or entirely idle for perhaps one half of each year, while their capacity may be overtaxed during the other.

The primary object of my present invention is to obviate this objection by making proper provision for the continued operation of raw sugar factories, and thereby not only to distribute the work more uniformly throughout the year, but to very materially increase the efficiency and capacity of existing plants.

The improvements I have made secure other and important incidental advantages, some obviously resulting from the novel procedure which I have devised, and others which I have discovered to result adopted by me in carrying out the objects in view. The following statement of the processes heretofore followed and of the novel steps introduced by me will serve to convey a clear understanding of the nature and purposes of my invention and the advantages secured thereby.

The plan generally followed in the extraction of the juice from cane, is to express the juice by passing the cane through a series of rollers in tandem. Another method frequently practised is by the so-called diffusion process; while still another involves a combination of the two processes of milling and diffusion. In all cases, however, the extraction of the juice or recovery of sucrose from the cane is carried out as completely as considerations of economy and efficiency permit, by what may be regarded as a single or continuous process, and the bagasse used for fuel or converted to other uses not directly concerned with the production of sugar. According to my invention, however, I extract, by the use of shredders or crushers and mills, a certain percentage only of the juice usually recovered from the cane, thus reducing the amount of liquid in the cane to approximately fifty per cent. of the original amount by weight. The juice expressed or recovered is then treated according to the present or any approved methods for the recovery therefrom of crystallized sugar. The cane residue passing from the mills and containing the residual sugar is then subjected to a preservative process, preferably and chiefly by drying, and suitably treated to permit its being conveniently handled, stored and indefinitely preserved. Preferably, it is dried and baled or compressed, in which form it is most economically stored until such time, after the cane-cutting season, as it may be conveniently treated for the extraction of the remaining sugar either by the milling or by the diffusion process. It is well known that cane, after a large percentage of the liquid constituents have been eliminated in this way becomes so friable that it may be reduced, with little difficulty to a coarse powder. It is also known that drying under known temperatures results in the coagulation of the albuminoids in the cane, which renders them, as well as certain waxy, gummy and coloring matters more or less insoluble, particularly in cold water, and allows the sucrose to crystallize, in which state it is readily soluble even in cold water. It will, therefore, be seen that the cane residue, after being dried, as above described, is not only in condition to be baled, transported, and stored for an indefinite period without deterioration, but is actually in a very desirable condition for treatment by either the milling or diffusion process at any time between the cane cutting seasons, when the capacity of the factories is not so severely taxed.

If desired, the cane residue, either before or after drying may be reduced to any de-

grve of comminution by machinery suitable and well known for such purposes. Although such treatment may not be desirable, except when the dried residue is to be subjected to the diffusion process.

It is obvious that when only fifty to sixty per cent. of the juice is primarily extracted from the cane a larger quantity can be put through mills of a given capacity, perhaps double the amount that could be passed through the mills in the same time when the extraction of the whole proportion of available juice is attempted. The same holds true in regard to the dried cane residue; that is to say, twice the usual amount can be profitably passed through either the mills or the diffusion batteries, it being understood, of course, that in the former case the residue is thoroughly saturated with water while undergoing the milling treatment.

A very important feature of this invention, which materially reduces the cost of known processes, is the fact that the quantity of the juice expressed from the cane in the first step of the process, is in a higher state of purity, and in a more concentrated form, than where the entire quantity of the juices is extracted from the cane in the usual milling process. The purity results from the fact that a very large proportion of the albuminoids and associated impurities remains in the cane residue; it is more concentrated because no water has been added, as is usually done in roller presses, to facilitate the extraction of the sucrose in the juice. As stated above, the drying of the partially expressed cane, because of the coagulation of the albuminoids and solidification of the gummy and waxy matters, decreases the solvent effect of water for these substances. It will, therefore, be observed that the defecation and subsequent treatment of the juices are quite simplified, both with respect to the juice expressed in the first step of the process and the juice extracted from the cane residue.

It will be seen from the above that the process of evaporation of cane juice may, by this means, be continued throughout the year on an efficient and economical scale. This results largely from the fact that about fifty to sixty per cent. of the total amount of juice in the cane is extracted in the first, and the equivalent of the remainder, in water and sucrose, in the last step of the process. It is to be understood, however, that the invention is not limited to the extraction of this precise proportion of the total amount of juice from the cane before drying the residue. This specified proportion of extraction is preferable because it is found that the evaporating apparatus, when double the amount of cane is passed through the present mills, can readily take care of this quantity of juice. It will be evident, however, that more or less of the juice can be extracted at this stage of the process, without departing from the spirit of the invention.

