Sugar from Sorghum.

In reply to a correspondent who asked for the best process for causing sorghum sirup to crystallize so as to make sugar, we give the following by Stewart: "At the close of the boiling, transfer the cooler to the crystalizing room. Here two modes of treatment are to be pursued to suit the kind of product to be obtained. By the first method, a fair, yellow sugar, of a quality equal to that of the ordinary brown sugar of commerce, is the result. By the second, white sugar, or any grade intervening between it and the crude article, may be obtained. As a pre-requisite to success by either method, the crystallizing and draining rooms should be uniformly heated to a temperature of not less than 80° Fah. To secure this, a close room is needed, opening by a door into another apartment instead of by an outside door. The crystallizing vessels should be roughed along the sides and a stove placed in the center. Crystallization and drainage should be performed in the same vessels, and their form should be such as to conduce to both these ends. 1. Crude sugar of good quality and large grain will uniformly result from well defecated sirup of the proper density, at a temperature of 80° to 90° Fah., by means of slow crystallization and natural drainage. The vessels should be shallow to admit of the speedy downward passage of the molasses through the crystallized mass, and their bottoms should be inclined sufficiently to secure its rapid transmission to a common outlet. They should be of a uniform size, and, in order to secure a large grained crystallization, should be made moderately large. Vessels conforming to these requirements may be of various forms; but for convenience and general efficiency I give the preference to a form of vessel which the experience of nearly a century has not modified for the better. I refer to Dutrone's crystallizing box, thus described by himself: 'Experience has proved to me that the quantity of matter which combines the greatest number of advantages in the crystallization of cane sugar is fifteen or sixteen cubic feet, for which reason the dimensions given to the crystallizing vessels are five feet in length by three feet in breadth. The bottom is formed of two planes, inclined six inches, the intersection of which forms a groove in the middle. If this groove are twelve or fifteen holes of an inch in diameter, to permit the sirup to flow out. The depth is nine inches at the sides and fifteen inches at the center. The vessels should be made of boards one inch thick, and lined with lead' (or better, coated heavily with iron paint). 'Before lining it, the holes should be bored in the groove, and burnt out with a hot iron from the inside, so as to form a small cavity surrounding the hole, in consequence of which not a drop of sirup will remain after draining.' Such vessels combine every possible advantage in crystallizing and purging with the requisite strength. 'The crystallizing vessels rest upon strips of wood two inches thick and three inches broad, which are fastened to and supported by upright posts eight or ten inches high, at the distance, laterally, of ten inches from the middle line. Troughs connecting with a cistern on a lower level receive the molasses as it drips from the sugar.' These vessels, when filled to within 3 inches of the top, will hold about 75 gallons of sirup for granulation, weighing nearly 1,000 lbs., of which one half, or 500 lbs., will be good dry sugar. The depth of the crystallizing mass in the boxes may sometimes be diminished to 3 inches at the sides, where the bottom is most elevated, and 9 inches in the center, when there is reason to apprehend any difficulty of drainage by reason of the presence of an undue amount of grape sugar, or otherwise. After the molasses has all drained out, this depth will be much diminished, and the large surface of sugar exposed permits it to dry speedily. The number of these boxes that will be required will of course depend upon the amount of work to be done, and the length of time that must elapse before they can be refilled and used again. Two weeks is as short a time as can be reckoned upon for the completion of the crystallization and drainage. It will be found that one of these vessels will be required for each 450 or 500 gallons of juice delivered by the mill during that period. Close the openings in the bottom of the box with long, smooth, wooden plugs, abruptly pointed, which may be allowed to project through the holes into the inside of the box two or three inches. Range the boxes in order on the supporting rack, around the side of the room and over the dripping troughs, which are so arranged as to convey the molasses into a pointed wooden or tin gutter, and thence into a cistern. The dripping troughs may be simply short open conductors of the same materials. In twenty-four hours after the thick sirup has been passed into the crystallizing box from the cooler, the formation of crystals of small size will generally have commenced. They may then be seen along the edges of the yet liquid mass, but on the bottom of the box they will be found in the greatest abundance, and may be detached and brought to the surface at the shallow sides of the box, by means of a knife blade or the wooden scraper, which should always be at hand. The last-named implement is simply a long paddle of ash or hickory wood, with a stout handle and thin blade. With this the fine crystals should be loosened from the bottom and sides and stirred into the mass so as to distribute them as equally as possible through it, that they may act as nuclei for the formation of larger crystals. Generally in twenty-four hours after this operation, and often in less time, the crystallization will have pervaded the entire mass. When this is found to be so, then gently withdraw the stoppers and permit the molasses to drain. The sugar will be dry in ten days or less thereafter. It may then be shoveled into boxes or barrels, and the crystallizing boxes refilled."

Notes & Queries

H. C. S. will find directions for molding rubber on p. 283, vol. 29.—E. M. G. will find a recipe for soldering brass on p. 364, vol. 29.—F. W. Z. can find a recipe for a copper dip for iron on p. 90, vol. 31.—C. C. can cement glass to tin by using the preparation described on p. 298, vol. 30.—J. B. can measure the cylinder of his engine by the formula given on p. 16, vol. 29, and by that on p. 54, vol. 30.—R. H. H. can fasten rubber to rubber by using the cement described on p. 203, vol. 30.—J. J. F. will find directions for silvering glass on p. 234, vol. 30.—M. W. H. will find a description of mica on p. 88, vol. 24.—C. E. G. will find directions for stereotyping on p. 363, vol. 30.—N. L. F. can remove paint from window panes by the method described on p. 83, vol. 32.—T. J. C. can blue guns by the process given on p. 123, vol. 31.—F. W. will find directions for molding from living objects on p. 58, vol. 24.

