

MAKING GRAPE SUGAR FROM STARCH.

We give herewith Payen's illustration of the apparatus, and description of the process, employed in France for the conversion of starch into grape sugar. The product is used for manufacturing beer and a coarse kind of alcohol, which is said to be extensively employed in the manufacture of French brandy:—

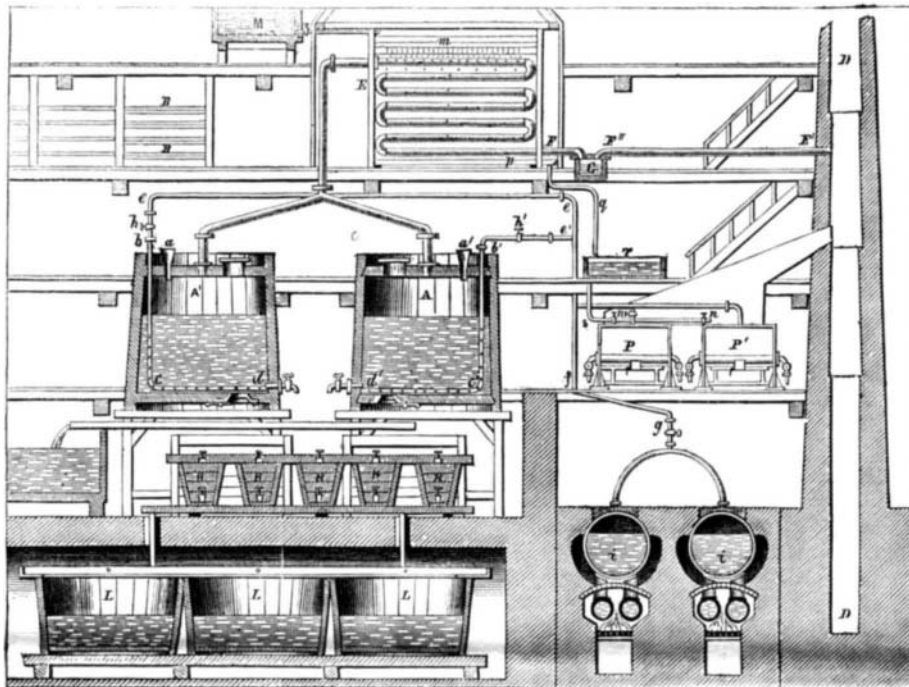
The saccharification of the starch is effected in large tubs or vats, A A', constructed of stout wood, to contain 2,800 gallons. In one of these, A', a lead pipe, b c d, coiled at the bottom, is placed, the circular portion being cut or perforated for the introduction of steam to heat the acidulous water with which it is two-thirds filled; the steam from the generator, i, is admitted to it at pleasure by means of the pipe, b f e g, and stop-cock, h. During the operation the vat is covered, and the disengaged vapor conducted to the chimney, D D; but before escaping it may be utilized in evaporating the sirup by conveying it through serpentine pipes, E F. By such arrangements the disagreeable odors resulting from the evaporation of the oil of the starch are considerably abated, being partly condensed in the serpentine pipe, so as to flow off with the water produced from the steam into a vessel interposed between the pipes, F G, and partly carried away by the pipe, F' F'', or the uncondensed vapors may be conducted into the fire where any remaining traces of essential oil are consumed, and thereby the nuisance is almost entirely prevented.

When it is proposed to convert two tuns of fecula in such an apparatus, the substance in portions of two hundred weight in a trough or tub, with twenty-two gallons of water, and when thoroughly steeped it is introduced by a funnel, a, in quantities of four to five gallons at a time, into the large tub or vat, which should be previously charged with about thirty-two barrels of water, and three quarters of a hundred of sulphuric acid agitated with it, the whole being raised to 212° by forcing steam into it. This temperature is maintained till all the fecula is introduced, and it is found that the transformation is accomplished in thirty or forty minutes after the last portion of the starch has been added. The point at which the change is completed is easily ascertained by simply testing a few drops of the clear liquid with a drop of a solution of iodine, when, if the saccharification be effected, no coloration takes place; in the contrary case the characteristic violet of iodide of starch manifests itself. After the conversion into glucose, the introduction of the steam is suspended, and the next operation is the saturation of the free acid by means of carbonate of lime, and the consequent precipitation of sulphate of lime. The latter being but sparingly soluble, most of it falls to the bottom. It requires from ninety to a hundred pounds of chalk to saturate the whole of the free acid; and this must be introduced gradually to guard against the evolution of too much carbonic acid at once. If an excess of lime be used, it prevents the solution from clarifying so readily as when the sulphuric acid is barely taken up; this is shown by the cessation of effervescence, and the inability of the liquid to change the blue color of litmus to more than a feeble purple tint. When the saturation is completed, the mixture is either permitted to repose in the same vessel, or if it be required to operate upon another batch at once, it is drawn off into the lower vat, A'', where it is left at rest during twelve hours; the clear liquid is then racked through coarse bone-black in the filters, H H, the deposit of sulphate of lime being also thrown upon cloth filters, where it is drained and washed. The sirup as it flows off from the filter, having a density of 1.11 to 1.122, is retained in the reservoirs, L L L, from which

