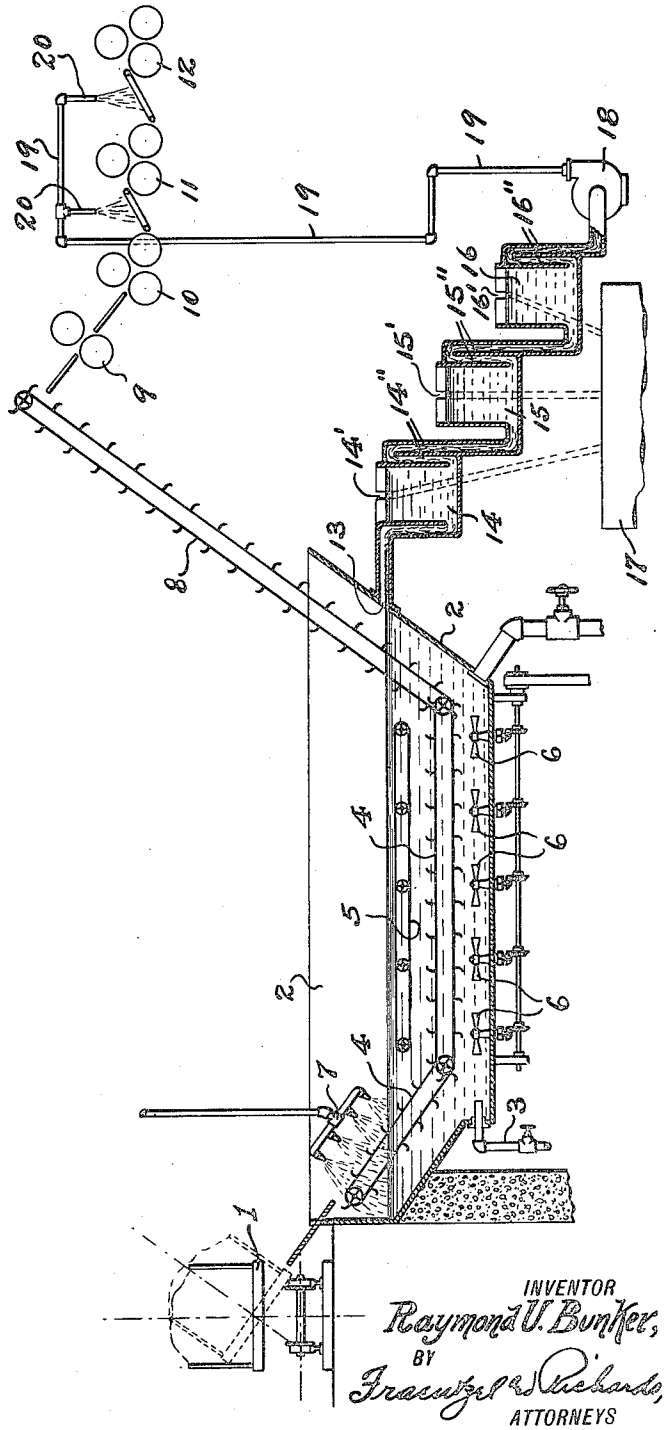
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PROCESS OF RECOVERING WAX FROM SUGAR CANE.

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1,309,999. Patented July 15, 1919.



UNITED STATES PATENT OFFICE.

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PROCESS OF RECOVERING WAX FROM SUGAR-CANE.

1,309,999. Specification of Letters Patent. Patented July 15, 1919.

Application filed February 27, 1919. Serial No. 279,646.

To all whom it may concern:

Be it known that I, RAYMOND U. BUNKER, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Processes of Recovering Wax from Sugar-Cane; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

The present invention relates, generally, to an improved method or process of recovering wax from sugar cane; and the invention has reference, more particularly, to a novel method of treatment or succession of process steps which may be employed incidental to the general well-known methods of manufacturing sugar from sugar cane, whereby a profitable by-product, in the form of a vegetable wax, may be cheaply and efficiently obtained.

It is a well-known fact that a free wax is present, to a more or less degree, in all varieties of sugar cane. This wax does not form in the interior structure of the sugar cane stalk, nor in combination with the gums, sap or juices of the sugar cane, but does occur as an excretion on the outer surface of the stalk, extending in the form of a thin film of varying thickness over almost the entire exterior of the stalk, but more especially in the vicinity of the nodes or joints of the mature stalk. The wax so distributed may be mechanically separated from the stalk by scraping the same away with a sharp instrument, such as a knife-blade, but, of course, such method of separation, for commercial purposes, is impractical.