(1) J. E. E. asks: What degree of heat will a diamond bear without injury? Diamonds are said to be destroyed at about 14° Wedgewood or 1,820° Fahrenheit, but they vary in hardness. What would be the effect of a cherry red heat upon a very hard diamond? Would it have a tendency to soften it? What heat will cause a diamond to crack and chip off on the outer surface? A. Heat would not soften a diamond, neither would the stone crystallize at extremely high temperature. Heated intensely, it would burn and be converted into carbonic acid gas, an exceedingly small residue being left behind.

(2) J. J. asks: Will a slit extending from top to bottom in the glass chimney of a lamp be a preventive from breaking by partial rapid expansion or contraction? A. Yes. 2 Do you think a slit would impair combustion? A. No. 3. Does glass require tempering or annealing before leaving the factory? A. Yes.

(3) A. A. F. says: I have tried your recipe for staining wood to a black walnut color, as follows: Water 1 gallon, washing soda ½ oz., chromate of potash ¼ oz. This will not make a stain. It settles at the bottom; and after standing a few moments the water becomes almost clear. A. We have tried this stain and had no difficulty in obtaining a very fine stain, perfectly counterfeiting the color of black walnut. The settling or precipitation of your solution is due probably to impurities in the chemicals or water used. Separate your water into two portions, in one of which dissolve the soda and in the other the bichromate of potash. The solution of soda should be perfectly clear; and when added to the other solution, it should impart a bright yellow color to it. The wood should be steeped in this solution for about one hour, or until the desired shade is obtained. A gentle heat will hasten the process.

(4) M. H. K. asks: What is the kind and character of change that takes place in white of egg when beaten from the shell into a stiff froth? A. The continued beating causes the albumen to become aerated, or mixed with a large quantity of air bubbles.

How can I make a stamp or press, out of other material than wood, to quickly press and shape a lump of butter to fill the table butter dish? A. There is no material, to our knowledge, that will answer the purpose so well as wood.

1. How can I polish a pearl, found in an oyster? A. Try rouge powder. 2. Have such pearls any value compared with others? A. They have no commercial value.

(5) F. W. H. asks: Is rottenstone and linseed oil good for repolishing a piano? A. The rottenstone is used as a polishing powder, the linseed oil to cleanse the surface after having been polished. They are not mixed together.

How can I prepare glue, so as to use without heating? A. Dissolve the best isinglass in the strongest (glacial) acetic acid.

(6) C. R. S. B. says: I curl my hair with a thin gum arabic water. Is it injurious? A. It is of no benefit, and probably of no more injury to the hair than the use of too much water, rendering the hair stiff and dry. 2. What is good to prevent the hair from falling out? A. See p. 363, vol. 31.

(7) E. B. says: I have some elder wine which last summer turned sour, but not sour enough for vinegar. I added ½ pint alcohol to the gallon when made. How can I make vinegar of it, fit for the table? A. Add to it a little yeast, or mother of vinegar, which will hasten fermentation.

(8) W. C. says: I have a lot of molded sandstone, saturated with coal oil. How shall I take the oil out? A. Heating to a moderate temperature might be tried, if practicable. Sometimes chalk and magnesia are used to absorb and extract oil stains.

(9) A. M. F. asks: How can a harmless substance be magnetically polarized, to convey into the human system the positive or negative forces, so as to circulate in the blood and so through every part and atom of the body? A. There is not, to our knowledge, anything that is susceptible of magnetic polarization that may be taken into the system in the way you describe.

(10) E. B. J. asks: 1. What can be added to tobacco that will cause the odor of the smoke to smell sweet? A. Try lavender. 2. Can it be made pleasant by passing the smoke through perfumed water or alcohol? A. No.

(11) B. S. asks: What is the behavior of potassium and sodium, and similar metals, in absolute or nearly absolute (95°) alcohol? A. When sodium or potassium is added gradually to absolute alcohol, a brisk action occurs, the temperature rises rapidly, and the metal is dissolved; while an extrication of pure hydrogen takes place, and a fusible, crystalizable, deliquescent compound is formed, which has received the name of sodium alcohol (or potassium alcohol) or of ethylate of soda (or of potash].

(12) W. E. says: I have tried many recipes for tinning articles made of cast iron, some of which are malleable; the last I tried was: "Cover the articles in a solution of sal ammoniac, then dip them in melted tin," but it would not work. A. The operation only succeeds well when the surface of the metal to be tinned is quite free from oxide, and when during the operation the oxidation of the molten tin is prevented. The former requisite is attained by the use of dilute acids, rubbing and scouring with sand, pumicestone, etc. the latter condition, by the use of either rosin or sal ammoniac, both of which cause the reduction of any oxide that may be formed. The objects intended to be tinned are heated nearly to the melting point of tin; they are then dipped into a vessel containing the molten metal, and rubbed with a piece of hemp over which some sal ammoniac is strewn. Pins, hooks and eyes, small buttons, and similar objects are tinned by being boiled in a tinned boiler filled with water, granulated tin, and some cream of tartar. The tinned objects are dried by being rubbed with sawdust or bran. In the manufacture of tinned sheet iron, technically termed tin plate, the iron must first be thoroughly scoured, so as to present a clean metallic surface, and then immersed in baths of molten tin covered by a layer of molten tallow to prevent the oxidation of the metal. On being removed from the tin bath the sheets are immersed in a bath of molten tallow to remove any excess of tin, wiped with a brush made of hemp, next cleaned with bran, and packed.

