Sugar and the Sorghum.

We have received from Dr. A. A. Hayes the following abstract of an interesting paper read by him on the above subject before the Scientific Association at Montreal:—

So rapidly has chemical science progressed of late, that the term "sugar" has now become a generic name for a class of bodies with the most marked diversities of sensible characters and composition. We have sugars which are sweet, others which are slightly sweet, and some destitute of sweetness; some are fermentable, others do not undergo this change; some are fluid, more are solid.

Adopting cane sugar as the most important kind from certain inherent qualities, we find its sources abundant, but not numerous. So far as observation has extended, its production by a plant is definite; a change of locality, even when accompanied by a marked change in the habit of the plant, does not alter essentially the nature of the sugar it produces. Thus the cane of Louisiana rarely matures and is an annual, while in the soil and climate of Cuba, it enjoys a life of thirty, or even sixty years. The juice of our southern plant always contains more soluble alkaline and earthy salts than is found in the cane of Cuba, but its sugar is secreted as cane sugar. The juice of the sugar beet, of watermelons, and a large number of tropical fruits, the sap of the maple and date palm, afford cane sugar. In these juices and saps, when concentrated by desiccation in the cells of the plants, it always appears in regular, brilliant crystals, of a prismatic form, clear and colorless; distinctly indicating a vital force in the plant, separating it from other proximate principles and leaving it in its assigned place pure.

The class of sugars next in importance includes, under the general term Glucose, a number of sugars having varied characters, which should be separately grouped. Among them are the sugars of fruits, seeds and grasses; those produced in the animal system, and the artificial sugars made from starch, grains and sawdust. The varieties of glucose are both solid and semi-fluid. When solid the organic tendency to rounded surfaces is generally seen. The semi-fluid forms often manifest a disposition to become solid on exposure to the air, and they then experience a molecular change, which produces crystals having new relations to polarized light and different physical and chemical characters.

Individuals of the class are easily distinguished from each other, and most clearly and remarkably from cane sugar. The plants producing the natural glucose sugars mature their cells as perfectly as those producing cane sugar, and the secretion can be found as distinctly isolated from other principles as cane sugar is, even when the glucose is semi-fluid. Hence we are able to determine by microscopical observations, aided by chemical tests, the presence and kind of sugar in the tissues or sap, of a plant, often without incurring the risk of change of properties through the chemical means adopted for withdrawing the sugar. The *Sorghum vulgare*, or sacharatum, belongs to the tribe including grasses. The unsuccessful attempts made to crystallize sugar from the juice of the Sorghum, produced in different climates of our country last year, indicated that it contained no cane sugar, or that the presence of some detrimental matter in the expressed juice destroyed the crystallizable character of cane sugar. My observations commenced after I had obtained several specimens of the Sorghum, and have been continued on the semi-fluid sugar, likewise from different parts of the United States, with uniform results.

When a recent shaving of the partially dried pith of the matured stalks of the Sorghum is examined by the microscope, we observe the sugar cells filled with semi-fluid sugar. After exposure to air it is often possible to distinguish some crystalline forms in the fluid sugar. These grains, after being washed, cease to present a clear crystalline character, and have the hardness and general appearance of *dry fruit sugar*. The most careful trials I could make failed in detecting cane sugar in any samples of the Sorghum stalks, or in the samples of sugar, including one made by Col. Peters in Georgia, prepared under the most careful management. I must therefore conclude, that the Sorghum cultivated in this country does not secrete cane sugar or true sugar; its saccharine matter being purely glucose in a semi-fluid form.

Pearl Muscles.

