(No Model.)

2 Sheets—Sheet 1.

W. LITTLEJOHN.

MODE OF MAKING SUGAR.

No. 250,824. Patented Dec. 13, 1881.

Fig 1.

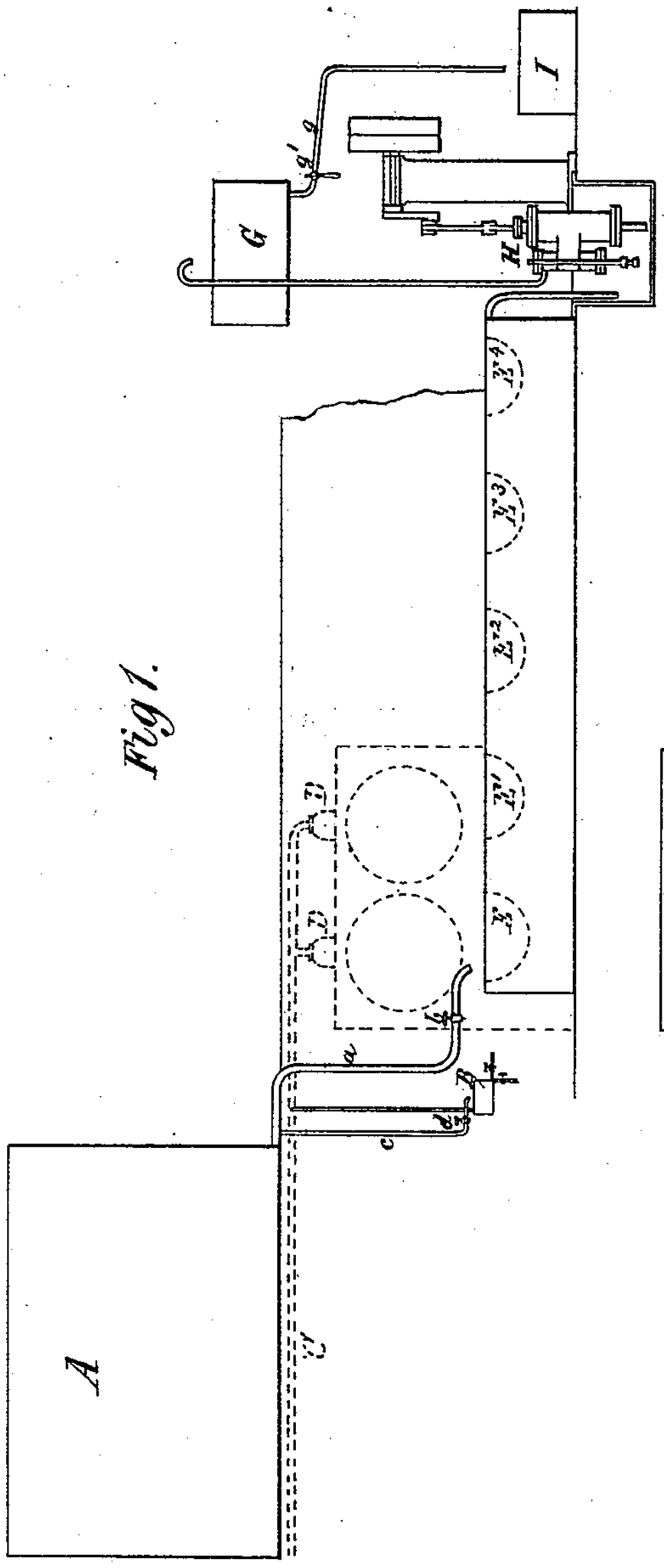
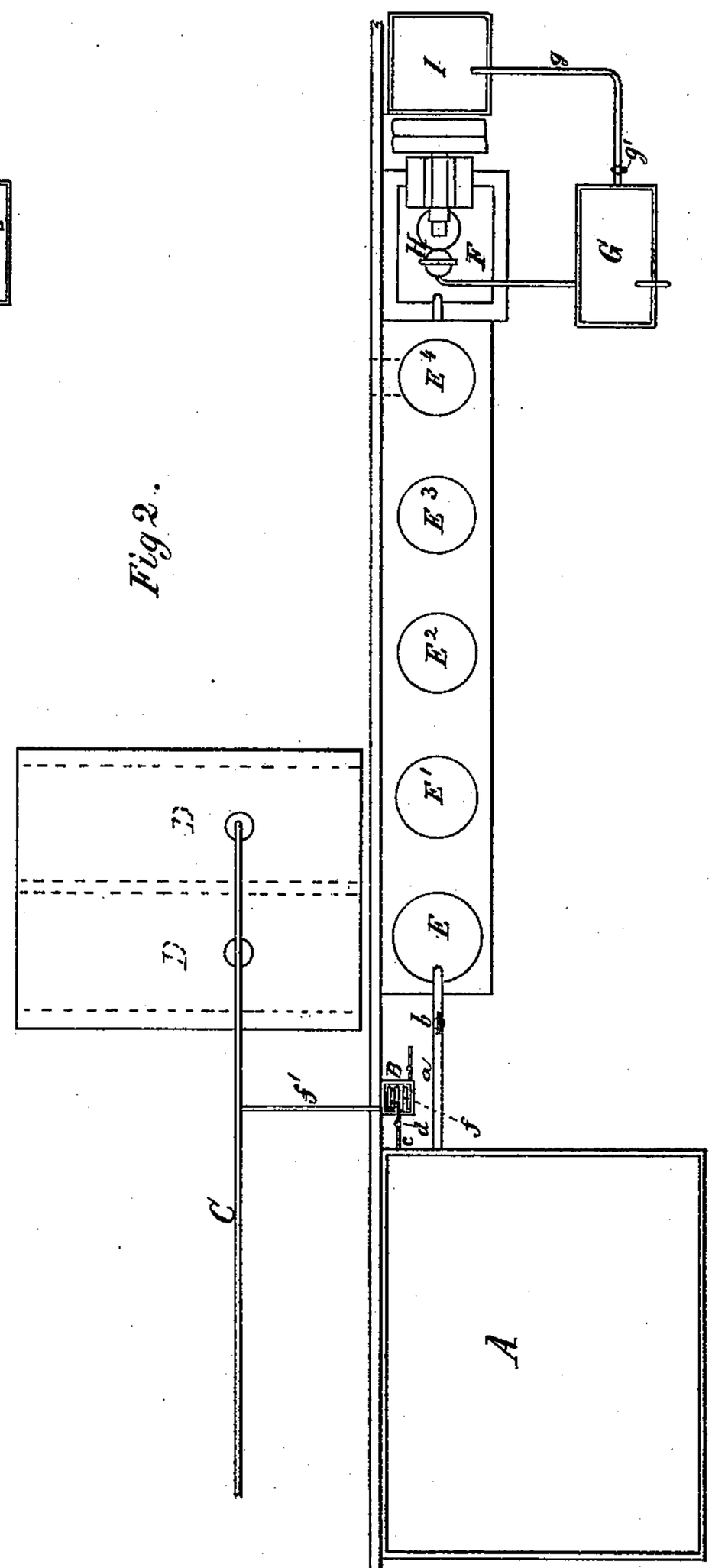