(13) S. N. M. says, in reply to O. H., who asks: What is the force of blow of the pile of a pile driver, whose weight is 100 lbs., falling 20 feet? "Force is any cause which moves or tends to move a body. Weight is the measure of the force of gravity. Momentum is the quantity of motion, the impetus, the force with which one body strikes another, and is equal to the weight × velocity." This must be the force of the blow of the pile driver. To find the time of falling, equal to $\sqrt{20}$ feet $+ 16\frac{1}{2} =$ 1·115 seconds. To find the velocity $= 1{\cdot}115 \times 32\frac{1}{6} =$ 35·861 feet per second. Therefore, $35{\cdot}861 \times 100 = 3586{\cdot}1$ lbs. = the force of the blow. If there be any demonstrable error in the above, I shall be pleased to learn it. I conceive it possible that it may be said that the momentum is not the same as the force of the blow, estimated in pounds. A. The definition of momentum, given above, that it is the force with which one body strikes another, is incorrect; and indeed, this definition is ordinarily given incorrectly, in elementary works on mechanics. The force of the blow of a pile driver, as we understand it, is a certain weight which would produce, by steady pressure, the same effect as the falling body. The amount of the weight can only be ascertained by experiment.

(14) C. J. L. asks: How can I electrotype from an iron solution instead of copper? A. Use the protosulphate or neutral chloride of iron, a single battery cell, and an iron positive pole.

(15) J. C. C. asks: Have dispatches ever been successfully transmitted on the same wire in both directions at the same time? A. Yes. The Western Union Telegraph Company has been successfully using Stearns' method of sending two messages over the same wire at the same time for several years past.

(16) C. A. C. asks: Will you please explain the process of electrotyping, and the kind of metal used? A. An impression of the objects which you desire to reproduce is first taken in gutta percha or wax, which is then covered with plumbago by brushing with a camel hair brush. The impression is then attached by a wire to the zinc pole of a weakly charged Daniell cell, and a copper plate is attached by a wire to the copper pole of a battery. The impression and copper plate are then dipped into a strong solution of sulphate of copper, when the copper of the solution will begin to deposit itself on the impression, first at the black-leaded surface in the vicinity of the connecting wire; then it will gradually creep over the whole conducting surface. It is usual to keep the impression in the solution for about 24 hours, when the copper deposited on it will have formed a tolerably strong plate, which can be easily removed from the wax. On the side of the plate next the matrix, will be found a perfect copy of the original object.

(17) L.W.asks: In a galvanic pile composed of copper and zinc plates, 4 inches square, how many pairs would it take to produce a shock that would be felt? A. One hundred pairs would produce a perceptible shock.

(18) T. J. W. asks: Is it twelve o'clock when the clock strikes the first stroke, or when it strikes the twelfth? A. As a general thing, a clock indicates the hour of twelve at the first stroke.

(19) R. K. asks: What is the objection to driving ferrules in boiler tubes, or to caulking the tubes, when the boiler is full of water? A. It cannot be ordinarily done with safety and convenience.

(20) C. R. asks: Which is the most powerful wheel, the overshot or the turbine? A. The following data may be accepted as generally correct for the average performance of the different kinds of wheels: Percentage of the power of the water that is utilized by the wheels: Overshot and breast wheels from 75 to 80, undershot wheels from 40 to 60, turbines from 60 to 80.

(21) E. E. E. asks: Will cast iron make a safe head on which to put four cutters for a wood molding machine, the heads to be from 2 to 6 inches across and 6 inches square, with 1¼ holes in center for shaft? The shaft is to revolve at the rate of from four to six thousand per minute. A. Possibly, but wrought iron or steel would be preferable.

(22) W. H. F. asks: Can you give me the rule for determining the electromotive force necessary to overcome a given resistance? For instance, on a line of say 100 miles, having a resistance of about 1,500 ohms, how many Daniell's cells would be required to operate it satisfactorily? A. Much depends upon the size of the wire, its insulation, and the delicacy of the receiving instruments used. Assuming the wire to be of No. 8 gage, the insulation of the Kenosha pattern, and the instruments Morse relays of 150 ohms resistance, 50 cells would be sufficient.

(23) J. C. G. asks: What tools and materials would a person need to make small working models of steam engines? A. A lathe, a small planer, and a good vise bench, with hammer, files, chisels, center punch, scribers, etc.

(24) W. P. says: I inclose some indicator cards from the compound engine that I run in a flour mill. What do you think of them? A. They appear to be very fair. We would be glad to receive from you a brief account of the performance of the engine, giving average power exerted, consumption of fuel, water, oil, and any other matters of interest that you can furnish.

(25) S. B. H. says: You recommend heating wire ropes. All the wire rope that I ever saw had a small piece of rope in the middle, for the purpose of making it pliable. as I suppose. Would not the heating of the rope red hot injure the hemp? A. Wire rope is made with either a wire or hemp center, according to the wishes of the purchaser. Our correspondent's question implied that his rope had an iron center.

(26) J. D. asks: Will it add to the power of an engine to increase the length of cylinder from 12 to 16 inches, and proportion all other parts to the increased length of cylinder, the number of revolutions and the pressure of steam remaining the same as it did on the 12 inch cylinder? A. The power will be increased if the alteration is made.

(27) R. M. R. says: On p. 27, vol. 32, I find this question (No. 64): "At what speed would an engine, having 2 inches bore and 4½ inches stroke, drive a boat 18 feet long, 5 feet wide, and drawing 6 inches of water? The engine will have 100 revolutions per minute and 50 lbs. steam." You reply: "The engine would be entirely too small to give a satisfactory result, unless a much higher pressure of steam and greater piston speed were employed." Would not such an engine have at least one man power under the conditions named? If so, the engine ought to be able to do as much work as a boy of fourteen could do: pull such a boat with a pair of oars at about 3 miles an hour. I have often done this when I was about fourteen. If a screw loses so much of the power as to make the engine less powerful than a small boy, why did you not advise F. C. R. to connect a long cylinder with a pair of oars, or construct a machine to work oars? A. As you surmise, one man power applied to the screw of a small boat would be entirely too small, on account of the loss from friction and slip. If you have any plan for a boat with steam oars, which you have proved by experiment to be more economical and satisfactory than the ordinary modes of propulsion, we will be glad to hear from you again.