Heretofore some attempts have been made to recover this sugar cane wax from the waste products of the cane after all possible sugar has been extracted. Such attempts at wax recovery will be best understood from the following brief description.

The sugar cane, after being chopped down, topped and stripped of leaves, is cut into three or four foot lengths, and made up into bundles. This work being done by hand in the fields. The bundles of cane are then conveyed to the factory, and usually loaded upon a conveyer or "conductor" which elevates the cane to the chute through which it is fed to the crusher rolls. In modern milling practice, the cane is so thoroughly crushed that the trash or "bagasse" remaining is almost pure cellulose and water, everything else present, including the cane wax, having been expressed into the mill juice. After leaving the mills the cane juice is limed or otherwise chemically treated, and then heated in various forms of apparati to 212 degrees to 220 degrees Fahrenheit, and is then allowed to settle in large, relatively shallow, vats, known as "defectors". The settling process, as carried on in the defectors, results in a more or less complete separation of the so-called impurities from the cane juice, part of said impurities rising to the surface of the juice in the form of a scum blanket, and the balance gravitating to the bottom of the defector in the form of sludge or mud. After a reasonable time has been allowed for the accomplishment of the separation of impurities from the juice, in the manner above stated, the relatively clear juice is decanted or drawn off, and the scum and sludge collected and passed through a filter press, whereby any remaining sugar juice or liquor is expressed therefrom, leaving a more or less solid cake of matter, known as a "press-cake." This press-cake contains the bulk of the organic substances and impurities that accompany the sugar cane from the fields into the mill, among which substances will be found the above described sugar cane wax. It is, therefore, from the press-cake that it has been heretofore attempted to recover said sugar cane wax, the process of recovery used being to leach the press-cake with benzene to separate the wax therefrom. Such process, however, is not entirely satisfactory, and does not assure a substantially complete recovery of the wax, and, furthermore requires the carrying of the wax, with other impurities, into the sugar cane juice, which is not satisfactory.

I have discovered that the melting point of sugar cane wax is approximately one hundred and eighty degrees Fahrenheit; therefore, if sufficient heat is suitably applied at a temperature above one hundred and eighty degrees Fahrenheit, but below a temperature at which either the wax or sugar juice will be injured, the wax will

be melted and thus caused to separate itself from the surface of the cane stalk, and may be recovered as a by-product, preliminary to the main process of sugar juice extraction, and without injury to the sugar cane, and without substantially lessening the sugar content of the cane. To this end, therefore, I have discovered and devised the following novel method or process of treatment, whereby I recover the wax before the cane enters upon the milling process, so that not only do I recover greater quantities of the wax than is possible to recover by any other process, but incidentally I aid the main process of sugar extraction by removing at the very start one of the cane impurities which gives more or less trouble during such main process.

Referring to the accompanying drawing, I have illustrated therein, in a graphic or diagrammatic form, an arrangement of apparatus which will efficiently serve to carry on the several steps of my novel method or process. I do not wish to be understood, however, as confining myself to the specific forms or arrangements of such apparatus, since I aim to cover by Letters-Patent the combinations and succession of process steps involved, regardless of the particular mechanical aids by which said steps may be carried on.

In the main my novel process consists in the melting of the wax from the exterior of the cane stalks by means of a bath of hot water, through which the cane stalks are passed, before the same are delivered to crushing and macerating mills, then removing the wax from said hot water, and then delivering the hot water previously utilized as a bath to the macerating mills to carry to the sugar juice expressed by said mills any sugar leached from the cane stalks incidental to their passage through the hot water bath.