MESSRS. EDITORS—In No. 50, this volume SCIENTIFIC AMERICAN, I noticed a communication with the above heading, from E. D. B. Perhaps I can partially answer his inquiries. The muscle with a thick shell, (purple inside) is, I think, a species of the *Unio*, several varieties of which are found in the streams of Ohio, and no doubt of Wisconsin, and other Western States. The thin shell belongs to the *Anadonta*, or toothless. About the year 1843, the Farmington Canal (now a myth) was still in use in the city of New Haven, and among other productions of that noted water channel were the *Unio* and *Anadonta*, in considerable numbers. Learning that pearls were to be found in the *Unio*, I was induced to search for them, not for their pecuniary value, but only as specimens. Upon one occasion, when a portion of the canal had been drawn off, I gathered and opened about a hundred of the *Uniones*—these were from three to four inches in length, and about two in breadth—and was rewarded by finding ten pearls, in size from a pin's head to a pea, the majority rough and unfinished. I enclose you the largest one, and one of the small ones. You will observe that the color is pink or purplish, and similar to the inside lining of the *Unio*. Now, I think (and the idea is not new) that the nucleus of the pearl is some particle of sand, gravel, or other insoluble matter, which has accidentally fallen within the valves of the shellfish, and which cannot be dislodged by it. To relieve the irritation occasioned by its sharp angles or edges, the animal gives it a succession of coats of the same secretion with which it lines its own shell. Hence I think we may regard it as a fixed law, that the color of the pearl will be similar to the inside of the shell in which it is found. No white pearls, then, will be found in the purple *Unio*.

Again, will any pearls be found in the shell-fish of sluggish and muddy streams? The nucleus or insoluble particle is wanting. (Will E. D. B. please tell us the character of the creek which he mentions?) The bottom of the Farmington Canal was sand, gravel and sedimentary matter, more or less of which was stirred up by the passage of every canal boat; here were the particles, and the disturbing cause which might have introduced them.

Whether the pearl-producing muscles of New Jersey are identical with those to which E. D. B. alludes, I have no means of knowing, but I may suggest to him not to spend much time in searching for pearls for profit, but to turn his attention to employing the shells of the *Unio* for some of those purposes for which the mother-of-pearl is now used, and in association with which various articles might be elegantly ornamented.

W. J. W.

Yaphank, L. I., August, 1857.

[One of the specimens sent us by our correspondent is about the size of a pea, of light pink color, and not perfectly round, but nearly so; the other is not much larger than the head of a large pin, and is less perfect than the large one. We think W. J. W. is correct in his theory that the pearls found in muscles will correspond in color with the shell by which they are surrounded, and are under obligations to him for his brief but clear article, which will be of great interest, we presume, to a very considerable number.

Velocity and Colors of Lightning.

The lightning of two classes does not last for more than one-thousandth part of a second; but a less duration in passing than one-millionth part of a second, is attributed to the light of electricity of high tension. In comparison with this velocity, the most rapid artificial motion that can be produced appears repose. This has been exemplified by Professor Wheatstone, in a very beautiful experiment. A wheel made to revolve with such velocity as to render its spokes invisible, is seen for an instant, with all spokes distinct, as if at rest, when illuminated by a flash of lightning, because the flash had come and gone before the wheel had time to make a perceptible advance. The color of lightning is variously orange, white and blue, verging to violet. Its hue appears to depend on the intensity of electricity and hight in the atmosphere. The more electricity there is passing through the air in a given time, the whiter and more dazzling is the light. Violet and blue colored lightnings are observed to be discharged from the storm clouds high in the atmosphere.—*Exchange.*

[We have always believed in the great velocity of ordinary lightning on the authority of Prof. Wheatstone's experiment alluded to above, and believed that although the light of a flash appeared to remain for a considerable period, it was really instantaneous—that, in short, the time of its remaining visible was an optical illusion—until one night, we took some pains to investigate the matter during a heavy storm. We could not well see the motion of the balance wheel of a watch, but the pendulum of a mantel clock was observed to make, in some cases, as many as three distinct vibrations. The Professor's experiment must not be understood as applying to all varieties of these natural discharges of electricity.

Castor Oil.

The cultivation of the Palma-Christa plant, which produces the seeds from which castor oil is pressed, has been practiced to a limited extent in this country, particularly in Illinois; but the demand has not been large enough to warrant extensive planting. The plant does not afford as great a yield in Mississippi as it does nearer the northern limit of its growth, which is about the latitude of 40°. M. Berris, a French chemist, declares that this oil is applicable to a great many industrial purposes to which it has not heretofore been considered applicable. He says:—

"By distilling castor oil upon concentrated potash, the sebacic acid and caprylic alcohol are extracted as separate products, which may be turned to good account. The sebacic acid, having a high melting point, may be employed, instead of stearic acid, in the manufacture of candles, and if it be mixed with stearic acid, the hardness and quality of the candles are greatly improved, and in appearance they resemble porcelain. It is possible to use caprylic alcohol in all the purposes to which ordinary alcohol is put, particularly in illumination, and in the composition of varnishes, and from it certain other compounds may be derived, of remarkable odor, similar to those which are at present largely used in commerce."