(28) W. & B. ask: Is tannate of soda safe to use in all cases, for removing scales from boilers? A. Try it.

Is superheating of steam any advantage in economy of fuel, and is it safe? A. This depends upon the manner in which you are using your steam. It is safe, if properly done.

(29) A. F. A. asks: Has the coefficient of expansion of hard rubber been determined? A. We do not remember ever having seen it, and would be glad to hear from any of our readers who may have information on the subject.

(30) J. G. says: I have just set an 8 foot by 34 inches tubular steam boiler for running engine and heating building. The inspector says that it should be run with water within 6 inches of the top (over 3 solid gages) to save the tubes from unequal expansion; while I contend that there should be at least 16 inches steam space, 2½ gages water, to have dry steam and work to the best advantage. Which is right? A. It is common to carry water in such boilers from 2 to 4 inches above the top row of tubes.

(31) C. S. D. asks: Does a column of water flowing to a hydraulic ram through a pipe twenty feet long, inclined at an angle, with a vertical fall of ten feet, give more force than flowing through a ten foot pipe attached to the ram in a vertical position? A. No.

(32) J. H. P. says: A bell has been placed in a church spire, but only a heavy and strong man can ring it. A. says that if the bell be hung higher in the yoke it will ring more easily, and the tongue will strike heavier and louder. B admits the former but maintains that the tongue will strike with less power and consequently emit less sound. Which is correct? A. The question cannot be answered, positively, without more data. If the bell is raised in the yoke, it can be moved more easily, but it will be necessary to swing the yoke through a greater angle in the same time as before to produce the same sound. Hence the ringer will have to work more quickly than before.

What should be the length and width of an iron wedge two inches thick, to be used for splitting wood? If it be too long, it will bend in crooked-grained wood. If too short, it will fly back when driven into frozen wood. If too wide, it will drive hard. If too narrow, it will merely displace the wood without splitting. Should the faces of the wedge be plane surfaces with sharp corners, or oval, like those of an ax with rounded corners? A. It would seem to be better to have different wedges for the several kinds of wood. They are commonly forged, not finished, with sharp corners.

(33) H. A. H. asks: Would a wire, cut or grooved out like the threads of a bolt, cut wood readily? A. Not unless it was tempered and had a cutter at the end, which would change it into a common auger.

(34) K. asks: If steam at 100 lbs. per inch be confined in a certain area and the area be doubled, what will be the pressure in the enlarged area? In other words, what is the elasticity of steam? A. The pressure varies nearly inversely as the volume. You will find precise formulas, which are somewhat complicated, in any good treatise on heat.

(35) T. E. L. says: I notice that you state in your answer to B. L. H. that the pressure is greatest at the bottom of a boiler. This being the case, why is it that an injector will supply a boiler? A. On account of the difference in area of the steam pipe and orifice through which the water is forced, the velocity of the steam is greater than that of the water; so that steam at boiler pressure, moving at a high velocity, can overcome a much greater pressure if the resistance moves at a less velocity. Similar action takes place in the case of a lever where a small weight moving fast raises a large one moving slow. It can also be observed in an ordinary system of ropes and pulleys, and in numerous other instances, which will doubtless occur to you.

(36) W. C. R. asks: If I take a cylinder with an outlet and stopcock to it, and compress air in it to a pressure of 100 lbs. to the square inch, and put it on a small boat, and then open the stopcock, letting the air escape, the air on the outside traveling in the same direction, and at the same speed as that coming out of the cylinder, will it propel the boat? I say it will not, as there is no reaction. A friend of mine claims that it will. Which is right? A. Your friend.

(37) J. A. H. says: 1. T. L. maintains that if you half fill a boiler with cold water, disconnect the pump (if any be attached) and heat up to 130 lbs. pressure, all the water will be turned into steam, in other words, there will be no water in the boiler by the time it reaches 130 lbs. pressure. I say that this is wrong, and that only a small portion of the water will be turned into steam, which steam occupies that portion of the boiler not occupied by the water. Which is right? A. You are. 2. T. L. says that if you take a hollow cylinder or other vessel of sufficient size to contain 1,000 gallons gas in a liquid state (not 1,000 gallons liquid), force gas into it under proper conditions until it is full of liquefied gas, then draw off 500 gallons gas, that the remaining 500 gallons (less the quantity evolved into gas to full space above liquid) in the vessel will not and cannot be in the liquid state. I say it can be in the liquid state under such conditions, and will be in such an instance, provided the exhaustion of 500 gallons of gas has not reduced the pressure below the pressure at which the gas liquefies. Who is right? A. You are. 3. He further maintains that if you take any vessel, half fill it with fluid and raise the internal pressure to 150 lbs. per square inch (either by heat, pumping in air, or the efforts of a liquefied gas to reassume the gaseous condition) you cannot hear such fluid shake and gurgle if you agitate or shake the vessel; in other words that, if there be any fluid in such vessel under such pressure, it will not change position by turning the vessel upside down and other movements. I say he is wrong. Who is right? A. You are.

(38) J. G. P. asks: Is there any invention to facilitate the safety of treasure in case of fire or foundering of a vessel at sea? Could not a large floating preserver be made and placed in the ship with the treasure enclosed, and, when found necessary, be given to the waves with better hopes of recovery than if it went down with the ship? A. The idea is quite practicable, and is, we think, practised. Your turbine device would not work.