Fig 2.



Witnesses:
J. P. Theo. Lang.
B. Carlyle Fenwick.

Inventor:
William Littlejohn
by his attys
Mann Fenwick & Lawrence

(No Model.)

2 Sheets—Sheet 2.

W. LITTLEJOHN.

MODE OF MAKING SUGAR.

No. 250,824. Patented Dec. 13, 1881.

Fig 3.

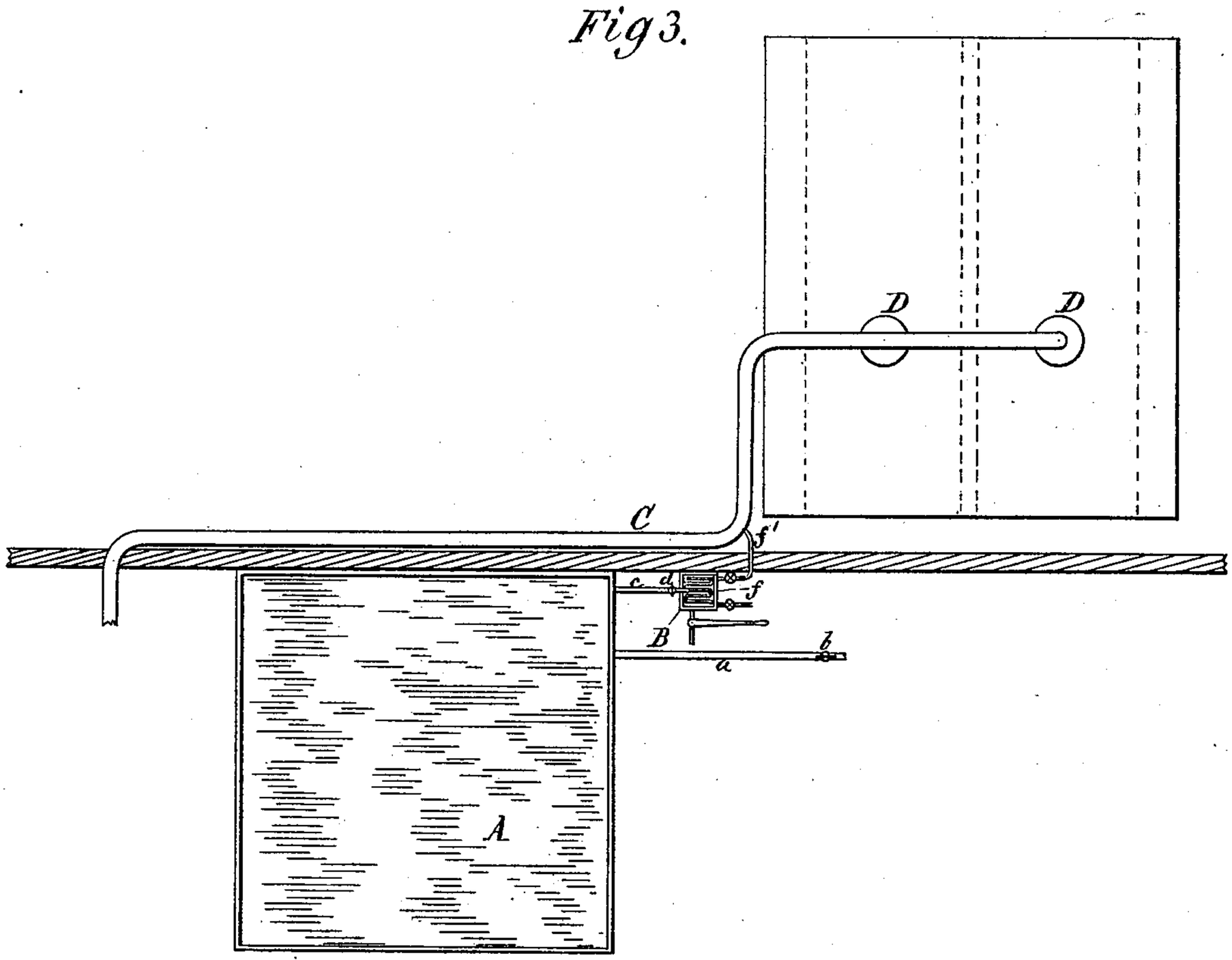
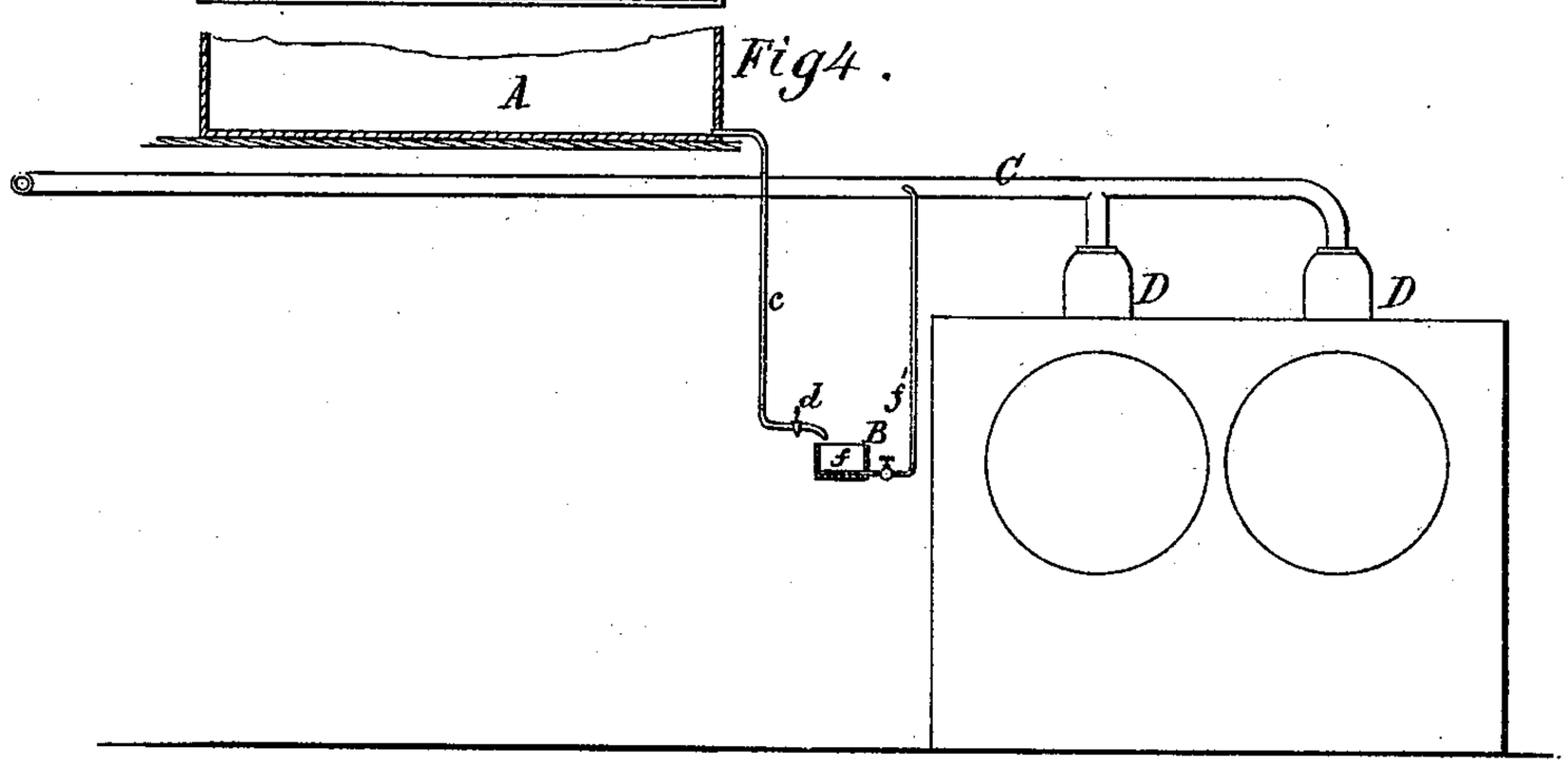