Having reference again to the accompanying drawing, my novel process consists, more in detail, in conveying the cane stalks from the fields in wagons or cars 1 to the sugar factory, and then dumping said cane stalks from the wagons or cars 1 into the receiving end of a tank 2. Said tank 2 is continuously supplied with hot water at proper temperature through a suitable supply pipe 3. Said tank 2 is provided with a submerged conveyer mechanism 4, running lengthwise therethrough, adapted to convey the cane stalks from the receiving end of the tank through the same to the discharge end thereof. The speed of the conveyer mechanism 4 shall be so regulated, that the travel thereof from end to end of the tank will allow sufficient time to permit the heat of the hot water to effectively attack and melt off or remove the wax from the surfaces of the cane stalks. Spaced above the submerged conveyer mechanism 4 is an endless apron or other suitable guard mechanism 5, whereby the cane stalks, as they are carried through the tank 2, are maintained submerged within or immersed beneath the surface of the hot water with which the tank is filled. Preferably a suitable means for agitating the hot water content of the tank 2 should be provided, whereby the movement of the hot water against the surfaces of the cane stalks will more readily wash off the melted wax from its adhering relation to the stalks. Such means may consist of a suitable arrangement of mechanically rotated paddles or agitators 6. The conveyer mechanism 4 should be of a suitably open construction, so that any clay, dirt, grit or other foreign substance of greater specific gravity than water, and which may adhere to the cane stalks, may be easily washed off by the action of the water, and then sink to the bottom of the tank, from whence it may be cleaned out in any manner found desirable. In addition to submerging the cane stalks in the hot water content of the tank 2, hot water may be also directly applied to the cane stalks as a vigorous spray or wash as the cane stalks are dumped from the cars 1 into the tank 2, a suitable spraying mechanism 7 being provided for this purpose. Such spray or wash will more quickly dislodge the more or less loosely clinging soil, clay, dirt or grit from the cane stalks, so that as the same become finally submerged in the water content of the tank, an immediate and direct attack of the water upon the wax films of the cane stalks can occur. The water in the tank 2 should be constantly maintained in properly heated condition, either by means of submerged steam coils, or by means of steam directly vented into such water content, so that a temperature approximating two hundred and twelve degrees Fahrenheit is attained and maintained. Arranged at the discharge end of the tank 2 should be provided a suitable elevator conveyer 8, which receiving the cane stalks from the submerged conveyer mechanism 4, will remove the same from the tank, and convey the same to the sugar mill apparatus, comprising the crusher rolls 9, and the train of macerating mills 10, 11 and 12. The wax liberated from the surfaces of the cane stalks while the latter are submerged in and passed through the hot water content of the tank 2, being of less specific gravity than water, will rise to the surface, and form a film thereon. The apron or guard 5 must be of open structure to permit the wax to rise therethrough. The film of wax may be removed from the surface of the water content of the tank 2 by mechanical skimming devices, or otherwise, but I prefer to remove the same by overflowing the tank 2 into a separator mechanism in the nature of a battery of grease traps, since the overflowing

water is valuable for three reasons, to wit; first, for the film of wax floating off therewith; second, for the sugar in solution that it may contain; and, third, for the purpose of providing a supply of "inbibition" or "maceration" water for delivery to the maceration mills. To this end the tank 2 is provided with a suitable overflow discharge opening 13 at its discharge end. Connected in communication with said discharge opening 13, so as to receive the overflow from the tank 2, is a series of interconnected grease traps or separators 14, 15 and 16. These traps or separators operate as follows:—The hot water overflowing from the tank 2, and bearing with it a film of wax floating thereon, enters the trap 14 and gradually fills the same. The trap 14 is provided with a surface outlet 14′, so that the wax accompanying the water rises to the surface of the trap tank, and is permitted to flow off and away from the surface of the water therein through said surface outlet 14′. As the cross sectional area of the surface outlet 14′ is much less than that of the inlet to the trap tank 14, the latter will continue to fill even after the surface outlet begins to vent the wax. As soon as the trap tank 14 is full, the siphon outlet 14″ will operate so that the water is emptied out of the trap tank 14 from the bottom thereof, and all the content will pass out through the siphon outlet, except the wax that has overflowed through the surface outlet 14′. Since the floating layer or film of wax is never fully discharged through the siphon outlet 14″, a substantial layer of the melted wax will accumulate, and a great portion of this layer will run off through the surface outlet 14′ each time the trap fills. The traps 15 and 16 having respectively surface outlets 15′ and 16′, and siphon outlets 15″ and 16″, are connected in series with the trap 14, the wax will be discharged practically free of water, and the water finally discharged through the siphon outlet 16″ practically free from wax. Means for maintaining the water, flowing through the traps, at a proper heat must be provided, so that the temperature of the water does not fall much below two hundred degrees Fahrenheit, whereby the wax is maintained in a free state of flux. The wax discharged from the traps 14, 15 and 16 may be collected in any suitable way, and preferably finally settled in a suitable receptacle 17.

