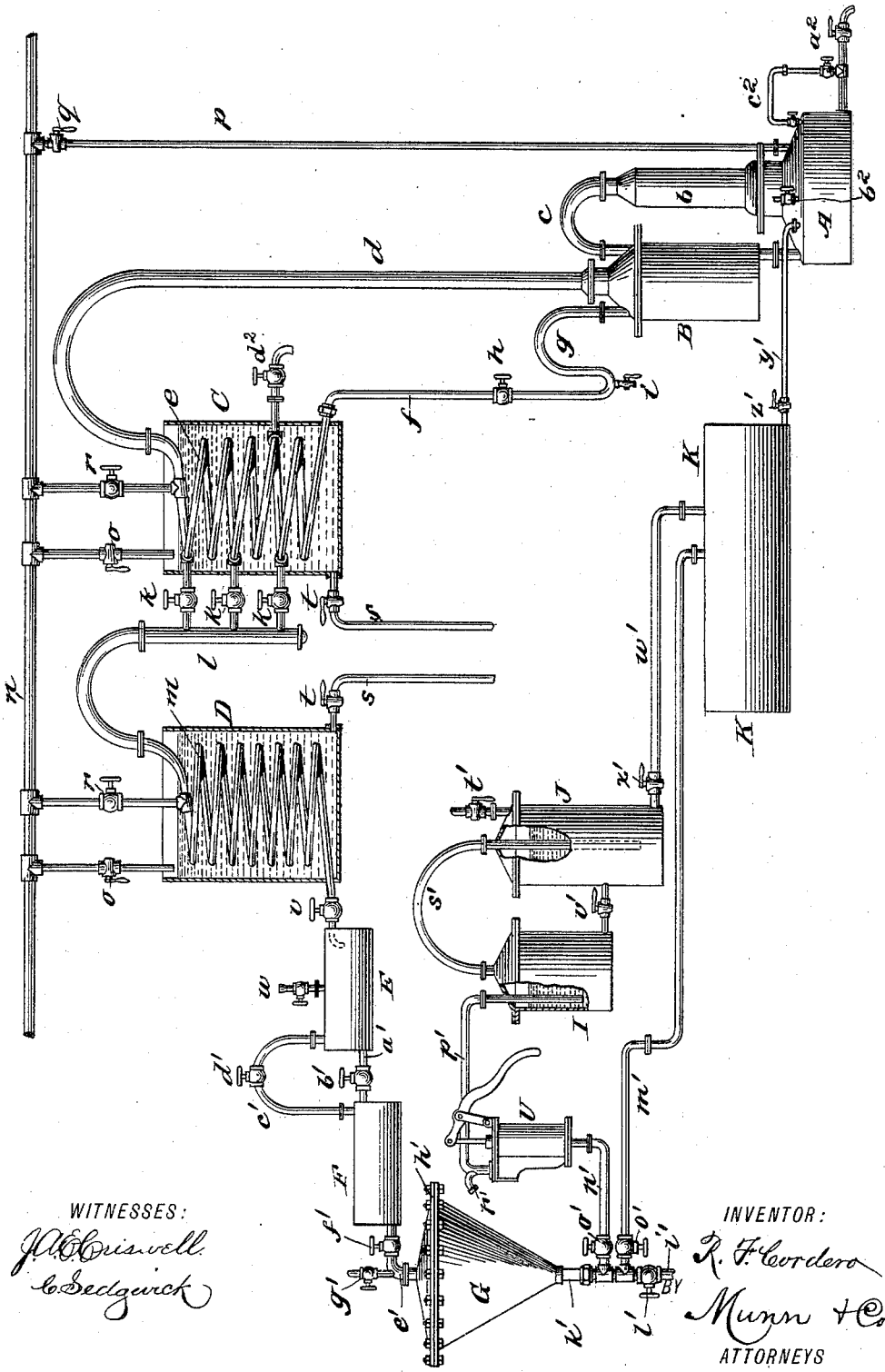
(No Model.)

R. F. CORDERO.

APPARATUS FOR WASHING SUGAR.

No. 456,799. Patented July 28, 1891.



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APPARATUS FOR WASHING SUGAR.

SPECIFICATION forming part of Letters Patent No. 456,799, dated July 28, 1891.

Application filed August 9, 1890. Serial No. 361,510. (No model.)

To all whom it may concern.

Be it known that I, RAMÓN FEBRES CORDERO, of Rubio, section of Tachira, State of Los Andes, United States of Venezuela, South America, have invented a new and useful Improvement in Apparatus for Washing Sugar, of which the following is a full, clear, and exact description.

This invention relates to the washing of sugar by alcohol; and it consists in apparatus of special construction for the purpose, whereby the same alcohol that has been used for washing one charge of sugar is retained or made to circulate within the apparatus for washing a succeeding charge or charges of sugar with but little or no waste of the alcohol, substantially as hereinafter described, and more particularly pointed out in the claims.

Reference is to be had to the accompanying drawing, forming a part of this specification, in which the figure represents a view in perspective of an apparatus for washing sugar embodying my invention.