Fig 4.



Witnesses:
J. P. Theo. Lang.
B. Carlyle Fenwick

Inventor:
William Littlejohn
by his attys
Mason Fenwick Lawrence

UNITED STATES PATENT OFFICE.

WILLIAM LITTLEJOHN, OF NEW ORLEANS, LOUISIANA.

MODE OF MAKING SUGAR.

SPECIFICATION forming part of Letters Patent No. 250,824, dated December 13, 1881.

Application filed November 10, 1881. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM LITTLEJOHN, a citizen of the United States, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented a new and useful Improvement in the Mode of Making Sugar, of which the following is a specification.

The improvements which I have made relate, first, to the mode of testing the sugar-cane juice for determining the amount of lime which should be placed in the same for the purpose of clarifying it; second, to a mode of bleaching the sirup produced from the clarified juice.

The object of my invention is to manufacture with simple apparatus and means sugars which are of a superior quality.

The nature of my invention will be fully understood from the following specification and accompanying drawings, in which latter—

Figure 1 is a front elevation and partial section of a sugar-making apparatus which is adapted for carrying out my invention. Fig. 2 is a top view of the same. Fig. 3 is a top view, on an enlarged scale, of a portion of the apparatus shown in Figs. 1 and 2, the wall of the building being shown in horizontal section; and Fig. 4 is a side elevation and partial section of the parts shown in Fig. 3.

A in the drawings shows the sugar-cane-juice box, provided with the usual discharge-pipe, *a*, and shut-off cock *b*. This box is also provided with another pipe, *c*, having a cock, *d*, for a novel purpose, as will be presently described.

B is a small pan, provided with a steam-coil, *f*, upon its bottom, which coil is connected by a pipe, *f'*, with the ordinary steam-pipe, C, of boilers D D.

E E' E^2 E^3 E^4 represent ordinary kettles, in which the cane-juice is boiled.

F is the receiver for the sirup from the battery-kettle E^4. Above the receiver F the sirup-tank G is placed, and to this tank the sirup is elevated from the receiver by means of a pumping apparatus, H. The sirup-tank G is provided with a discharge-pipe, *g*, having a cock, *g'*, and by means of this pipe the sirup is discharged into the finishing-pan I.