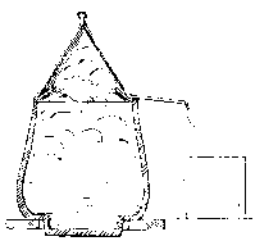
(39) W. A. N. asks: How is linseed oil manufactured? A. By cold pressure in a mill. Sometimes the seed is roasted first to destroy a gummy matter in the outer envelopes. This frees the oil from mucilage, but renders it more acrid and higher in color than the cold process, which, however, should be used in preparing oil for medicinal purposes. The residue (oil cake) is a most valuable food for cattle.

(40) J. S. B. says: The following is a good recipe for welding cast steel: Take copperas 2 ozs., saltpeter 1 oz., common salt 6 ozs., black oxide of manganese 1 oz., prussiate of potash 1 oz.; pulverize and mix with welding sand, 3 lbs. Use it in the same way as you would sand.

(41) C. F. asks: 1. From what substance is methylic ether made? A. Methylic ether or oxide of methyl is obtained by distilling 1 part of pyroxylic spirit and 4 parts of oil of vitriol; a colored gas (homologous with ethylic ether) is disengaged. It is accompanied with carbonic and sulphurous acids, which may be removed by allowing the gaseous mixture to stand 24 hours in contact with slacked lime. The gas is liquefiable at a temperature of —33°, and boils at —6° (Berthelot). 2. What ether is mostly used in the manufacture of artificial ice? A. Ethylic or vinic ether, sometimes called sulphuric ether.

(42) F. G. H. asks: 1. What is nitroglycerin made of? A. Nitroglycerin is a compound formed by the action of a mixture of highly concentrated nitric and sulphuric acids for a few minutes on glycerin. 2. Can the ingredients be mixed in one or two seconds, so as to be ready for use? A. No; the manufacture requires great care and careful watching.

(43) J. H. asks: How can I make distilled water? A. By boiling water and condensing the steam in a tube or coil of block tin pipe surrounded by cold water. Another way is by using the little device shown in the engraving, in which the steam condenses inside the conical cover, and descends the same, being caught by a projecting gutter and conveyed to the spout. A cloth kept wet with cold water on the top will facilitate the condensation.



(44) W. R. B. says: 1. In your issue of August 26, 1874, I see a description of a new light for photographers, which is produced by passing hydrogen through iodide of ethyl in which zinc has been digested. Will you explain what iodide of ethyl is? A. In order to prepare this ether, 100 parts of alcohol are placed in a retort, and a small amount of iodine is introduced; phosphorus is added in small quantities until the liquid becomes colorless; a fresh portion of iodine is then added, and then a fresh quantity of phosphorus, until about 200 parts of iodine and 2 or 3 parts of phosphorus have been added. The mixture thus obtained must be cooled by immersing the bulb of the retort after each addition in cold water, otherwise a large proportion of the phosphorus will become converted into the red variety, which is not susceptible of being attacked by the iodine at low temperatures. After the reaction has terminated, the liquid is distilled by the heat of a water bath, taking care that the iodine (as shown by its brown color) is in slight excess. The distillate should be washed with water, digested on chloride of calcium, and redistilled. 2. Is metallic zinc meant? A. Yes. 3. Is there anything dangerous about this light in careful hands? A. No.

(45) P. D. asks: Is there any process by which an amethyst can be restored to its original color after being heated? A. Not if the color has been destroyed.

(46) E. B. G. says: In drilling into rock which forms the pavement of coal, I struck a vein of water, which soon turned to a deep red color, and tasted strongly of alum. Is there probably alum in it? A. It was probably colored by suspended oxide of iron, and contained compounds derived from the pyrites, etc., analagous to the sulphate contained in alum.

(47) A. T. asks: How can I take impressions from sunk lines on copper plates? A. Obtain a fine copper plate ink from a reputable maker, dab on the (warm) plate with a rolled flannel, wipe the plate quickly with a soft leather and then with the palm of the hand. The ink should be stiff enough to remain in the engraved lines, although the surface of plate is perfectly cleaned as described. Print by heavy pressure between rollers.

(48) W. J. L. asks: Can carbon gas be liquefied by any known process, and what are the means? A. Carbon gas is rather an indefinite term; carbonic acid gas can be liquefied. Take bicarbonate of soda with water and place it in a strong wrought iron bottle, together with a narrow pot nearly full of sulphuric acid. The bottle is closed by a screw plug, and then agitated so as to shake the acid out of its pot, and bring it in contact with the carbonate. The great pressure produced by the evolving gas condenses the carbonic acid to the liquid form. Carbonic oxide, however, has resisted all efforts for its liquefaction. Marsh gas ($C H_4$) a combination of carbon and hydrogen, is, next to hydrogen, the lightest of known substances. It has resisted all efforts of cold and pressure to liquefy it. Ethylene (C_2H_4) was condensed to a liquid by Faraday. Coal gas is a mixture of gaseous compounds given off by coals. It consists of, in 100 parts: Hydrogen 45·58 (cannot be liquefied), marsh gas 34·90 (cannot be liquefied), carbonic oxide 6·64 (cannot be liquefied), ethylene 4·08 (can be liquefied), butylene 2·38 (can be liquefied), sulphuretted hydrogen 0·29 (can be liquefied at a pressure of 17 atmospheres), nitrogen 2·46 (cannot be liquefied), carbonic acid 3·67 (can be liquefied). This analysis is of the gas supplied to the city of Manchester, England.

