given, which makes the sugar dark, and at others too little, in which case it granulates badly, consequently a large quantity of molasses is produced, and it drains with great difficulty. And with regard to the aforesaid mixture of lime and alum, or saturation of lime and alum, called finings, although I do not claim to have invented that compound, it having been long known; having discovered the important and valuable effects produced by it upon cane juice, I do mean to apply for letters patent to entitle me to the exclusive right to the application of the same to cane juice, for the purposes for which I employ it.

I will now proceed to state the method of preparing the aforesaid mixture called finings, which is as follows: a quantity of alum is melted either in a wooden or copper vessel, with its own weight of water, or thereabouts. A quantity of good well slacked lime, mixed with water sufficiently thin to allow the gross particles, or the lime that has not dissolved, to subside, leaving a kind of milk of lime, or very strong lime and water; this lime is then added to the alum, till the test paper showing acidity, changes colour no longer.

The test paper showing the presence of lime is then tried, to ascertain that lime does not predominate, the mixture being made perfectly neuter is then thrown upon a strainer, and allowed to drain off the water, when it is fit for use.

My invention, or improvement, upon which I claim in these my letters patent, an exclusive privilege, consists in this, my process, or method, herein specified, of purifying and preparing the juice of the cane grown or cultivated in the United States, intended to be converted into sirop, or sugar.

W. A. ARCHBALD.

Specification of a patent for an improvement in the making or manufacturing of Raw or Brown Sugar, from the Cane Juice, or from the sirop made therefrom. Granted to Wm. A. ARCHBALD, Sugar Refiner, of the City of New York, April 19, 1830.

THIS improvement consists in concentrating, or converting the said cane juice into sirop, or sugar, in wooden vessels; which wooden vessels may be made of any convenient shape or size; in preference made of well seasoned white pine, fitted up and arranged in the interior with a copper pipe of a dimension suited to the size of the vessel which may be deemed convenient for the operation; or with a copper or other metallic vessel in the form of a globe, or in any other form calculated to receive and retain steam, and impart the heat thereof to the juice, or liquid, by which it is enveloped. But I do use in preference wooden vessels in the form of tubs, or tanks, of a round shape, hooped with iron, fitted in the interior with one or more rows of copper pipe placed horizontally, either lying close together, or at a small distance from each other, which pipe I do bend in a circular form so as to occupy and fill up the whole of the interior surface of the bottom of the tub, except a small space in the

centre, in which space I do fix a valve with a rod attached thereto, for the purpose of drawing off, or allowing the liquid to escape. This pipe is connected with the steam generator, and fitted with cocks to allow the steam being let on to boil the juice or liquid, and stopt at pleasure; which any engineer, or copper-smith, can arrange.

Now for the purpose of boiling or concentrating the cane juice into sirop, or sugar, I do use three or more of these wooden vessels, or tubs, placed one above the other, on wooden frames, so as to admit of the liquid being conveniently and freely drawn by a cock, or valve, into the lower one, which I do use as a concentrator, the others operating as evaporators. And I do by preference arrange the pipes of the aforesaid concentrator, so that both rows are close together, lying upon the bottom of the tub; while those of the evaporators are raised six or eight inches above the lower one, in order more equally to distribute the heat of the steam in the liquid; the lower end of this pipe I do pass through the bottom or side of the tub, so fixed as to prevent leakage at the hole through which it passes, at the outer end of which pipe, in each tub, I do fix a cock to allow the condensed steam to escape; and I do declare that in order to boil with economy and advantage, I do make use of the same steam that is employed to work the engine, that is to say, I do use steam generated by the same fire that is employed to produce steam for the engine, although steam generated in any way would answer. The aforesaid tubs may be arranged and placed in any way most convenient for operating; and the steam should be of a high temperature, such as is produced from steam of 40 or 50 lbs. to the inch, or upwards; the higher the temperature the more rapid the operation, and the better the effect upon the sugar.

In order to supply the tubs with juice, I do conduct it from the receiver by means of a wooden or other spout; the juice being converted into sugar, is drawn off into a cooler, and then transferred to moulds or hogsheads.

I now proceed to state the advantages to be derived from boiling the cane juice in wooden vessels, instead of, as is now done, in those of metal; and these advantages are, *first*, the cheapness with which they can be made, and the ease and economy with which they can be arranged and set. *Secondly*, their great superiority over metallic vessels in retaining heat, causing a considerable saving of fuel, and the rapidity of boiling resulting from wood being a nonconductor of heat, consequently not allowing any portion of the heat imparted to the liquid from the steam to escape, but confining the whole of such heat to the liquid. *Thirdly*, the absolute impossibility of burning the sugar, which by the ordinary mode of boiling almost invariably occurs, from the heat of the vessel. *Fourthly*, their seldom or never wanting to be renewed, and hardly ever needing to be cleaned, whereas the vessels now used, not only require to be frequently cleaned, at great trouble and loss of time, but often crack, or break, by which the planter is retarded in his operations, and suffers great loss.

I claim under these my letters patent, an exclusive privilege in