With an apparatus such as I have represented I proceed to make sugar as follows: The juice-box A, being of a capacity to hold, say, about five hundred gallons of sugar-cane juice, is supplied with that quantity of bleached sugar-cane juice. Into this juice, for the purpose of clarifying it, I put about thirty cubic inches of lime, which is about five or ten cubic inches less of lime than experience has shown to be the amount usually found necessary to effect the perfect clarification of that quantity of juice. The lime having been thoroughly mixed with the juice, I next let off from the juice-box a quantity of the juice—say about two gallons—into the pan B, and at the same time turn on the steam into the coil *f* at the bottom of said pan. As soon as the juice in the pan boils and the scum which rises is skimmed off, I take out a small quantity of the same in a testing-glass, and by occular inspection determine what additional quantity of lime is probably necessary to effect the desired clarification of the cane-juice in the juice-box. I then add, say, about five or more cubic inches of lime to the juice in the said box. Having thoroughly mixed the added lime with the juice in the box A and drawn off the small quantity which was used for the first test, I again discharge from the juice-box into the pan a like quantity as before, let the steam into the coil, allow the juice in the pan to boil, and then test this juice as before, and if it still is found not perfectly clarified I add an additional quantity of lime—say three or more cubic inches—to the juice in the juice-box, and mix the same thoroughly with the juice. This done, another quantity of juice from the juice-box may be let into the pan, boiled, and tested, as before, (two tests, however, are generally sufficient for the purpose,) and if at this or any test the juice is found perfectly clarified the cock of pipe *a* is opened and the juice passed into the train of kettles E E' E^2 E^3 E^4, or open pans, if used, boiled in the usual manner, discharged into the receiver F, and elevated in the form of sirup into the sirup-tank G by the pumping apparatus H. When the sirup is in the tank an inspection is made as to its quality or color, and if it is found that it is not sufficiently bleached, (which is generally the case,) so as to make choice sugar, I put in a proper quantity of bisulphite of lime, and after the same is thoroughly incorporated with the sirup I test the color of the sirup again in a glass vessel, and if found not sufficiently bleached add an ad-

ditional quantity of the bisulphite of lime. Once, however, is generally sufficient. Having thus ascertained that the sirup is perfectly bleached, I pass it off into the finishing-pan I, and the sugar made from the sirup will be found to be of choice or superior and uniform quality.

In the ordinary process of making sugar on plantations the cane-juice, as it comes from the mills, is bleached either by passing sulphur-gas through it, or by mixing bisulphite of lime with it, and it flows into large juice-boxes or into iron defecators, (which are sometimes used and heated by steam,) and is thence drawn off into a range of iron-kettles of different sizes, usually five in number, heated by wood or coal fires, or, as is sometimes the case, into large open pans heated by steam, and in these kettles or pans it is cleaned of all impurities, and concentrated into sirup by boiling; but before it can be made into sugar, and before it is concentrated into sirup it must be clarified, and lime is used for that purpose by mixing it either with the juice in the juice-box or in the defecator, or in the first kettle of the range, called the "grand," which latter is the common plan, and the sugar-maker determines whether the juice is properly clarified by certain signs in the scum which rises to the surface when the juice is about to boil, which, it may be said, is a very unsatisfactory and dilatory test, for if he does not hit upon the proper quantity of lime the first trial he makes several grands full of juice may be passed before he gets his lime all right, and in this way a good deal of bad sugar is made.

It is well known to sugar makers and planters that to make uniform good sugar more depends upon the proper clarification of the juice by lime than anything else, for an excess of lime will color the juice and injure the quality of the sugar, and if less than is necessary for proper clarification is used, the juice cannot be cleaned of its impurities by any heretofore-known mode, and a bad character of sugar is the result.

It was the foregoing difficulties which led me to invent the modes hereinbefore described of testing the clarified condition of the juice in the juice-box or defecator, and of bleaching the sirup in the sirup-tank, which bleaching process enables the sugar-maker to so bleach his sirup and thereby overcome the difficulties experienced from an excess of lime or other causes in its clarification. My mode of testing the juice is far better than the haphazard plan of determining the proper quantity of lime necessary to clarify cane-juice heretofore practiced. It is certain and expeditious.

In practicing with my invention I have found that the quantity of lime necessary for clarification varies according to circumstances, so that it is not the same at all times; and this being so, if the old plan is pursued, a large quantity of the juice will have passed into the grand, or the open pan, as the case may be, (either of which will hold from four hundred to five hundred gallons,) before the fact that an insufficiency of lime or an over quantity has been used will be discovered, and thus great waste or loss would be experienced; but with my small testing-pan, holding, say, one or two gallons, the tests can readily be made and the proper quantity of lime employed before any of the juice has been allowed to pass into the grand, or open pan.