(49) O. L. asks: 1. Is aluminum worked in this country? A. It is not. The metal which comes into this country is mostly manufactured in France. There have been several manufactories in France, namely, at Salyndres and Amfreville, and one in England, at Washington, county Durham. 2. Can you give the process of extracting it from clay? A. The metal has not, as yet, been profitably extracted from ordinary clay (silicate of aluminum); the nearest approach to it has been the process of Professor Rose, of Berlin, who first used cryolite, which is a compound of the double fluorides of aluminum and sodium. This mineral, being treated at a high temperature with sodium, yields aluminum and fluoride of sodium, and the latter, treated with quicklime, yields caustic soda and fluoride of calcium. Aluminum is also obtained from bauxite, native hydrate of alumina, which, having been previously mixed with common salt and coal tar, is next heated in an iron retort with chlorine gas, the result being the formation of carbonic oxide, and the double chloride of aluminum and sodium, which volatilizes, and is condensed in a reservoir lined with glazed tiles. The salt so obtained contained iron, and consequently the aluminum derived from it is alloyed with that metal. The double chloride of aluminum and sodium is converted into metallic aluminum by being heated in a reverberatory furnace with sodium, while the aluminum is set free. A slag is formed, consisting of the double salt with excess of chloride of sodium. 3. If aluminum can be readily worked, why is it not in common use? A. Aluminum is now not so much in use; when first introduced, aluminum jewelry was much employed. The metal is at present more usefully employed for small weights, light tubes for optical instruments, and to some extent for surgical instruments. The price, however, of this metal ($1.50 per oz.) is too high to admit of its extended use.

(50) W. G. C. asks: 1. What kind of ink is used for machine ruling? A. Any good fluid ink will do. Dilute with water to the required tint, and add ox gall to prevent the ink running, and to hasten drying. 2. What kind of pens are used? A. They are cut out of very thin brass by a tool constructed for the purpose. 3. Is a blotting roller used after the paper passes from the pens or points? A. No.

(51) P. O T. asks: What is the nature of manganese? A. Manganese is a combination of oxygen, 36·7 per cent, with metallic manganese, 63·3 per cent. It usually occurs in deposits, being frequently associated with ores of iron. If the ore is good, it is fit for use directly. It is extensively mined in Thuringia, Moravia, and Prussia. It is common in Devonshire, Somersetshire, and Aberdeenshire in Great Britain. It is found in various parts of Vermont, also in Massachusetts, Connecticut, and other parts of the United States, New Brunswick and Nova Scotia. The pure article is sold in New York at from 10 to 15 cents per lb.

(52) A. B. P. asks: How can I prepare paper for cartridges so that the explosion of the cap will ignite the powder without first opening the cartridge? A. Cartridges of this kind are made by enclosing the fulminating powder between disks of hard, stiff paper in the head of the cartridges.

(53) J. H. K. asks: How can mildew, stains, etc., be removed from gold lace? A. For this purpose, no alkaline liquors are to be used; for while they clean the gold, they corrode the silk, and change or discharge its color. Soap also alters the shade, and even the species, of certain colors. But spirit of wine may be used without any danger of its injuring either color or quality, and, in many cases, proves as effectual for restoring the luster of the gold as the corrosive detergents. But though the spirit of wine is the most innocent material employed for this purpose, it is not in all cases proper. The golden covering may be in some places worn off, or the base metal, with which it has been alloyed, may be corroded by the air, so as to have the particles of gold disunited, while the silver underneath, tarnished to a yellow hue, may continue of a tolerable color; so it is apparent that the removal of the tarnish would be prejudicial, and make the lace less like gold than it was before.

(54) N. J. P. asks: What is bleaching powder? A. It is commonly called chloride of lime. It is made by passing chlorine gas over moistened lime. It is a moist grayish powder, and is soluble in 10 parts of water, any excess of hydrate of lime remaining undissolved. It deteriorates by keeping; when freshly made, it may contain 30 per cent of chlorine, but often has less than 10 per cent. It is decomposed by acids, yielding chlorine. It consists of hypochlorite of lime and chloride of calcium, with water and excess of lime. It is used for bleaching, and as a disinfectant. We do not understand your other question.

(55) J. G. C. says: I doubt very much if A. W. B. ever kept cider sweet in the way he mentions. If the fermentation is not checked, it will inevitably turn to vinegar. I have been advised to strain the cider through sand, as it comes from the press into the barrel, so as to get it free from as much impurity as possible; put the barrel in a cool place, taking care not to freeze it, leave the bung out a few days till the most violent of the fermentation has taken place, then bung it up tight bore a small gimlet hole near the bung, and put in a spile; watch it closely, and once in three or four days draw the spile, so as to relieve the pressure on the cask, otherwise it may burst. Judgment must be used in the matter, and the time must be lengthened gradually for giving vent; finally leave it to itself; and in the following February, if you wish to bottle it, take a clear, cool day for the operation, use good strong bottles and the best of corks, and drive them in with a wooden mallet, first softening them with a cork squeezer. By putting a moderate sized lump of the best white sugar into each bottle, it will tend to make it more sprightly. The bottled cider must be kept in a cool place. The later in the year that cider is made, the better it will keep.

(56) A. K. says, in reply to J. C. & Co., who ask as to why millers steam their wheat before grinding: There are several good reasons for this. The first reason is that it improves the quality of the flour and increases the yield. It also makes a broader bran, proving what I have already said; for if you can make a broad bran, you will evidently have less of it to contend with in your bolts. In fact, it puts the whole system of milling in a superior condition for manufacturing a choice article of flour. Some millers object to steaming

on the ground that it requires more dressing of stones, and they have ample reason for making this their standpoint. In very dry and cold weather, when there is trouble in keeping up the grade of flour, steaming serves instead of rain or thaw. We can do better milling when the weather is moist and damp.