It is customary in modern sugar cane milling practice to utilize a quantity of hot water, varying from twenty-five to seventy-five per cent. of the weight of the cane, in the form of a spray applied to the crushed cane or bagasse, as the same is conveyed from one set of macerating rolls to another. This water is denominated "inbibition" or "maceration" water, and is applied to the cane or bagasse between the succession steps of the multiple grindings to which the latter is subjected, in order to dilute the juice in the cells of the cane stalks as these cells are ruptured, and free the sugar which is not entirely expressed by the grinding action. My process fits in admirably with this practice, since the hot water required for this purpose, may be supplied from the discharge of the wax traps or separators, after having served its purpose in melting the wax from the cane stalks in the tank 2, and by means of a suitable pump 18, may be propelled through suitable piping 19 to spray nozzles 20 properly located relative to the macerating mills, so as to be discharged on the cane or bagasse passing through the mills. This practice is also valuable, in that any sugar leached out of the cane while in the tank 2, and brought into solution with the water discharged from the tank 2 and wax traps or separators, will be delivered without loss to the main juice collecting tank of the factory, by reason of the use of such water as inbibition or maceration water.

From the above description it will be quite apparent, that my novel process provides a highly efficient method of wax recovery without loss of any of the sugar content of the cane stalks, and, furthermore, that my novel process steps fit in so well with the general process of sugar extraction, that such general process itself is incidentally improved by reason of the fact, that substantially all of the surface impurities (soil, dirt, grit, etc.,) accompanying the cane stalks to the factory are first removed, together with the desired wax, before the cane is crushed and macerated, so that the defacating process is rendered much more rapid and absolute in cleansing the expressed juices from undesired impurities.

I claim:—

1. A process of recovering wax from sugar cane consisting in submerging the cane stalks in a tank of hot water at a temperature sufficient to melt the wax from the surfaces of the cane stalks, agitating the hot water in the tank around the cane stalks, allowing the wax liberated from the cane stalks to collect on the surface of the water in the tank, overflowing said water with the collected wax into separators to remove the wax from the water, discharging the cane stalks freed from wax for delivery to cane crushing and macerating mills, and then delivering the hot water from said separators to said cane macerating mills.

2. A continuous process of recovering wax from sugar cane consisting of flowing hot water at a temperature sufficient to melt the wax from the surfaces of the cane stalks through a tank, delivering cane stalks into one end of said tank, propelling cane stalks

through said tank and submerged in the hot water flowing therethrough, allowing the wax liberated by the hot water to collect as a film on the surface of the hot water, removing the cane stalks from the opposite end of said tank, overflowing said tank from its water surface level to carry off the water and the collected film of wax, and then delivering said overflow of water and wax to separating means for removing the wax from the water.

3. A process of recovering wax from sugar cane consisting of flowing hot water at a temperature sufficient to melt the wax from the surfaces of the cane stalks through a tank, propelling cane stalks through said tank and submerged in the hot water flowing therethrough, allowing the wax liberated by the hot water to collect as a film on the surface of the hot water, overflowing said tank from its water surface level to carry off the water and the collected film of wax, delivering said overflow of water and wax to separating means for removing the wax from the water, discharging the wax freed cane stalks from said tank and conveying the same to cane crushing and macerating mills, and then delivering the hot water flowing from said separator means to said cane macerating mills.

4. A continuous process of recovering wax from sugar cane consisting of flowing hot water at a temperature sufficient to melt the wax from the surfaces of the cane stalks through a tank, delivering cane stalks into one end of said tank, propelling cane stalks through said tank and submerged in the hot water flowing therethrough, agitating the hot water in contact with said cane stalks, allowing the wax liberated by the hot water to collect as a film on the surface of the hot water, removing the cane stalks from the opposite end of said tank, overflowing said tank from its water level surface to carry off the water and the collected film of wax, and then delivering said overflow of water and wax to separating means for removing the wax from the water.

5. A process of recovering wax from sugar cane consisting of flowing hot water at a temperature sufficient to melt the wax from the surfaces of the cane stalks through said tank, propelling cane stalks through said tank and submerged in the hot water flowing therethrough, agitating the hot water in contact with said cane stalks, allowing the wax liberated by the hot water to collect as a film on the surface of the hot water, overflowing said tank from its water surface level to carry off the water and the collected film of wax, delivering said overflow of water and wax to separating means for removing the wax from the water, discharging the wax freed cane stalks from said tank and conveying the same to cane crushing and macerating mills, and then delivering the hot water flowing from said separating means to said cane macerating mills.

In testimony that I claim the invention set forth above I have hereunto set my hand this 24th day of February, 1919.

RAYMOND U. BUNKER.

Witnesses:
GEORGE D. RICHARDS,
ADOLPH HANSEN.