

E. E. PEARSE.

Manufacture of Grape Sugar.

No. 159,837.

Patented Feb. 16, 1875.

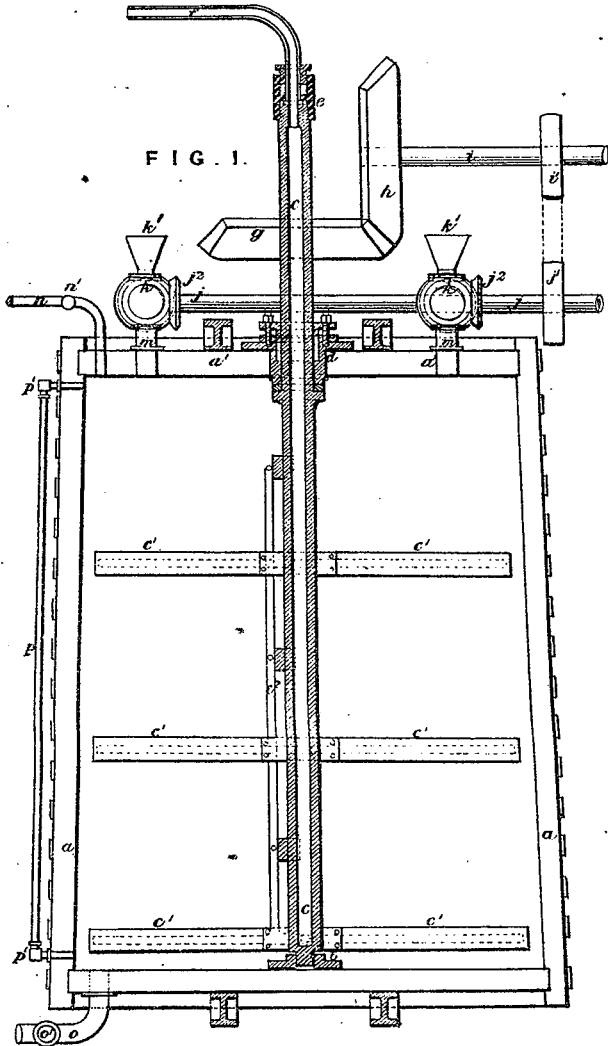


FIG. 2.

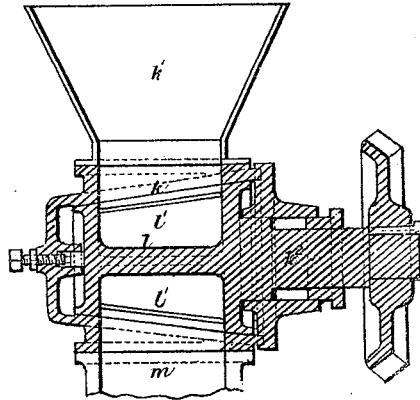


FIG. 3.

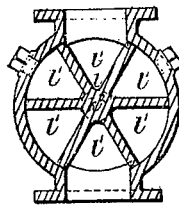
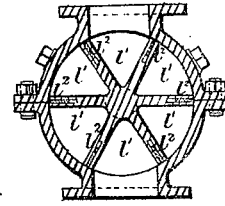


FIG. 4.



Witnessed.

William Proctor.

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Inventor.

Edwin Egerton Pearse

# UNITED STATES PATENT OFFICE.

EDWIN EGERTON PEARSE, OF NEW WANDSWORTH, ASSIGNOR TO THE PATENT GRAPE-SUGAR COMPANY, LIMITED, OF RUPERT STREET, WHITECHAPEL, LONDON, ENGLAND.

## IMPROVEMENT IN THE MANUFACTURE OF GRAPE-SUGAR.

Specification forming part of Letters Patent No. 159,837, dated February 16, 1875; application filed February 20, 1874.

*To all whom it may concern:*

Be it known that I, EDWIN EGERTON PEARSE, of New Wandsworth, in the county of Surrey, England, have invented certain improvements in the manufacture of glucose or grape-sugar from rice and other grain, and in apparatus employed therein, of which the following is a specification:

The invention relates to means for effecting the conversion of rice and other grain into a saccharine liquid or glucose or grape-sugar solution by one operation, by feeding the grain whole into a vessel, which I call a saccharifier, under steam-pressure, in order completely to effect the conversion of such grain into a saccharine liquid.

Glucose sugar is now manufactured from prepared starch, and also from cane-sugar, but by means which are much more expensive, and involve a longer time, than when, as adopted by me, the raw grain is converted into a saccharine liquid or glucose or grape-sugar solution by one operation. But that the invention may be fully understood I will, by the aid of the accompanying drawings, proceed to describe means pursued by me in carrying the same into effect.

Figure 1 represents, by a vertical section, parts of apparatus adapted to carry out my invention. Figs. 2, 3, and 4 represent parts, separately, on a larger scale.

In each of the figures the same letters indicate corresponding parts wherever they occur.