It may be stated that it is old in the art to shred or slice cane, as well as the sugar beet, preparatory to extracting the sucrose therefrom. This is invariably done in those factories in which the diffusion process is practised. It has also been proposed to shred or slice both cane and sugar beets and dry the same before subjecting them to the processes for recovering the sucrose, and it has also been proposed to subject bagasse containing a certain proportion of sucrose to special and further treatment for the recovery of this sucrose from the same. My process, however, differs from all or any combination of these processes and is distinctive in that about one-half of the juice is extracted from the cane in the first step and immediately treated, while the cane residue is then dried, and baled, stored or otherwise preserved in convenient form to be subsequently treated for the extraction of the remaining sucrose therefrom. This process, so far as I am aware, is distinctly new and results in great economy. An important advantage results also from primarily expressing a substantial proportion of the juice and then drying the cane, inasmuch as the moisture expressed from the cane does not have to be eliminated in the drying process for the preservation of the cane residue. Moreover, as explained above, a larger total percentage of sucrose can be obtained from the cane by this process. Where about ninety five per cent. only could be obtained heretofore by the milling process, an additional two per cent. or more may be recovered by my improved process, particularly so when the cane residue is subjected to the diffusion process.

It is understood by those skilled in the art that sugar cane or beet pulp cannot be dried on a large or commercial scale without some deterioration. My invention therefore has also for its object to eliminate the cause for this loss as much as possible by deoxidizing the air to a certain extent which is used for the drying medium. This is to say, by removing the oxygen as nearly as practicable which is contained in the air by causing the same to flow preferably through a fire or furnace by which the oxygen combines with the carbon and is thus eliminated. It is also advisable to pass the said air or gases from the furnace through a dust catcher in order that the free carbon and cinders may be eliminated or segregated before the gas comes into contact with the sugar pulp. The final residue of the cane may be used for fuel, or material for paper pulp, or any other known purpose.

I claim:

1. The method of increasing the working

period and capacity of sugar mills which consists in first extracting a part of the sugar contained in the sugar beet or cane by means of pressure, dehydrating the pulp by means of a drying fluid from which the oxygen has been partly removed, and subsequently extracting sugar from the dried pulp.

2. The method of manufacturing sugar which consists in reducing the beet or cane to pulp, separating a portion of the water or fluid from the pulp, extracting the sugar from this fluid, drying the pulp with a deoxidized medium as nearly as practicable, and then extracting sugar from the dried pulp by saturation and diffusion.

3. In the method of manufacturing sugar which consists in reducing the sugar beet or cane to pulp, separating a portion of the fluid from that pulp, extracting the sugar from the fluid, dehydrating the pulp for preservation, subsequently extracting the sugar from the pulp and again dehydrating said pulp for preservation.

4. The herein described process of recovering the sucrose from sugar cane, which consists in partially extracting the juice from the freshly cut cane and treating the cane residue to preserve it in a condition in which it may be stored and its sucrose extracted at a subsequent period of time.

5. The herein described process of extracting sucrose from sugar cane, which consists in partially extracting the juice from the freshly cut cane, drying and subsequently extracting the remainder of the sucrose from the cane residue.

6. The herein described process for extracting sucrose from sugar cane, which consists in partially extracting the juice from the cane by the usual mechanical appliances, drying and storing the cane residue and subsequently extracting the remainder of the sucrose from the cane residue by the diffusion process.

7. The herein described process of extracting sucrose from sugar cane, which consists in extracting approximately 50% of the juices contained in the cane when cut, drying and storing the cane residue for future use and extracting at a subsequent time the remainder of the sucrose from the cane residue.

8. As a new article of manufacture, a sugar-producing material, composed of a vegetable residue from which a part of the original juice has been extracted, dried and in condition to withstand deterioration or decomposition.

9. As a new article of manufacture, a sugar-producing material composed of a vegetable residue from which the original juice has been partially expressed; dried and treated so as to be indefinitely preserved.

10. As a new article of manufacture, a sugar-producing material composed of cane residue from which the original juice has been partially extracted, dried, and treated so as to preserve the sucrose therein in condition for recovery.

LOUIS GATHMANN.

Witnesses:
ELMA GATHMANN,
GEO. M. COPENHAVER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."