It is evident that so small a quantity of juice as one or two gallons can be brought to a boiling-state several times—at least six—and an equal number of tests be made as to the clarified condition of the juice in about the time it would take a grand or defecator full of juice to boil. Thus, without much loss of time, and with no loss by reason of poor quality of sugar, the desired clarification can be effected.

In many instances sugar-juices from the same plantation vary so much in quality and color, either on account of soil in which the cane is grown or the manner in which it is affected by the cold weather or frosts, and from many unknown causes, that it is necessary, in order to effect perfect clarification, to provide for a speedy testing of the cane-juices several times before it is passed from the juice-boxes to the kettles. Therefore the great utility of my mode of testing with a small quantity before boiling must be seen.

Instead of first putting the bulk of lime into the juice-boxes and then boiling a portion of this partially-clarified juice in the small testing-pan, a good result, but not as good as that obtained from the mode described, might be secured by taking one or two gallons of juice from the juice-boxes before lime is mixed with it, then putting a proper quantity of lime, by measurement, in the testing-pan; then boiling this small quantity of mixed juice and lime in the pan and testing as to the clarified condition of the juice. Now, having ascertained that the juice is clarified, and knowing the amount of lime it requires for a given small quantity, multiply that quantity of lime with respect to a given large quantity of juice in the juice-boxes, and mix the multiplied quantity with the juice in the boxes. I, however, prefer to first mix nearly the required quantity of lime with the juice in the juice-boxes, and then to test as often as necessary a small quantity of this partially-clarified juice after boiling it in the testing-pan.

It is a very important desideratum to have the juice clarified in bulk, for under the old plan, when the demand for a supply to the kettles arrives, the juice must be passed along, whether fully clarified or not.

When sugar is made in kettles alone according to the common plan, and the cane has been windrowed, as described in my application filed November 7, 1881, a uniform grade of sugar can be made far better than by the ordinary plan by adopting my mode of testing as to clarification of the juices, without the necessity of re-

sorting to the bleaching of the sirup; but if, on account of carelessness and inattention of those in charge of the business, an excess of lime should be used, or from other causes the juices, although properly bleached, should, when converted into sirup, appear more or less discolored, which is usually the case, then, in order to make sugar of a uniform grade and ranking as choice sugar, the cane must not only be windrowed and the red ends of such cane cut off, as claimed in the aforesaid application, but there must be a finishing-pan, to boil by means of steam, and two or more tanks, made of wood or metal, into which the sirup made in kettles or pans must be pumped, and there submitted to a bleaching process by mixing in an additional quantity of bisulphite of lime, as already explained, until the color, by occular test in a glass tumbler or other glass vessel, indicates choice sirup, when it is ready to be passed into the finishing-pan and concentrated into sugar.

I do not confine myself to any special mechanism whereby the sirup is conducted from the juice-tanks or defecators to the test-pan, as this may be accomplished by dipping the juice out of the boxes or defecators and pouring it into the pan.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The mode herein described of effecting the clarification of sugar-cane juices, consisting in first mixing the major portion of lime with the bulk of juices in the juice-box or defecator, taking a small portion of this juice and boiling it in a test-pan, then placing this boiled juice in a glass vessel and ascertaining by occular test whether it is clarified, then adding an additional quantity of lime if found not clarified, then again boiling a small quantity of juice taken from the box or defecator and testing it in a glass vessel, and if not found clarified then adding more lime to the juice in the boxes or defecators, and so on as circumstances require, or until perfect clarification is effected, substantially as described.

2. The test-pan provided with means whereby steam is circulated through it without coming in contact with the juice, for the purpose of boiling sugar-cane juice within the pan, such pan being used with the juice-tank or defecator of sugar-making apparatus, and the means for circulating the steam and heating the juice being connected with the steam-boiler or steam-pipe of the boiler, substantially as and for the purpose described.

3. The mode of bleaching sirup, consisting in applying bisulphite of lime to the sirup in the sirup-tank, then taking a portion of the sirup from the tank and placing it in a glass vessel and ascertaining by occular test the color of the sirup, then adding more bisulphite to the sirup, if required, and so on until it is fully bleached and suited for making superior or choice sugar, substantially as and for the purpose described.

WILLIAM LITTLEJOHN.

Witnesses:

ROBT. L. FENWICK,

B. CARLYLE FENWICK.