(57) W. T. B. says, in reply to H. D., who asks how to get rid of red spiders: The minute insect known to florists as red spider is usually of a bright red color, though some are brown and others almost green. They seem to increase most rapidly in a dry, hot atmosphere, and upon plants that are not growing well, or that have been allowed to suffer for lack of water at the roots. They infest the under side of the leaves, and apparently shun the light; but when very numerous, they may be found upon all parts of the leaves and stem. The upper part of the leaf, opposite where the insects are at work, becomes light colored and dusty looking. In greenhouses, they are most troublesome in the warmest part of the house; but I have seen them in a house where the temperature was allowed to fall to 40° at night, and also on plants growing in the garden. I would suggest the following treatment: Syringe the plants freely with water once or twice a day, taking care to wet the under side of the leaves. Keep the air of the room moist, by setting pans of water on the flues, heating pipes, or register; give all the light possible, and ventilate freely whenever the weather will permit. When the soil is dry, give sufficient water to moisten all the soil in the pot; and water no more until the surface is dry again. If plants seem stunted or sickly, re-pot them in fresh, rich soil, or use some other means to induce a healthy growth. The red spider is anything but an aquatic insect, and will yield to the hydropathic treatment, if it is persisted in.

(58) A. H. says: E. S. S. can season his croquet balls after they are turned by brushing them over with linseed oil, then baking them in the oven (slowly at first) to get the oil into the pores of the wood, repeating the oil coating three or four times, and then storing them away for the oil to dry. This will not only keep them from checking, but will make them waterproof and keep them from rotting. Last winter I made some plane handles out of a piece of a plum tree, 5 inches in diameter, those treated with oil stood the sun's rays without the least check; the others, not oiled, checked so as to make them useless.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

H. D. P.—Having subjected your sample of paper to the usual tests, we failed to discover the presence of arsenic.—J. T.—Your box contained but one specimen, a piece of basaltic rock, the only value of which would be in building.—W. M. I.—It is a fossil coral.—A. B. H.—It is galena, containing 85 per cent of lead and 15 of sulphur.—S. M.—It is quartz grains, yellow mica, black mica, and fragments of augite, which is a silicate of lime, magnesia, iron, and alumina, but is of no value in the arts.—P. B.—It is a superior red oxide of iron. We have known several specimens to contain as high as 70 per cent of iron. It will make red paint and, if in sufficient quantities, will be a valuable ore of iron.—H. P. E.—No. 1 is quartz grains, colored red with oxide of iron, and mixed with small crystals of black mica. No. 2 is the same as No. 1, but with yellowish mica also. No. 3 is quartz rock with yellow mica. No. 4 is the same as No. 2, with more quartz. No. 5 is similar to No. 3.—R. E. M.—It is asphalt. You have already a knowledge of its valuable qualities. It is a highly bituminous asphalt, capable of yielding illuminating gases and oils, and of being used as a paint. You have only to develop the deposit.—E. T. D.—It is garnet in mica schist.—N. S. S.—It is garnet. The crystaline form is the rhombic dodecahedron, and belongs to the variety of garnet called the iron-alumina garnet, which is common.—A. J. R.—It is difficult to determine the value of stones from such small specimens. If you will send us a stone of the proper dimensions (3 inches thick), and finished on one surface, we will give it a practical trial.—H. L. H.—No. 1 is a quartz rock containing scales of yellow mica, of no value. No. 2 is quartz rock with some iron, but too little to be worth working. No. 3 is a crystal of aragonite, which is carbonate of lime.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Canal Towage. By R. B. C., and by W. R. W.
On Filling Teeth. By A. H. B., and by J. C. C.
On Springs as Motors. By M. W. P.
On the Patent Office. By O. P. S.
On Furnaces and Flues. By H. M. S.
On Anointing in Cases of Fever. By R. P.
On a New Lamp. By D. D. N.
On a New Bridge. By J. A. P.
On Spiritualism. By H. M., and by F. S.
On Lacing Belts. By R. G.

Also enquiries and answers from the following:

J. P. W.—N. C. P.—J. H. K.—J. S. B.—W. X. Y.—H. M.—T. F. M.—J. S. E.—T.—W. S. D.—H.—F. G. S.—E. A.—S.—J. E. E.—W. C. B.—S. D.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of enquiries analogous to the following are sent: "Who makes steam cracker-making machinery? Who deals in old coins? Who makes sample trunks? Who publishes works on the construction of lights for lighthouses? Where are the best carpenter's tools to be obtained?" All such personal enquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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January 5, 1875,

AND EACH BEARING THAT DATE.

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7,969.—DESK.—W. T. Bromwell, St. Louis, Mo.
7,970 to 7,976.—CARPETS.—R. R. Campbell, Lowell, Mass.
7,977 to 7,981.—CARPETS.—J. M. Christie, Kidderminster, England.
7,982.—SIDE OF CASE.—J. E. Hunter, N. Adams, Mass.
7,983, 7984.—CARPETS.—C. S. Lilley, Lowell, Mass.
7,985.—CARPET.—C. W. Swapp, Lowell, Mass.
7,986.—CARPET.—R. Allan, Yonkers, N. Y.
7,987.—SMOKING PIPE.—I. Demuth, New York city.
7,988.—BOTTLE.—E. R. Durkee, Brooklyn, N. Y.
7,989 to 7,991.—CARPETS.—E. Petit, Paris, France.
7,992.—NURSING BOTTLE.—V. H. Smith, Philadelphia, Pa.

TRADE MARKS REGISTERED.

2,150.—YEAST CAKES.—Amer. Y. Co., Fond du Lac, Wis.
2,151.—CIGARS.—Freedman & Co., Detroit, Mich.
2,152.—NECKTIES.—Hellenberg *et al.*, New York city.
2,153.—OIL.—W. E. Jervey, New Orleans, La.
2,154.—TOBACCO POUCHES.—Novelty Co., New York city.
2,155.—CIGARS.—S. Lowenthal & Co., Cincinnati, Ohio.
2,156.—PLAYING CARDS.—V. E. Mauger, New York city
2,157.—FELON CURE.—W. H. Puffer, Athol, Mass.
2,158.—SHIRTS.—Bullock Man. Co., Bridgeport, Conn.

