Scientific Museum.

The Adulteration of Sugar.

At a recent meeting of the London Botanical Society, a paper was read by Dr. Arthur Hassall, on the Adulteration of Sugar, a condensed but clear abstract of which we here present, which cannot but be of much interest to our chemists, planters, &c. :—

Two kinds of sugar have been particularly distinguished by chemists, viz., cane and grape sugars. The first named sugar is obtained from the cane, the beetroot, the maple-tree, and one or two other plants; while the second is contained in most fruits and honey. These two sugars differ in their properties, and chemists have hitherto supposed that grape sugar might at all times be discriminated from cane sugar by means of certain tests; a point of very great consequence, since cane sugar is very frequently with a form of grape sugar, made artificially from potato flour. Thus Dr. Ure, in the Supplement to his "Dictionary of Arts, Manufactures, and Mines," at p. 250, writes, in reference to the well known copper test, "With my regulated alkaline mixture, however, I never fail in discovering an exceedingly small portion of starch sugar, even when mixed with Muscovado sugar, and thus an excellent method is afforded of detecting the frauds of the grocers."

Dr Hassall stated that he regretted that his observations did not allow of his confirming the remark of Dr. Ure and some other chemists, as to the value of the copper test in detecting the adulteration of cane with grape sugar. Thus, Dr. Hassall found that when applied to thirty-six different brown sugars obtained from grocers, the red oxide was thrown down in every case; that the same result ensued when the test was employed with sugars procured from the hogsheads, and even with that taken direct from the sugar cane itself; also that the oxide subsided when applied to lump sugar in three cases out of twelve, and that this result ensued in all the refined sugars after they had been boiled and reduced to the state of syrup. For these reasons, therefore, it is evident that the copper test is of no use whatever, as applied to the question of adulteration of cane with grape sugar. Finding, then, chemistry to fail him in this inquiry, Dr. Hassall had to rely, in following out his investigations, almost exclusively upon the microscope.

In sugar produced from cane, broken fragments of the tissues of the cane were always to be detected by the microscope, in great abundance, in the sugars imported, and that thus a valuable test of the presence of cane sugar in many articles was afforded. In potato sugar a certain number of starch granules was frequently to be detected.

He found fragments of cane in all that he examined, except a very fine white purified sugar. Beetle-like animalcules were found in 19 cases,—these animalcules were evidence of great inferiority, due to a great quantity of molasses remaining in the sugar. Sporules of fungi were present in 10 cases, showing that there had been fermentation—this was more common in beet root sugar.

That in the whole of the sugars submitted to examination, a variable quantity of starch or flour existed as free granules, aggregations of granules, or cells, as those of the potato.

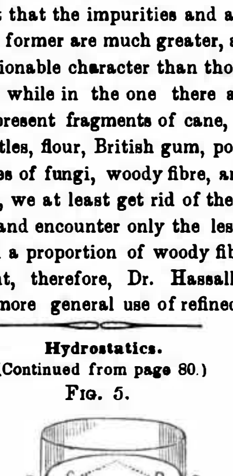
The results of the examination of fifteen different specimens of lump or refined sugar were given. From an examination of these, it appeared that animal matter, employed in refining the sugar, was present in ten instances; that saw-dust like fragments of woody fibre were observed in twelve cases, being very numerous in seven examples; that a greater or less quantity of starch was present in the whole fifteen sugars; and that in no one instance were either beetles, fungi, or fragments of cane to be detected. Dr. Hassall, therefore, considered that these fifteen sugars were beyond question adulterated, and that inasmuch as sugar, in its refinement, undergoes additional boiling and careful filtration, the smallest number of starch granules found in lump sugar is to be regarded as sufficient evidence of adulteration.

Contrasting the condition of moist and lump sugar, as met with in commerce, he said, it is evident that the impurities and adulterations of the former are much greater, and of a more objectionable character than those of the latter; that while in the one there are very commonly present fragments of cane, animalcules or beetles, flour, British gum, potato sugar, sporules of fungi, woody fibre, and grit; in the other, we at least get rid of the beetles, fungi, &c., and encounter only the lesser evils —flour, and a proportion of woody fibre. On this account, therefore, Dr. Hassall recommends the more general use of refined sugar.

Hydrostatics.

(Continued from page 80.)

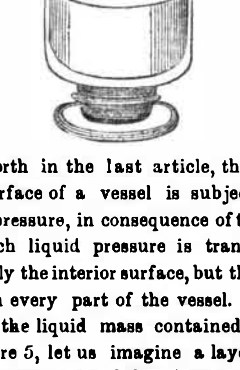
FIG. 5.



As set forth in the last article, the whole interior surface of a vessel is subject to an enormous pressure, in consequence of the manner in which liquid pressure is transmitted, and not only the interior surface, but the liquid particles in every part of the vessel. In the interior of the liquid mass contained in the vessel, figure 5, let us imagine a layer, L L, parallel to the surface, S S. All the particles of this layer are pressed by the mass of the liquid above,—they are under the pressure of a liquid cylinder; the pressure from above, downwards is on the principle of action and re-action, exactly equal to that from below, upwards, and the separate particles of the layer, L L, are held in equilibrium by equal and opposite pressures. By taking a portion of the layer, A B, it will be observed that the surface is at once pressed from above, downwards, by the liquid column, C D B A, and from below, upwards, by a precisely equal force, so that if a solid were plunged into the water, whose base exactly occupied A B, this pressure would act upon the solid from below, upwards, tending to drive it out of the liquid.

By taking a tolerably large glass tube, T, fig. 6, ground flat at its lower extremity, is closed by means of a glass plate or valve,

FIG. 6.