The farmers in Algeria can produce from a given quantity of land three times as much castor oil as they can olive oil, both of which productions afford good compensation to the cultivator.

Amylene, the New Anæsthetic Agent.

Dr. Snow, in a paper read before the Medical Society of London, has directed attention to amylene as an anæsthetic agent, and numerous trials of this substance for producing insensibility have been made with satisfactory results, the relative advantages and disadvantages of the article being as follows:—In regard to its odor, it is more objectionable than chloroform, but much less so than sulphuric ether. The odor of any volatile substance is, however, no longer perceived after a patient begins to inhale. In respect to its pungency, it has a great advantage over both ether and chloroform, being less pungent than either of them. Thus, while the patient, especially if a female, often complains of a choking feeling and want of breath in commencing to inhale chloroform, and two or three minutes are lost before the vapor can be inhaled in any useful quantity, she can inhale the amylene of full strength within half a minute from commencing, and the operation may generally be begun within three minutes. In the amount which suffices to produce insensibility, it is intermediate between chloroform and ether, chloroform having the advantage. Amylene is superior in preventing pain with a less profound stupor than that occasioned by the other agents, and in the ready waking and recovery of the patient.

Does Sunshine tend to Extinguish Fire?

The common opinion that the sun shining on a fire tends to extinguish it, and that consequently the embers must be shaded, if we would preserve them alive in a fire place, was made the subject of experiment in the year 1825 by Dr. Thomas McKeever, of England, and the results seemed to show a real foundation for the opinion that solar light does actually retard the process of combustion. These results were copied by the contemporary scientific journals, and even the great German chemist, Leopold Gmelin, in his *Handbook of Chemistry*, announces Dr. McKeever's conclusions, without expressing any misgivings in relation to their accuracy. Sunshine is an agent which is certainly capable of producing very remarkable effects; but the disagreement of this with other facts, has recently led Dr. John LeConte, Professor of Natural Philosophy in the South Carolina College, to repeat the experiments of McKeever, but using greater care; and the results obtained, as detailed by him at the late meeting at Montreal, tend to overthrow the idea, and prove that light has no influence whatever on the rate of combustion.

The fire employed in both the sets of experiments was simply a wax candle. McKeever found it to burn about 12 per cent faster in the dark; but LeConte finds the light of the sun, even when concentrated by a large lens, produces no effect except by heating. If the air in the dark be heated to the same extent, and the air in each case be kept equally quiet, the candle burns at precisely the same rate. McKeever's experiments indicated that the candle burned from 5 to 11 per cent faster in the dark than in common sunshine. He supposed that the chemical rays exercised a deoxidizing power which, to some extent, interfered with the rapid oxydation of the combustible matter, and by trying the candle in different parts of the colored spectrum (produced by decomposing a ray of light in passing it through a prism,) his experiments appeared to indicate that a taper burned more rapidly in the red than in the violet extremity of the solar spectrum.

The whole subject cannot as yet be considered definitely settled, as the recent paper is regarded as merely preliminary to a more thorough experimental investigation, which Dr. LeConte proposes to undertake during the next twelve months. It is obvious that these researches have a practical bearing.

Wrecks on the Bahamas.

From January 1, 1856, to May 9, 1857, forty vessels were lost on the Bahama Banks. Commerce has suffered by these disasters, in seventeen months, to the amount of $2,609,800. Governor Bannerman, in a recent State paper, asserted that a large proportion of the wrecks were the work of design. He roundly asserted that, in a majority of instances, vessels were run ashore by their masters, with the understanding that they should share the proceeds of the wreck with the wreckers; and this practice, he said, was most common with American ship-masters. If his statement—founded on official information—was correct the matter should at once be made the subject of official inquiry by the United States Government.

New Sloop of War.

Proposals from ship-builders will be opened by the Secretary of the Navy to-day for the construction of a steam propeller sloop-of-war. The object of the government in contracting for this ship, and having her built outside the navy yards, is stated to be, "to obtain the best ship-of-war the mercantile marine can produce." When this contract is completed, it is supposed that another of the five sloops ordered by the last Congress will be let out. The competing ship-builders object to their models and plans being passed upon by the naval constructors in the employ of the government, who are utterly opposed to building a war ship except in a government yard.—*New York Tribune, Aug.* 24.