it is raised by a pump or a chain of buckets to the reservoir, M; from this it is distributed in a horizontal channel, m, by numerous lateral apertures upon the serpentine evaporator, E F, and then flows by a channel, p, and tube, q, into a receiver, r, whence it can be drawn at will by the tube, s, and stop-cocks, n n, into the boilers, P P', which are heated by steam, and in which the liquid is concentrated to 1.26 specific gravity. The sirup thus obtained, after reposing a sufficient time to allow the sulphate of lime precipitated by the evaporation to subside, is fit for the brewer or distiller; but if intended for the confectioner or liquor maker it should be allowed to rest for twenty-four hours, filtered when cold through coarse bone-black, and casked immediately. When it is desired to obtain the glucose in a solid state, the evaporation is carried so far as to concentrate the sirup to 1.38 or 1.39 specific gravity

liquor may still contain is saccharified.

The desiccation of the drained sugar was long a work of difficulty, the moisture of the air being sometimes sufficient to convert it again to sirup, which, with the heat of the factory, melted and agglomerated the remaining portion. M. Fouschard has obviated these inconveniences by furnishing the tuns or tubs, R R, with tables of plaster of Paris, which absorb the portion of the interposed sirup. This very much quickens the desiccation of the crystals, especially in a current of air heated to 77°, taking care that the granules are not thereby soldered together. There is, however, a certain amount of the crystallized mass which has to be submitted to a second solution, namely, that which is agglomerated on the end of the loaf resting on the plaster; this must be separated, and the sugar extracted from the sulphate of lime, by grinding them between cast-iron cylinders, and dissolving in the ordinary way.



—73° to 74° Twaddell; it is then poured into the cooler, where it is kept till the crystallization commences, and thence transferred to the tuns in which the solidification is effected.

Of late years, instead of preparing the sugar in an amorphous solid mass, as by the preceding method, it is obtained in grains or regular crystals. The process for converting the starch into sugar is the same as that already described; but care is taken to do it more thoroughly, since any excess of dextrin in the sirup is found to prevent crystallization. After the acid has been neutralized, and the lime salt removed by deposition, etc., the saccharine liquid is decolorized, and concentrated to 1.300, or 60° Twaddell, in summer; and 1.262 or 53.5° Twaddell, in winter. At these stages it is racked off into large reservoirs where the lime salts settle down; and during this period it is necessary, in order to prevent any fermentation, that the liquid be cooled either by circulation of air or of cold water in a coil placed in the vessel. After thirty-six to forty hours, the sirup, being clarified and cooled to about 65°, is put to crystallize in ordinary tuns furnished with a false bottom placed over the lower one, which is pierced with a number of holes that are stopped with wooden pegs. These tuns are placed on stages along the walls of the room, twelve to fifteen inches above the floor. A sheet of lead or large canal or sluice, reaches along each range of crystallizing tuns. To avoid the fermentation of the sirup, which in summer often prevents the crystallization, six or seven ounces of sulphurous acid solution are added to the content of each tun. At the end of eight or ten days the crystallization commences and goes on, the crystals depositing in succession. When the bulk of two-thirds of the liquid becomes a mass of crystals, the pegs in the lower bottom are withdrawn, and the still fluid portion is permitted to drain off, the operation being quickened towards the end by tilting two adjoining tuns against one another. The drainings are conducted to the converting tun, where any dextrin the

iron vessels. Perhaps in no other river or harbor in this country do the bottoms of iron ships foul so rapidly as in Chatham harbor, and consequently every precaution is taken by the officials for the preservation of the hulls of iron ships by means of the best anti-fouling mixtures which science has yet discovered. It appears that the new mercurial anti-fouling composition, the invention of Mr. Gisborne, is to be applied to the vessel.

What Industry and Energy can Accomplish.

Mr. J. C. Whitin, the mechanic in the firm of P. Whitin & Son, now the exclusive owner of the machine works in Whitinsville, Mass., is building a large shop, three hundred and fifty feet in length, by seventy wide, and four stories in height, with foundry and forge shop to correspond, for mechanical purposes. With the old shop, parallel to, and connected with the new, three hundred feet by one hundred, and three stories high, it will make the largest establishment of the kind, owned by a single individual, in the United States. Mr. Whitin commenced life with but little, save skill, industry, and determination. He is the inventor and manufacturer of the famed Whitin Picker. The entire works when in full operation will employ over a thousand mechanics and laborers.

SPECIAL NOTICE.

JOSEPH W. FOWLE, of Boston, Mass., has petitioned for the extension of a patent granted to him on March 11, 1851, for an improvement in steam drilling machines.

It is ordered that the said petition be heard at the Patent Office, Washington, on Monday, Feb. 20, 1865.

All persons interested are required to appear and show cause why said petition should not be granted. Persons opposing the extension are required to file their testimony in writing at least twenty days before the final hearing.