*a a* is a vessel, which I call a saccharifier or digester. This vessel I usually form of wood, and it is adapted to sustain pressure from within of, say, ten to twelve pounds to the square inch. It is formed with a close cover, *a'*, and with an internal step, *b*, in order that it may sustain the lower end of the hollow shaft or axis *c*, which at the upper end passes through, while it is guided by, the stuffing-box *d* in the cover *a'*, and at its upper end this hollow shaft passes into a screw-cap, *e*, formed to admit of the shaft revolving freely therein, while it is capable of receiving steam from a suitable steam-generator through the feed-pipe *f*. The hollow shaft *c* has also applied to it the hollow arms *c'*, which receive steam

from the shaft *c* by means of the pipe *c''*, and are formed with numerous small holes for the escape of the steam therethrough into the chamber *a*. On the upper part of this shaft or axis *c* is applied the beveled-tooth wheel *g*, the teeth of which are taken into by the teeth of the beveled-tooth wheel *h*, affixed on the shaft or axis *i*, which is supported in suitable bearings, and has motion given to it from a steam-engine or other suitable power. On this shaft *i* is also applied the toothed wheel *i'*, which, by an intermediate wheel, gives motion to the toothed wheel *j'*, affixed on the shaft or axis *j*, and this shaft *j*, by the beveled wheels *j''* thereon, gives motion to the feeding means by which the grain to be treated is supplied to the interior of the vessel *a*. *k k* are the feeding means, of which there are two shown; but this may be varied, and a description of one of them will serve as a description of the other. *k'* is a hopper by which the grain is fed to the feed-cylinder *l*, which is attached to, and caused to revolve with, the shaft *k''*, as that shaft is caused to revolve by the beveled-tooth wheel *k'''* being taken into by a beveled-tooth wheel, *j''*. As shown, each feed-cylinder *l* is formed with six compartments or feed-chambers, *l'*, and each chamber, in the rotation of the cylinder *l*, comes into a position to receive grain supplied from the hopper *k'*, and thence, as it passes round, to deliver it by the open pipe or passage *m*, through the cover *a'*, to the interior of chamber *a*. As shown, the outer surface of the compartments *l'* of the cylinder *l* is formed conical, so that, as any wear takes place between the outer surfaces thereof and the interior of the chamber in which that cylinder revolves, the parts may be pressed closer up and retained in contact; but in place thereof the outer surface of the partitions forming the compartments *l'* of the cylinder *l* may be parallel, or, properly, cylindrical, when, in order to provide for the wearing away of the outer surfaces of the partitions in contact with the chamber in which they revolve, these partitions are each formed at those parts with spring-packing.

In using this apparatus I proceed as follows: I first run dilute acid into the chamber

*a*, the acid solution being generally formed by combining one part of acid with ten of water, or thereabout, and this solution is kept well mixed, as well as heated to a temperature of, say, about 220° Fahrenheit. Steam is supplied to the shaft *c*, and thence, through the arms *c'*, to the chamber *a*, so as to maintain a temperature in the chamber *a* of, say, 220° Fahrenheit. This shaft *c* being set in motion, the steam escaping therefrom gradually raises the heat of the acid liquor in the chamber *a* to 225° Fahrenheit, and to a pressure of, say, ten pounds per square inch, when I gradually and slowly commence to feed in the grain to be operated upon through one or both of the feed apparatus *k*, taking care still to maintain the temperature of the interior of the vessel *a* about as stated.

*n* is a pipe, with tap *n'*, capable of being regulated for the escape of steam from the interior of the chamber *a*. *o* is another pipe, with tap *o'*, for drawing off from the chamber *a*. *p* is a glass gage, communicating in the usual way, at *p' p'*, with the top and bottom of the vessel *a*, to indicate the height of liquid in that vessel *a*.

By these means the whole of the grain is subjected to the action of the steam, which is caused to pass through it, and in a very short time a complete conversion of it into a saccharine liquid or sugar solution in the chamber *a* takes place.

A safety-valve (not shown by the drawing) is employed to regulate the pressure in the chamber *a*.

In place of wood, metal may be employed for the vessel *a*, and a higher pressure may also be employed; but in such case great care is necessary, or the sugar produced will be found to have obtained a burnt flavor.

I form the hollow shaft and the arms thereof of gun-metal, or other metal not injuriously acted upon by the acid. The acid I find to answer best for the purpose is dilute sulphuric acid.

As the saccharine liquid is run out of the vessel *a* it is acted upon by alkaline solution, as is usual in such cases. I then proceed with

what I call the cleansing part of the process—that is to say, the separation of the husk and the remaining alkali from the solution.

To facilitate this cleansing, I employ hydraulic-pump apparatus, and force the liquid through suitable filters, the result being a bright and pure saccharine liquid, with very little waste, as compared with the ordinary method of filtration without pressure. The liquid thus obtained is then passed through charcoal filters in the ordinary way, and it is then treated by being acted upon in evaporating and vacuum pans in the usual way.

Having thus described my invention, and means which I adopt in carrying the same into effect, I would have it understood that I do not confine myself to the precise details of working as described; but

What I claim is—

1. The described process of producing saccharine liquid by one operation, in the manufacture of glucose or grape-sugar from whole grain, by feeding such whole grain into a vessel containing sulphuric acid, in successive and regulated quantities, such vessel being supplied with steam by hollow stirrers, performing the double function of stirring and of conveying and distributing the steam.

2. The combination of the vessel *a*, the hollow shaft *c'*, for the passage, supply, and distribution of the steam, and the feeding devices *k k l l*, as shown and described.

3. In combination with an apparatus for producing saccharine liquid from whole grain, the grain-feeding devices described, consisting of the supply reservoir or hopper and the automatic revolving cylinder *l*, supplied from the hopper, and provided with a circular series of pockets, and operating to feed intermittently and regularly, in the manner described.

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

EDWIN EGERTON PEARSE.

Witnesses:

WILLIAM BROOKES,  
ALFRED GEORGE BROOKES.