The University of Virginia, it is stated, has devoted fifteen hundred dollars to the preparation of a gymnasium.

Propellers.

Whittaker's "Improvement in Side Screw Propulsion" has been introduced in a propeller lately launched at Keyport, N. J. The hull is 110 feet in length, 28 in breadth, and six feet deep. The engines are manufacturing in Jersey City, and it is expected the boat will be in running order in one month from the present time. The persons interested in the affair believe that side propellers, with high pressure engines, are much more economical and better than paddle wheels and low pressure engines. The experiment has been previously tried on the Lakes with good results. Capt. Whittaker's invention was illustrated a short time ago in the SCIENTIFIC AMERICAN.

E. Barrows' rotary engine, which has been several years successfully used on small experimental boats, (one of which, the *Rotary*, a side wheel steamer some sixty feet long, was employed last summer in the Coast Survey,) has lately been constructed on a considerably large scale and applied to a propeller intended to form the first of a line of such vessels to ply between this city and New Bedford. She has made several successful trial trips, running under different circumstances, pressures, &c., to test her capacities; and high hopes are entertained that the engine will prove not only more manageable and less troublesome to keep in order than ordinary reciprocating engines, but considerably more economical of fuel. We shall probably recur to this subject when she is regularly running. The American and foreign Patents for Barrows' invention were obtained by us. The engine has been illustrated in the SCIENTIFIC AMERICAN.

The Corliss engine (working very expansively with rotary and very quick-shutting valves) has been for several months performing admirably on the propeller *Curlew*, a large vessel plying between this city and Providence. This vessel is said to make better time with a considerably smaller consumption of fuel than any other vessel of her size and model in these waters. She is the first example of the adaptation of these highly popular engines to marine purposes.

Hewit's Pump.

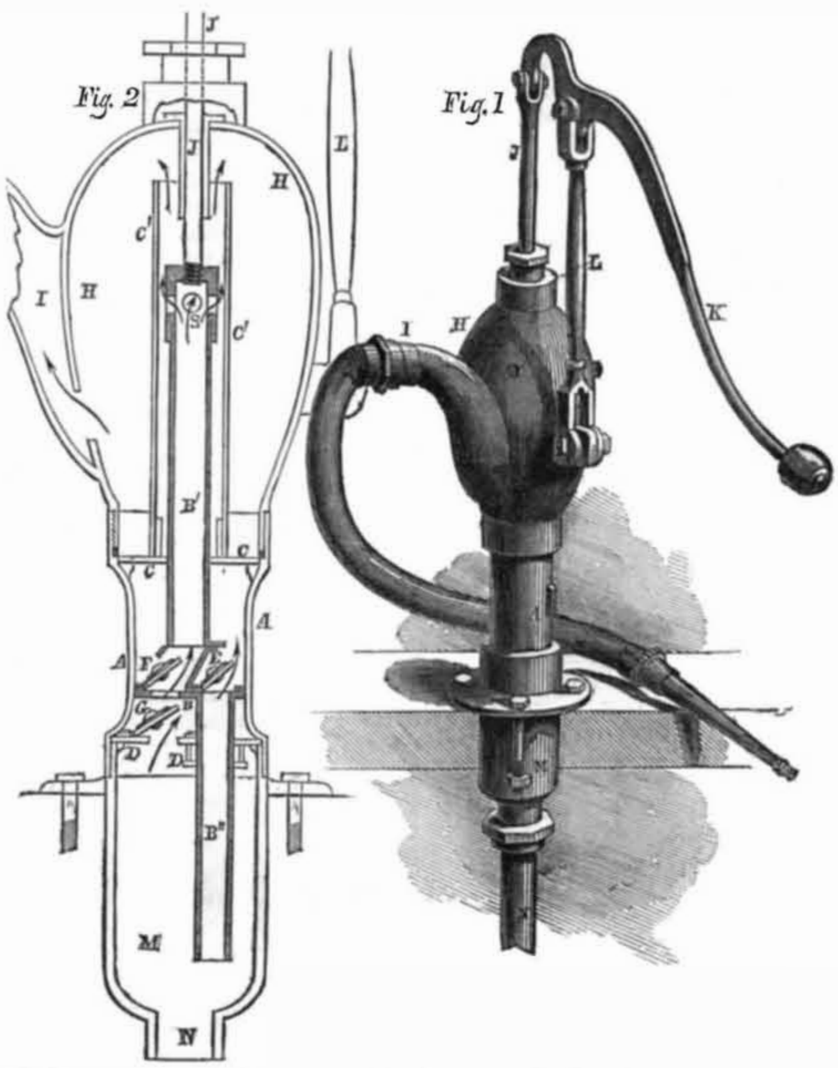
This pump is so constructed that the fluid travels in an almost direct line from the induction to the eduction passage. It is a reciprocating pump, with valves in the bucket, and is, in these principal features, similar to a very large class of pumps in common use.