V V, from the centre of which proceeds a cord up to the top of the tube. If the surfaces be smooth, the valve will close the tube water-tight, by pulling the string. On lowering the tube into the vessel of water A B C D, the valve will be upheld by the pressure of water, upward and the string let go, for the upward pressure which it sustains, is equal to that which it would sustain at that depth from a column of water acting from the surface downwards, is proved by pouring water into the tube. As soon as the interior level approaches the exterior, A A, the glass valve is pressed from above, as much as it is pressed from below, and it then falls to the bottom of the water by its own weight, or rather by the difference between its weight and that of an equal bulk of water.

The pressure upon a given surface of water is the same, whether it face upwards or downwards, and may also be proved to be the same in whatever direction it be turned, provided its centre of gravity remains at the same depth below the liquid surface; for this pressure is equal to the weight of a column of liquid, whose base is the given surface, and whose length equals the depth of its centre of gravity.

In water, the pressure of any surface, at the depth of 1 foot, is nearly equal to ½ lb. on the square inch; at 2 feet it is about 1 lb.; at 3 feet, 1½; at 4 feet, 2 lbs. In a cubical vessel full of a liquid, the pressure on any one side is equal to one-half the pressure on the base; for the bottom sustains a pressure equal to the whole weight of the fluid, and the pressure sustained by each side is equal to the weight of a mass as long and broad as that surface, and as deep as its centre, and consequently to half the contents of the vessel. From this is adduced the remarkable result, that in a cubical vessel, a liquid produces a total amount of pressure three times as great as its own weight, for if this equal 1, and the pressure upon each of the four sides be equal to half of that upon the base, we have $4\times\frac{1}{2}=2$, and $2+1=3$.

New Method of Producing Burning Fluid.

We learn by the London Mechanics' Magazine, that a Mr. Abraham M. Marbe, of Birmingham, lately secured a patent for a new process of making burning fluid, which must be of great interest to many of our readers. It is prepared from oil of turpentine :—To one gallon of the oil of turpentine, 1 pound of sulphuric acid and a quart of water are added. This is stirred, and, after standing for three hours, the clear liquor is decanted into a vessel containing water, by which the remaining acid is separated from it. Into another suitable vessel, a pound of fine lime is put for every gallon of liquor, and the liquor is then gradually poured in and stirred along with the lime. This is left to settle for a night, when the clear is drawn off and is fit for burning, instead of turpentine. It is necessary, however, for a purer spirit, that it should also undergo the following process :—For every gallon of liquor have a vat, in which is placed 4 ounces of fine lime and half a pound of burned potash. Wet this, with half a pound of alcohol, and allow the vapor to subside : then add more until the lime and potash are covered with about a pint of alcohol for every gallon of the purified spirit, already described, a gallon of which is added for every half pound of the lime and potash. After this settles, the clear is distilled, and a beautiful burning fluid is the result.

Adulterated Drugs.

"Calomel is often adulterated by an admixture of various white powders, such as chalk, sulphate of bartya, white lead, and is sometimes contaminated by some corrosive sublimate, carelessly left in it by insufficient washing; also by common salt, and by sal ammoniac."

"Carmine is a splendid red pigment obtained from cochineal by a peculiar process. This pigment, being very costly, is often adulterated by the admixture of starch, of alumina, or of vermillion; sometimes, also, a portion of the animal matter of the cochineal from which it has been obtained, is accidently left mixed with it."

"Magnesia is often contaminated by carbonate of lime (chalk), which either has been fraudulently mixed with it, or because the magnesian salts from which it has been obtained were naturally contaminated with salts of lime, as is the case, when prepared for the mother-waters used in the manufacture of nitre, and common salt. The best is that obtained by precipitating a solution of sulphate of magnesia by one of carbonate potash or of soda."

"Carbonate of soda is often adulterated to an excessively large extent, by mixture with crystals of sulphate of soda, which are only half the price of the carbonate, and which for detergent purposes, are of no value whatever."

"Vermillion is often fraudulently mixed with red lead, peroxide of iron, and brick dust, and with sulphuret of arsenic."

"Black lead is adulterated to an enormous extent with sulphuret of antimony, micaceous iron ore, but more particularly lamp black. An extraordinary quantity of this substance is sold in small packets, for the purpose of brightening stoves, and some of these packets are adulterated with as much as from fifty to sixty per cent of lamp black."

LITERARY NOTICES.

NOW READY.—BROTHER JONATHAN PICTORIAL DOUBLE SHEET, FOR THE CHRISTMAS HOLIDAYS, A. D NEW YEARS, 1851.—It is known every where that this magnificent paper is the wonder of the world, as regards its immense size. splendid large Engravings, and astonishing cheapness. The beauty of this year's JONATHAN must astonish everybody ! as the Engravings are larger and richer than ever. Indeed, it would be impossible to over-rate the splendor of this magnificent Christmas sheet.

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OUTLINES OF PHYSIOGNOMY, OR THE TWELVE QUALITIES OF THE MIND.—No. 2 of this new System of Physiognomy, by Dr. J. W. Redfield, of this city, has just been published by J. S. Redfield, Clinton Hall, N. Y. This work is written in a familiar manner, in a series of letters to a friend. Dr. Redfield, it is well known, is an enthusiast in this field, which he has rendered not only interesting but instructive. There is scarcely an individual living who is not, by nature, a believer in physiognomy :—we form opinions of individuals by their looks, the first time we see them, and that, as it were, by instinct. There must be some reason for this ; certainly it is an evidence of the truth of physiognomy, the question is to get at the truth. Dr. Redfield's work throws a great deal of scientific light on the subject, and makes his little book as readable as a romance. The price is only 25 cents—it should be universally read.