A indicates a boiler surmounted by a chest *b*, in which, by a suitable application of heat, the molasses extracted from the sugar, diluted with the alcohol and water used in the washing of the sugar by the alcohol, is boiled.

B is a trapping-chamber connected with the chest *b* by a pipe *c*, by which the molasses while boiling is prevented from entering or rising up a pipe or uptake *d* from the trap, which pipe *d* conveys the alcoholic and watery vapors to the coil *e* of the first one C of a pair of stills or condensers C D. This coil or worm *e*, with the upper end of which the pipe *d* connects, is joined at its lower end to a pipe *f*, having a trap-like bend *g* below and provided with cocks *h i* for returning the alcohol of low grade to the trap-like vessel B.

The worm *e* of the condenser C is connected at different points in its height by cocks *k* with a pipe *l*, that connects with the upper end of the worm *m* of the condenser D to allow the alcohol of high grade to pass to said worm *m*. The condensers C D are charged with cold water outside of their coils to effect the necessary condensation of the alcohol in both coils. The water is supplied to said condensers by a pipe *n* and cocks *o o*, which pipe is further used to supply the boiler A with water by a pipe *p*, controlled by a cock *q*, and to admit water to the coils *e m*, when required, by cocks *r r*. The bottoms of the condensers C D are fitted with outlet-pipes *s s*, controlled by cocks *t*, for discharging the water exterior of the coils in said condensers, when necessary.

E is a receiver for the alcohol from the coil *m* of the condenser D on opening a cock *v* for the purpose. This receiver, which is provided with an air-escape hand-valve *w*, is connected at its bottom by a pipe *a'*, controlled by a cock *b'*, with the upper portion of a receptacle F, which provides for the discharge of the alcohol from the receiver E into it, the cocks *v* and *b'* regulating the flow, and an air-pipe *c'*, having a cock *d'*, providing for the passage of air between the two vessels E F.

G is a conically-shaped vessel, into which the sugar to be washed by the alcohol is placed and which receives its supply of alcohol from the receptacle F by means of a pipe connection *e'* between them, provided with a cock *f'*, which regulates the flow of the alcohol, and further provided with a cock *g'* for admitting cold or hot air to make the operation of washing the sugar more or less rapid.

The sugar-washing cone or vessel G is fitted with an air-tight cover *h'*, which may be fastened down by screw-bolts. At the lower end of said vessel is a discharge-tube *i'*, having a glazed upper section *k'* for inspecting the washing process while in progress. This discharge-tube *i'* has a lower cock *l'* for removing all impurities from the sugar-washing cone G when cleaning it, and said tube *i'* is connected above said cock with pipes *m' n'*, having cocks *o'*. The one of these pipes *m'* serves, on opening its cock *o'*, to convey the molasses produced in washing the sugar by the percolation of the alcohol through the mass in the cone G to a tank K, and the other one *n'* of said pipes connects with a suction-pump U, that when the cock *o'* in said pipe is opened draws upon the cone G to extract the air or vapor charged with alcohol and by a discharge-pipe *p'* to deliver the same to a receptacle I to be washed. Applied to the discharge-pipe *p'* is an odor-detector *r'*, to which the nose may be applied to ascertain whether the alcohol has or has not been sepa-

rated from the sugar. At the top of the washer I, and connecting it with another like receptacle J, and dipping down into the latter is a pipe s' for receiving the air from which the alcohol has been separated, and applied to the receptacle J is a cock t' for allowing the air separated from the alcohol to escape into the atmosphere and keep the outside air from entering when the apparatus is not at work. A cock connection v' serves to pass deposited matter in the receptacle or washer I to the receptacle J, and w' is a pipe provided with a cock x' for discharging the same into the tank K. A pipe y' from the tank K, controlled by a cock z', delivers the molasses collecting in the tank K into the boiler A. Said boiler is fitted with a discharge-cock a^2 for the emptying of the molasses and all impurities from it, also with a cock b^2 for the discharge of air from the boiler when the latter is being charged, and with a gage c^2, having the usual cocks for ascertaining the condition of the charge in the boiler at any time.