Fig. 1 is a perspective view, and Fig. 2 a vertical section of the pump complete. A is the body or barrel. B is the movable bucket, B' a tube perforated at the top, attached to B, and by which the latter is connected to J, the pump rod. C is a fixed horizontal partition above, through which B' plays tightly, and C is a tube, larger than B', and surrounding it. D is a lower or fixed bucket, through which plays tightly a tube, B'', fixed to the lower side of the movable bucket, B. There are two valves, E and F, hinged on the upper side of B. E simply opens and closes the tube B'', but F is faced with leather on both sides, and when it is thrown up into its highest position it meets the ledge represented. On the fixed bucket, D, is also a valve, G, opening upwards. H represents the upper reservoir, receiving vessel, or air chamber, and I the discharging pipe. J is the pump rod, working through suitable packing, and through a long packing tube, as represented, which latter is fitted tightly to the metal of H, so that any leakage through the stuffing box must come from the bottom of said tube thus aiding to retain a little air in the top of the air chamber, even if the stuffing box is quite leaky. K is the lever by which the pump is worked, and L is an upright link, which serves as a fulcrum therefor. M is a lower or receiving chamber, and N is the tube through which the water is received.

Operation.—When, by elevating the loaded extremity of K, the bucket, B, is depressed, the valve, G, shuts, and the pressure of the water below B, forces F to rise, and by meeting tightly the ledge referred to, it prevents the flow of the water into the portion of A above B, and compels it to rise through the tube, B', and be discharged through the holes, S, near its top. The same movement, by generating a partial vacuum in the upper portion of the cylinder, A, causes the valve, E, to rise, and allow water from M to rise and fill it.

When the motion of K, and consequently of B, is reversed, the valves, F and E, close, and the water in the upper portion of the cylinder or barrel, A, is compressed and compelled to rise through B', while the partial vacuum formed below B, causes the valve, G, to rise,

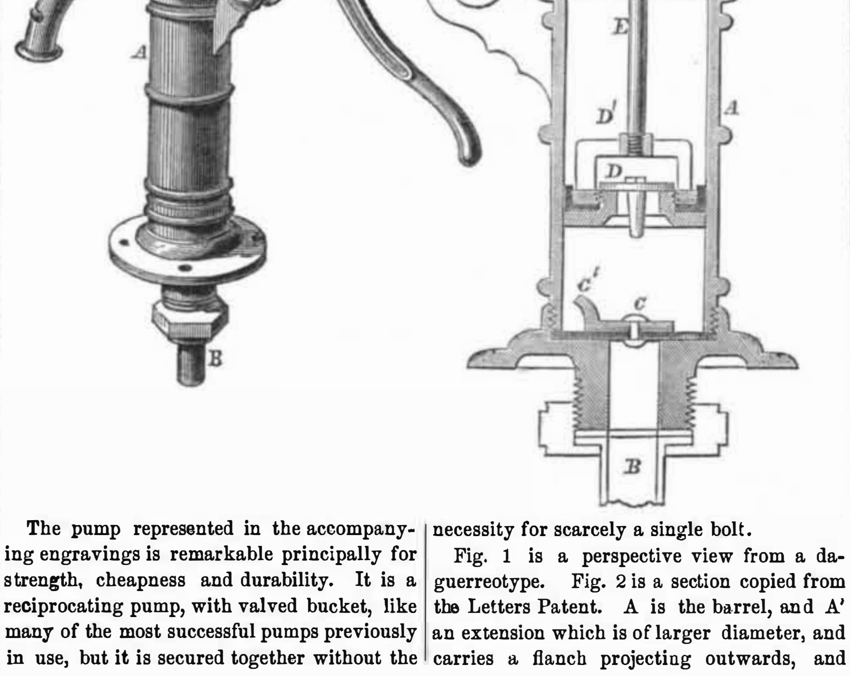
HEWIT'S DIRECT MOTION PUMP.



and allow the water to rise from M to fill the space. Whichever direction, therefore, the bucket, B, is moved, the water rises from N into M, and proceeds almost directly therefrom, either through B' or D, to be discharged from the tube, B'', and finally through the pipe or goose neck, I.

