

# UNITED STATES PATENT OFFICE.

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## PROCESS OF MANUFACTURING SUGAR.

991,505.

Specification of Letters Patent.

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No Drawing.

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*To all whom it may concern:*

Be it known that I, WILLIAM HENNING, a  
citizen of the United States, residing at  
Lahaina, in the Island of Maui and Terri-  
5 tory of Hawaii, have invented certain new  
and useful Improvements in Processes of  
Manufacturing Sugar, of which the follow-  
ing is a specification.

My invention relates to the manufacture  
10 of sugar from cane.

The object of my invention is to obtain  
from the sucrose in juice extracted from  
cane a maximum production of dry sugar  
with no waste molasses.

15 The manufacture of sugar, as at present  
practiced is attended with certain losses in  
so-called waste molasses. Whatever the sys-  
tem of boiling, either for one grade of sugar  
or more, the last drained off molasses from  
20 the last product in the centrifugals is consid-  
ered waste molasses; and the sugar con-  
tained therein is a total loss to the manufac-  
turer. This loss is universally acknowl-  
edged and there has been, heretofore, no way  
25 or means for the recovery of this sugar and  
the prevention of this loss, except by special  
chemical process, by forming a solid combi-  
nation known as saccharatis, which process  
has its disadvantages and is not used in  
30 cane-sugar factories.

By the term "molasses" is meant the final  
syrup, the sugar content of which is from  
45% to 50% of the weight of the molasses,  
and cannot be obtained by further concen-  
35 tration and under the best known and most  
favorable conditions for the formation of  
crystals. It is, therefore, declared a loss.  
Besides the financial loss, waste molasses is  
one of the most troublesome matters con-  
40 nected with a sugar factory and considerable  
labor and money is required for its removal.  
By my process I am able to prevent this loss.  
There is no waste molasses for all sugars,  
and at least 98% of the sucrose contained in  
45 the juice is recovered, allowing 2% for loss  
in clarification, filtration and filter processes,  
and the product is made into a dry, good,  
sugar polarizing at about 97°; which polar-  
ization could be lowered or raised according  
50 to the wishes or the skill of the boiler.

The initial steps of my process do not dif-  
fer from the ordinary way of working in  
any sugar factory. The juices from the mill  
are limed, clarified and filtered as usual.

Then the juice is condensed by evaporation 55  
and is boiled, care being taken to get very  
good and well grained sugar. The boiling  
being finished and the mixing completed,  
there then results from the drying operation,  
dry sugar and molasses. All this is usual 60  
practice. Now, instead of boiling this mo-  
lasses over again and producing No. 2 sugar;  
and doing the same with successive molasses  
residues to produce No. 3, or further sugars,  
and considering the final residue at whatever 65  
stage, as waste, I take this molasses result-  
ing from the first strike, and after cleaning  
it make a division of it, preferably an equal  
division. By cleaning I mean the usual  
blowing into the molasses of steam to pro- 70  
duce agitation so that the foreign matters  
will be brought to the surface and may be  
skimmed off, and all fine or minute grains in  
the molasses will be broken up and dis-  
solved; milk of lime or soda solution being 75  
added if acidity is found. I then dilute with  
water one of the parts so taken to reduce it  
to the specific gravity of the syrup, that is,  
water is added to said part until it is diluted  
to the density of the syrup, say, at least to 80  
degrees Brix or 35 degrees Baumé. Then,  
after the second strike of juice is well  
formed and boiled as far as possible, so as to  
allow room for the molasses, I put with it,  
the diluted portion of the molasses, and 85  
thereupon boil the whole mass to a finish,  
mix it and dry it as was done in the first in-  
stance. The molasses from this drying is  
similarly divided, and one part diluted, and  
added to the next strike when its sugar is 90  
well formed and so on.