SCHEDULE OF PATENT FEES.

On each Caveat $10
On each Trade mark $25
On filing each application for a Patent (17 years) $15
On issuing each original Patent $20
On appeal to Examiners-in-Chief $10
On appeal to Commissioner of Patents $20
On application for Reissue $30
On filing a Disclaimer $10
On an application for Design (3½ years) $10
On application for Design (7 years) $15
On application for Design (14 years) $30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA, JANUARY 7 to JANUARY 8, 1874.

1,217.—H. J. Wattles, Toronto City, Ont. Improvements on a machine for washing vegetables, called "Wattles' Vegetable Washer." Jan. 7, 1875.

1,218.—J. R. Smith, Brockville, Leeds and Grenville counties, Ont. Improvements on clothes wringers, called "The Victor Clothes Wringer." Jan. 7, 1875.

1,219.—C. A. Terrey, Southwark, Surrey county, England. Improvements on setting diamonds in drills and cutting tools, called "Terrey's Diamond Cap." Jan. 7, 1875.

1,220.—J. A. Stockwell, Lynn, Essex county, Mass., U. S. Improvements on boots and shoes, called "Stockwell's Combined Toe Guard and Half Sole for Boots and Shoes." Jan. 7, 1875.

1,221.—J. C. and C. J. Sturgeon, Erie, Erie county, Pa., U. S. Improvements in lawn mowers and harvesters, called "Sturgeon's Improved Lawn Mower and Harvester." Jan. 7, 1875.

1,222.—J. Lennerton, Princeport, Colchester county, Nova Scotia. Machine for making tree nail wedges, called Lennerton's Tree Nail Wedge Machine." Jan. 7, 1875.

1,223.—J. W. Elliott, Toronto City, Ont. Machine for the external application of croton oil, etc., called "Elliott's Counter-Irritant." Jan. 7, 1875.

1,224.—J. Vessot and S. Vessot, Jr., Joliette, Joliette county, P. Q. Améliorations an sémoir et herse combinés, dits "Le sémoir, herse, et rouleau combinés de J. & S. Vessot." Jan. 5, 1875. Improvement in combined harrow and sowing machine.

1,225.—R. B. Anderson and M. Anderson, Sackville, New Brunswick, Canada. Improvement on gentleman's scarf, called "Anderson's Improved Scarf or Necktie Holder." Jan. 7, 1875.

1,226.—G. W. McNeil, Akron, Summit county, Ohio, U. S. Improvements on wheat scourers, called "McNeil's Wheat Scourer." Jan. 7, 1875.

1,227.—R. Cobleigh, Chester, Windsor county, Vt., U. S. Improvements in carriages for children, called "Cobleigh's Improved Children's Carriage." Jan. 7, 1875.

1,228.—J. Telfer, Toronto City, Ont. Improvements on lamp-holding attachment to sewing machines, called "Telfer's Lamp Holding Attachment to Sewing Machines." Jan. 7, 1875.

1,229.—E. Mercier, Springfield, Hampden county, Mass., M. Lanctot, Jersey City, Hudson county, N. J., D. H. Elliott, New York city, U. S. Improvement on railway switch, called "Mercier's Railway Switch." Jan. 7, 1875.

1,230.—Wm. S. Wooton, J. G. Blake, and H. H. Fulton, all of Indianapolis, Marion county, Ind., U. S. Improvements on secretaries, called "Wooton's Secretary." Jan. 7, 1875.

1,231.—R. M. Wanzer, Hamilton county, assignee of J. Jamison, same place. Improvements in sewing machines, called "The Wanzer B." Jan. 7, 1870.

1,232.—Wm. Cochrane, La Fayette, Tippecanoe county, Ind., U. S. Improvements on harvesting machines, called "Cochrane's Harvester." Jan. 7, 1875.

1,233.—S. Paling, Woodstock, Oxford county, Ont. 1st extension, No. 598, on "The Ontario Balanced Window Blind." Jan. 7, 1875.

1,234.—S. Paling, Woodstock, Oxford county, Ont. 2d extension, No. 598, on "The Ontario Balanced Window Blind." Jan. 9, 1875.

1,235.—H. A. Dierkes, New York city, N. Y., U. S. Improvements in hanging and operating bells, called "Dierke's Improvements in Hanging and Operating Bells." Jan. 8, 1875.

1,236.—J. M. and C. T. Schramm, Pontoosuc, Hancock county, Ill., U. S. Improvements in the shingling of roofs, called "Schramm & Sons' Improvement in the Shingling of Roofs." Jan. 8, 1875.

1,237.—J. L. Massie, Cowansville, Missisquoi county, P. Q. Improvements in heaters, called "Massie's Improved Heater." Jan. 8, 1875.

1,238.—C. H. Miller, Buffalo, Erie county, N. Y., U. S. Improvements in wooden pavements, called "Miller's Improved Wooden Pavement." Jan. 8, 1875.

1,239.—J. C. Codyé, Windsor, Essex county, Mass., U. S. Improvements in water filters, called "Codyé's Excelsior Water Filter." Jan. 8, 1875.

1,240.—L. A. Powers, Meriden, New Haven county, Conn., U. S. Improvements on rakes, called "Powers' Rake." Jan. 8, 1875.

1,241.—W. S. Von Essen, Hamburgh, Germany. Improvements on apparatus for cleaning boiler tubes by steam, called "W. Von Essen's Steam Boiler Tube Cleaner." Jan. 8, 1875.

1,242.—W. A. Martin, London, England. Improvements on furnaces and furnace doors, called "Martin's Improvements on Furnace and Furnace Doors." Jan. 8, 1875.