I have extracted at the rate of over 1,900 pounds of water from 1,000 feet of green lumber, as a part of a large kiln, in four days.

H. G. BULKLEY.

Cleveland, Ohio, Aug. 17, 1865.

REVIVIFICATION OF ANIMAL CHARCOAL.

By HENRY MEDLOCK, Ph.D., F.C.S., M.P.S.

The principal source of expense in a sugar refinery is that of animal charcoal; and it is a great desideratum to the refiner, commencing with the use of new animal black, to adopt a means of keeping his coal in good condition, and retaining, unimpaired, its decolorising powers after each successive use. I will treat the subject very briefly under the following heads:---

1st. The composition of bone and animal charcoal.

2nd. Its decolorising property, and the causes of its becoming inactive.

3rd. The means of restoring its primitive powers of absorption and decolorization.

1. The composition of Bone and Animal Charcoal. —Bone, as is well known to anatomists, is a solid structure composed principally of phosphate of lime and osseine, a modified form of gelatine. The phosphate of lime, or solid portion of the bone, is composed of an infinite number of minute, almost microscopic cells, which are filled up by osseine, and bound thereby, as with cement, into a solid mass.

The composition of bone, after the removal of adhering fat by boiling, is as follows :---

| Phosphate of lime | 68·1 | per cent. |
|-----------------------|-------|-----------|
| Carbonate of lime | 1.4 | |
| Phosphate of magnesia | 2.1 | " |
| Other salts | 2.4 | ** |
| Osseine | 81·0 | 66 |
| | | |
| | 100.0 | |

When submitted to heat in a closed vessel, to which air cannot gain access, the osseine is decomposed, evolving oily and ammoniacal products, which are, by suitable arrangements, collected and applied to many useful and economical purposes. In the retort remains the cellular structure of the bone in a most porous condition, each cell and pore being coated with a thin film of finely divided carbon, resulting from the decomposition of the organic osseine.

The purely chemical reasons why the porous animal charcoal should possess such extraordinary decolorising and general absorptive properties, is a question which I need not now enter into, but I shall do so fully in a forthcoming pamphlet.

2. The Decolorising Properties of Animal Charcoal, and the causes of its becoming inactive.—It is well known to the refiner that his charcoal too soon loses the power of decolorising his syrups, and the question arises, what is this owing to? It is à priori assumed that it is owing to the grains of coal becoming coated on the surface with the slimy albuminous and mucilaginous matters contained in the raw sugar, which destroy to a great extent its porosity. This is doubtlessly one cause, but the principal, and by far the most serious cause, is the presence of lime in the raw sugar, and which, in a short time, effectually chokes up the pores, and, in the process of re-burning, cannot be removed, although the mucilaginous materials are destroyed.

3. The Means of Restoring its Primary Powers of Absorption and Decolorisation.—When the charcoal ceases to decolorise, it is usually washed with hot water to remove the syrup remaining therein, and then re-burned in closed furnaces of various construction, the object of re-burning being to carbonize the colouring matters extracted from the syrups. This restores to some extent the decolorizing powers of the charcoal; but at each successive re-burning the coal ceases to act as a decoloriser, unless it be mixed after each re-burning with a certain portion of new charcoal.

Another process, and one frequently adopted, is to destroy the organic matters by keeping the charcoal in water, and allowing it to ferment for several days, draining off the water, and adding fresh water containing about $\frac{1}{4}$ to $\frac{1}{2}$ per cent. of hydrochloric acid. The little acetic acid formed and the hydrochloric acid added, dissolve a small quantity of lime, and so far act beneficially. But the good effect is more than neutralised by the fact of the acids attacking the structure of the bone itself—namely, the phosphate of lime, thus rendering the coal friable, and consequently making much dust and waste.

Having referred to the two methods in common use of revivifying the decolorizing powers of charcoal, and alluded to their inutility and defects, I will describe a new method, as simple as it is ingenious, of rendering old and comparatively useless charcoal as good, and, indeed, better than new. Corenwinder, an eminent German chemist, has, by numerous experiments, established this axiom—namely, "That the decolorizing power of charcoal used in sugar refining is correlative to its power of absorbing lime." In other words, the more the coal becomes choked up with lime, the less is its power of decolorising. Now, to remove the obnoxious lime without attacking the structure of the bone itself, is a question which has occupied for many years the ingenious mind of my friend, Edward Beanes, C.E., F.C.S.*

Mr. Beanes, who by his chemical researches on the sugar plantations of Cuba has enabled the planters not only to produce much finer qualities of sugar, but considerably to augment their produce, has recently patented a process of restoring to charcoal its primitive properties of decolorizing syrups. Mr. Beanes found that charcoal perfectly dry and hot absorbs dry hydrochloric gas with the greatest avidity and in enormous quantity. The gas combines with the lime and converts it into soluble chloride of calcium. After the charcoal has been treated with gas, a portion of untreated charcoal is mixed up with it; the uncombined gas remaining in the pores of the former is taken up by the latter, and the whole becomes neutral; the chloride of calcium is then washed out-requiring only a few hours-and the charcoal is afterwards re-burned in the usual way. It is then found that the decolorising power of the charcoal is aug-mented at least 100 per cent. It is then found that

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