The operation of the apparatus is as follows: The cone or sugar-washing vessel G is first filled with the sugar to be washed, pressure being applied to the sugar as the filling proceeds. When said vessel is full it should be covered with a piece of canvas and over this a piece of wire-cloth put, to uniformly distribute the alcohol employed in washing the sugar. The cover h' is then screwed down. Alcohol of about 38° is then passed into the receptacle F by entering it through the cock w of the receptacle E and opening the connection between said receptacles. The cock f' is then opened to discharge the alcohol over and cause it to permeate or percolate through the sugar in the cone until it reaches the glazed upper section of the discharge-tube i'. The cock o' of the pipe m' is then gradually opened, so that, without making the sugar run, the molasses washed out of the sugar will be delivered by the alcohol into the tank K, the opening of the cocks f' and o' being proportioned to effect this. The flow of the alcohol through the sugar is continued until it is seen through the glazed inspecting-section k' of the tube i' that the discharging alcohol contains no more molasses. Then the cocks f' and o' are closed and the air-cock g' and cock o' of the pipe n' opened, so that by means of the pump U the air, cold or hot, admitted through the cock g' is continued to be sucked by said pump until by applying the nose to the detector r no alcohol is smelled. The air thus charged with alcohol extracted by the pump U passes by the pipe p' to the washer or receptacle I, and passing through the water in said receptacle it leaves the alcohol behind and passes by the tube s' down into the second washer or receptacle J to insure a more perfect freedom from alcohol, and from whence, after passing through the water in said receptacle J, it escapes by the cock t' into the atmosphere, entirely freed from alcohol. The sugar may now be taken from the cone G and a fresh charge put in. The water with the retained alcohol is then discharged from the receptacles I J into the tank K on suitably opening the cocks for the purpose, and from thence is run into the boiler A, where the molasses, diluted by the alcohol and water, is subjected to the action of heat, and ascending by the chest b passes to the trapping-chamber B, and in due course is returned again by the pipe y' to the boiler. The vapors ascending by the pipe d to the coil e of the condenser C pass down—that is, those of low graduation—by the tube f and its bend g to the trapping-chamber B, and those of high graduation by either of the cocks k, at will, through the tube l, to the coil m of the condenser D, care being taken before doing this to open the cocks o o and t t, so as to establish a current of cold water through both condensers. The cooled alcohol is passed from the last condenser D to the receiver E, and from thence to the chamber F, the cock d' being opened so as to pass air to the receptacle F, from whence the alcohol is taken, the cocks b' and f' being opened to the cone G, to wash or act again upon the newly-charged sugar therein.

Applied to the worm e of the condenser C is a cock d^2 for ascertaining whether there is any alcohol remaining in the worm of the condenser, and if so the molasses in the boiler A should be emptied, to be used as most convenient, either by fermenting the same or transforming it into sirup.

Steam or other heating medium may be used for getting up the necessary heat in the apparatus.

The operations of washing the sugar and distilling or condensing the alcohol may be kept up in rapid succession, so that when the washing of one charge of sugar is being made the alcohol employed in a preceding washing is separated from the molasses.

By washing the sugar with alcohol much labor will be saved as compared with the ordinary clay process and larger returns than by the usual methods, including the turbine, because the sugar is insoluble in the alcohol, and a better quality of sugar is obtained, inasmuch as alcohol is a better solvent of molasses than water, it having the advantage of not acidulating the sugar, and does not transform the sugar into starch.

The using of the same alcohol over and over again, as my improvement provides for, does away with the great objection heretofore experienced of washing the sugar with alcohol, inasmuch as there will be very little loss of alcohol.

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

1. In an apparatus for purifying sugar with alcohol, the combination, with the closed sugar-receiving cone or vessel having valved air and alcohol inlets at its upper end and a

valved outlet-pipe at its lower end, of an air-suction pump having a valved connection with the said outlet-pipe above its valve, a pipe p', leading from the pump and having a detector r, and a trapping device into which the air is discharged by said pipe p' and provided with a valved outlet for the air, and a tank below and into which said trapping device discharges, substantially as set forth.

2. In an apparatus for purifying sugar with alcohol, the combination, with the closed sugar-receiving cone or vessel having valved air and alcohol inlets at its upper end, and a valved outlet-pipe at its lower end, provided with a glass section k', of an air-suction pump, a valved pipe n', connecting said pump with said outlet-pipe above its valve, a pipe p', leading from the air-pump and provided with a detector r, and a trap into which the pipe p' dips to free the air from alcohol, substantially as set forth.

3. In a sugar-purifying apparatus, the combination, with the sugar-receiving cone or vessel, an alcohol-supply receptacle having a valved connection with the upper end of said cone or vessel, an outlet at the lower end of the cone or vessel provided with a glass section, a boiler in a lower plane than the said outlet, connections between said outlet and boiler, of an alcohol-condensing apparatus above the boiler, a vapor-pipe leading from the boiler to the condenser and provided with a trap between the two, and a valved pipe connecting the condenser with the alcohol-supply receptacle, substantially as set forth.

4. In a sugar apparatus, the alcohol-condensers comprising the two water-vessels C D, the water-supply therefor, a coil of pipe in each tank, a vertical pipe l between the two tanks and connected at its upper end with the upper end of the coil in the tank D, and valved connections k, at different heights, with the pipe l, and the coil in the tank C, substantially as described.

5. In a sugar apparatus, the combination, with the boiler for containing the molasses and alcohol, a dome or chest b on top of the boiler, and the trapping-vessel B, and the curved pipe C, connecting the upper ends of the chest and vessel B, of a condensing apparatus above the trapping-vessel and having a worm e, a pipe d, connecting the upper ends of the vessel B and worm e, pipe $f\,g$, connecting the lower end of worm e and upper end of vessel B, and an alcohol-tank into which the alcohol is delivered from said condensing apparatus, substantially as described.

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