likely to be wrong as right, for the after processes. The difficulty with beet sugar has always been the crystallization, and the getting rid of the potash and salt, and the trouble has been what the Germans and French call "slime sugar;" but if the foregoing rules are *exactly* followed, there will be no slime sugar or treacle—scarcely enough to enable you to get off that portion of the syrup which contains the salts, and which must be got out from the mass with the turbine. If you proceed to the second operation, bear these few rules constantly in mind. In the first operation when you add the milk of lime to the juice to clear it:—

1st. Never keep the lime in contact with the *hot juice a minute longer than you can help it;* the lime cannot be dispensed with to clear the juice, but its action on the hot juice produces more or less of slime sugar.

2nd. Do not agitate the juice with the lime in it, more than enough to mix, or you will spoil your filtration; the larger the flakes remain in the juice the better it will filter

3rd. Never carbonate at any other than a cow milk heat. If you carbonate hot, as most of the books tell you, you will make slime sugar.

Of course, throughout the whole process of boiling, heating, and evaporation, you must be extremely careful neither to burn, nor even brown the syrup. The syrup will be always highly colored; but if it has not been burned, all the color comes out without waste in the after processes, and if the process of evaporation is conducted in the best manner, the sugar which crystalizes out of the colored syrup, will be nearly, if not quite white. The burned sugar can never be recovered.

The foregoing instructions are the result of *actual experiment*, and may be relied on as the result of experience of two years' continual experiments on a working scale.

We shall now proceed to discuss the process of "Diffusion."

There is another process for the extraction of sugar from beet root, which is called the "Diffusion process," and it is now almost universally adopted throughout France and Germany—great numbers of the factories being altered from the old grating and pressing process to the diffusatory process, which is thus described:—

Roberts' Diffusion Process is now acknowledged to be the most economical of any, both in first cost and in working. The apparatus which is used is hardly liable to get out of order, and requires very little attention, while the operations are cleanly and free from filth. Of this process, Mr. Post, United States Consul at Vienna, Austria, wrote, in 1867, as follows:—

"The new process recently invented by "Mr. Julius Robert, a sugar manufacturer, "of Seelowitz, Austria, is working a com- "plete change in the manufactories here, and "will doubtless exert a great influence on an "extended introduction of beet sugar manufacture in the United States, and it is "adapted to extracting the crystalline sugar "from either sugar cane or beet root."

In the United States (and Canada) where labor is so expensive, this innovation must prove of incalculable importance The only thing required in this new process not necessary in the old, is an additional supply of water, an article tolerably plentiful and cheap wherever this manufacture is likely to be introduced in our country,

That this process is really the great improvement claimed, no longer admits of dispute. Mr. Robert has thoroughly tested it in his factory, and has adopted it, as have also many other factories. Since 1867, no less than 130 of the old beet sugaries of Europe have discarded their old process for the new one.

The apparatus for this process, as well as the principle of its action, is different from that of any other. While the other processes are to extract all the juice from the beet, this process extracts only the crystalizable sugar contained in the juice, and leaves most of the impurities in the cells. To accomplish this result the Beet roots are cut up in small thin slices, and put into a number of vats, which are connected by pipes running from the bottom of one vat to the top of the next succeeding. Water of a certain temperature, (it must be hot, nearly boiling) and of a quantity proportioned to the weight of the beet root in the vats, is mixed with the material in the first vat, and allowed to remain until it takes up a portion of the saccharine matter, or, so to speak, until the sugar in the vat is equalized between the water and the beet root; that is to say, if the beet root contains 8 per cent. of saccharine matter, the water will take up 4 per cent.; this water is then forced into the the second vat filled with the cut slices of beet root.

The water already contains four per cent. of sugar, but the beet having eight per cent. it will again equalize itself, and when forced into the third vat will contain 6 per cent. of saccharine matter; in this way the water becomes more and more impregnated with saccharine matter, until it contains almost as much as the beet itself. To return to the first vat we find that the first application of water extracted one half the sugar or four per cent., when this water was forced into the second vat; the fresh water which forced it out and supplied its place extracted two per cent. more before the saccharine matter became equalized between the water and the beets. This water is then forced into the second vat, and the fresh water which supplies its place finds the beets containing but two per cent of saccharine matter, and the next filling finds but one per cent., and in this way the water is extracted to within one half of one per cent.

It is said that by this process the raw material of syrup is much purer than when extracted by any other method, that from the same beets one half per cent. more of crystal-