The pump was patented May 19, 1857. For further information address the inventor and patentee, Silas Hewit, Seneca Falls, N. Y.

LEWIS' SUCTION AND FORCE PUMP.



The pump represented in the accompanying engravings is remarkable principally for strength, cheapness and durability. It is a reciprocating pump, with valved bucket, like many of the most successful pumps previously in use, but it is secured together without the necessity for scarcely a single bolt.

Fig. 1 is a perspective view from a daguerreotype. Fig. 2 is a section copied from the Letters Patent. A is the barrel, and A' an extension which is of larger diameter, and carries a flanch projecting outwards, and a broad horn or flanch, T, extending partially around its interior, and projecting inward. B is the suction pipe secured by a screw coupling. C is the lower valve, hinged with leather, which latter is fastened by screwing down the body upon the flange which forms the base. C' is a horn which prevents its opening too far. D is the upper valve which guards the opening in the movable bucket. D' is a guard which prevents D rising too high, and also confines the cup-leather which forms the packing of the bucket. E is the pump rod. F is a top-piece resting on a leather or rubber joint on the flange, A'. This is held down very firmly by the gland, I, which is fitted with a tight joint on the top of G, and which is tapped into H, so as to form the stuffing box, J, as represented. From the lower edge of H extend two stout horns or partial flanges, S S.

On fitting up the pump, the barrel A is secured in place, the bucket D and pump rod E inserted, and the piece, H, slipped over the latter. The piece, H, is turned partly around, so that the parts S catch under the parts, T, and then supporting it by raising the bucket and guard by the rod E to its highest extent, the part F is fitted on, and the part I inserted and screwed into J as tightly as possible. The whole is now firm without other fastenings, the construction being highly ingenious and economical.

G represents the passage through which the water is discharged. L represents the handle, and M the fulcrum. In all points relating to the operation, the pump is identical with all the pumps of this class.

It was patented June 23, 1857, by C. N. Lewis, of Seneca Falls, N. Y. For further particulars, address the assignee, G. C. King, of the same place.

Relation of Inventions.

The London *Critic*, noticing a recent invention of apparently little consequence, uses the following well chosen simile:—

"Let every development of thought, and every adaptation of thought, be encouraged and welcomed, even though its ultimate uses —we mean those uses which the man of the day can see—were as distant as gravitation and lunar distances from the conic sections of the Baconic school of geometers, which were ready to hand when wanted. Those who decry the highest stone because it supports nothing, are fortunate in one point—they will always have something to decry. Those who are busy in raising the next stone, will find them another job at the very instant the old one is finished."

Printing Textile Fabrics by Light.

The chromatic photo-printing process is an ingenious mode of printing textile fabrics, by the chemical action of light. It is designed to employ the chemical agency of light in dyeing or staining textile fabrics; the cloth, whether wool, silk, flax or cotton, being first steeped in a suitable solution, then dried in the dark, and subsequently exposed to the action of light—those parts which are to form the pattern being protected by pieces of darkened paper, or some other suitable material, attached to a plate of glass. When the desired effect is produced—the time for which varies from two to twenty minutes, according to the process, the fabric is removed in order to undergo a fixing operation.

Steam Wagon.

In the course of the present week it is expected that the steam wagon in course of construction at Sacramento City will be ready for the trial trip. As we have already stated, a joint stock company has been organized for the construction of several of these wagons, to be placed on different routes in various parts of the State. Every one who has seen the operations of the model steam wagon must have been convinced of its utility.—*San Francisco Globe, July* 20.

Use of Strychnine in Distilleries.

The physician of the House of Correction, at Lawrence, Mass., reports it almost impossible to treat delirium tremens successfully now, in consequence of the utter prostration of the nervous system of drunkards by the strychnine so generally used in the manufacture of liquors.