What is meant by the sugar being well  
formed and room being left for the molasses,  
is that it is customary at the beginning of a  
strike to fill the pan only about half full 95  
with syrup and to boil this down until it  
commences to grain. When the proper  
amount of grain has formed, (a point  
known to and controlled by the operator),  
more syrup is drawn into the pan, first in 100  
small charges, and later in larger ones, ac-  
cording to the wish or skill of the operator  
until the pan is filled to its capacity, where-  
upon the massecuite is boiled to a certain  
solidity, ready to be discharged. At this 105  
point the sugar is well formed and its grains  
well developed, and it is at this time that the  
diluted molasses is to be added; but as un-



der the ordinary practice the pan would be filled at this time, it is necessary, in my process, in order to add the diluted molasses, that the pan be not filled, so as to allow room for the amount of diluted molasses intended to be drawn in. The remaining part of the molasses in each successive instance is boiled to so-called "proof" or "string" (an expression known to the art), crystallized in due course of time (say about six days) and is then dried, resulting in sugar and molasses. This sugar is melted and placed with the so-called first sugar of the strike which may then be in progress, to which has also been added a diluted part of the molasses, and the whole mass is boiled to a finish, mixed and dried. All the molasses from the crystallized sugar formed as just stated from a part of a previous molasses is diluted, reclarified and filtered, and after the strike of sugar is almost finished and all syrups in the masse-cuite boiled up as well as possible, so that the grains of sugar are well developed, this diluted molasses is slowly supplied to and allowed to mix with the almost finished sugar; and all sugar in said molasses will grow on the grains found in the pan. After getting it as solid as required, it is mixed and dried as well as the preceding ones, and there will be found a perfectly even and good sugar and no accumulation of impurity or non-sugars whatsoever—no loss, no waste molasses,—doing away with all coolers and other containers for after products. This process will be continued right on the same way. There will be always so much molasses boiled into the crystallizer as may be dried out, so that there is a strict circulation of the masses and no accumulation whatever. The main benefit claimed by this process is simplicity in its working, less boiling, less containers, and, most important of all,—the sugars in the juice except as already mentioned, the ordinary losses by clarification, settling and loss in the mud presses, will be recovered. By my process the accumulation of impurities is avoided. There is no point through the whole process where the accumulations are so great as to hinder or even to interfere with the sucrose in either juice or molasses, granulating or graining on the grains it comes in contact with. Long and careful experiments have proved that the massecuites from the sugar remain of the same purity; also that the molasses from the sugars will be found the same, strike after strike, so that there is no reaction of impurities interfering with the boiling or the forming of the crystals and the final output of the sugars.

The main benefits gained by this process

are (1) that the work is far more simple, requiring only two boilings; (2) no coolers or receivers for after products, as there is no waste molasses and therefore a gain of sugar from 5 to 6% more than is recovered in any process known.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:—

1. That step in the process of the manufacture of sugar which consists in adding molasses residue from one strike, diluted to a syrup, to a second strike when the sugar of the latter is almost finished and its grains well developed.

2. In the process of the manufacture of sugar, those certain steps which consist in adding molasses residue from one strike, diluted to a syrup, to a second strike when the sugar of the latter is almost finished and its grains well developed, and then carrying the mass to a finish.

3. In the process of the manufacture of sugar, those certain steps which consist in adding molasses residue from one strike, diluted to a syrup, to a second strike when the sugar of the latter is almost finished and its grains well developed, then carrying the mass to a finish, then adding molasses residue from said finishing step, diluted to a syrup, to a succeeding strike when the sugar of the latter is almost finished and its grains well developed, then carrying the mass to a finish, and so forth.

4. The process of the manufacture of sugar which consists in converting the juices into dry sugar and residual molasses; dividing the molasses into two parts; diluting one part with water to a syrup; converting the other part into dry sugar and residual molasses; diluting said last named molasses with water to a syrup; adding both of said diluted syrups to a succeeding strike of juices at a time when the sugar of said strike is almost finished and its grains well developed; melting and adding the dry sugar of a second part of the residual molasses to a succeeding strike at the same time that diluted molasses is added; finishing the mass by converting it into dry sugar and residual molasses; and continuing the operation by adding to successive strikes, at the times stated, the dry sugar and diluted molasses from residual molasses previously produced.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM HENNING.

Witnesses:

L. WEINZHEIMER,  
F. STARK.