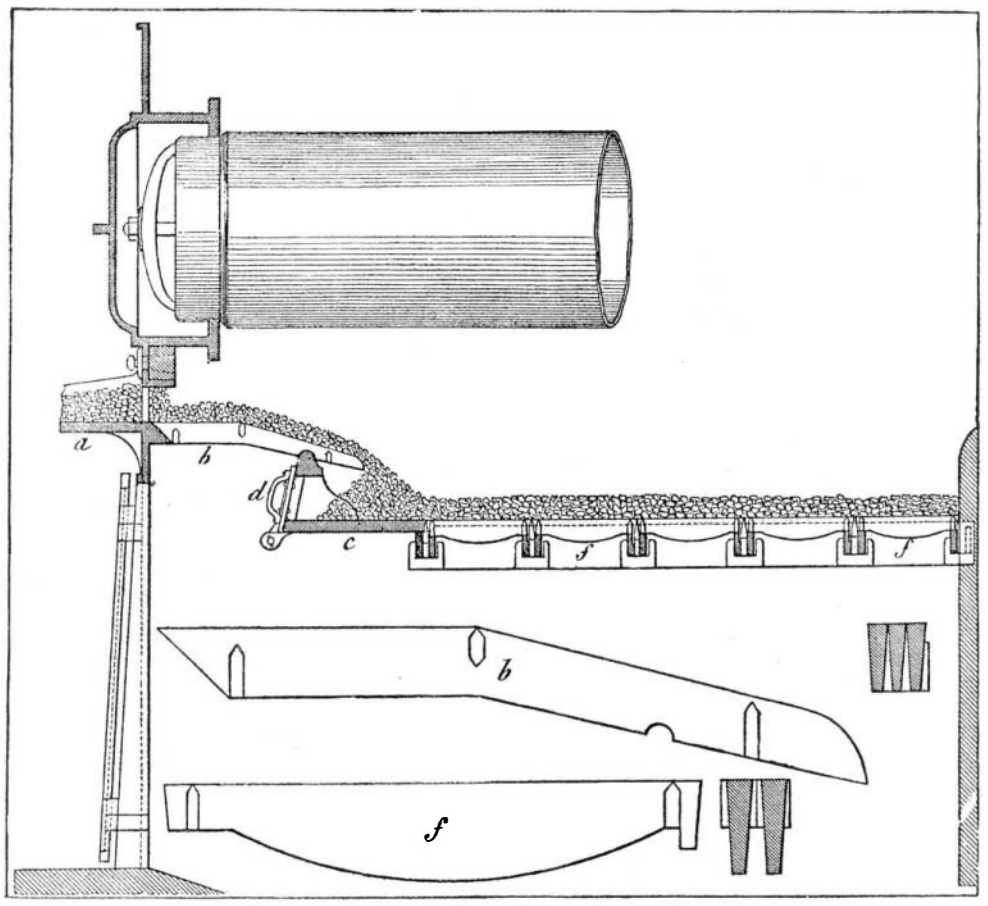
### NEW SMOKE-BURNING GRATE.

M. Jordan, of Augsburg, Germany, has recently devised the new smoke-burning grate illustrated in the annexed engraving. Instead of placing fresh coal directly on the fire, it is shoveled upon an exterior plate, *a*, in order that it may previously undergo a kind of dry distillation. From the plate, *a*, the fuel passes to a front grate, *b*, the inner part of which is inclined at an angle of 20°. From *b* the coal falls upon another plate, *c*, situated on a level with the main grate, and being inclined rearwardly upward at an angle of 7°. The aperture between the front grate and plate, *c*, is closed by hinged doors, which are preserved from over-heating by the unconsumed fuel in their rear, so that they may be easily opened and closed by hand.

In its journey from plate, *a*, to plate, *c*, the fuel disengages the greater part of its gaseous elements; and the latter, mixed with the air which penetrates the front grate, *b*, pass to the flame in the main grate, *f*, and are there completely consumed. The management of the main grate is effected through the doors, *d*, but one of which is opened at a time, so as not to cool the fire. The apparatus is said to be easily worked, and the fireman is not subjected to the radiant heat from the furnace.




JORDAN'S SMOKE-BURNING GRATE.

### Roquefort Cheese.

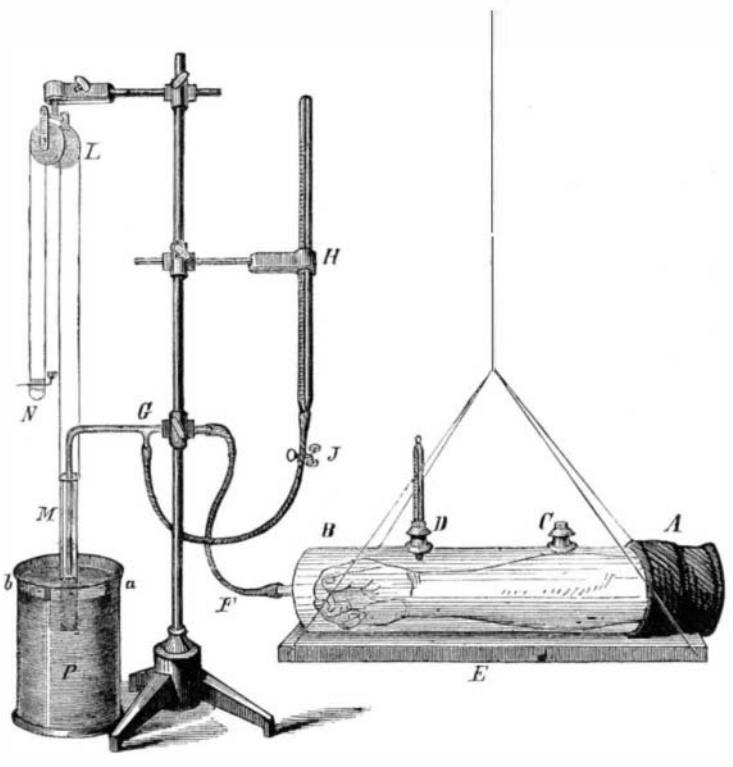
Probably few of our readers know what this very odorous cheese is made from. Its consumption has lately increased, says the London *Grocer*, in an enormous proportion. China itself, it appears, comes in for no mean part in consumption. France, of course, eats more Roquefort than any other nation; and England is acquiring a taste for it. The ewe's milk, from which it is made, is carefully preserved for the special manufacturing of Roquefort; 250,000 ewes furnish this milk, which is poured into large earthen basins, and slightly heated; it is then placed in molds under a slice of decayed bread, which promotes the formation of greenish tints; after which the cheeses are salted and piled up in cellars, where they are left for several months before they are edible; and even then it takes the American people some time to acquire the taste necessary for their proper appreciation.

### THE PLETHYSMOGRAPH.

Dr. A. Mosso, of Turin, says *La Nature*, from which we extract the annexed engraving, has devised a new method for measuring the movements of the blood vessels, which is destined to acquire very extended usage in physiological investigation and in clinical medicine. It consists in encircling with a rubber ring, A, any member of the body, as for instance the forearm, and inserting it in a glass cylinder, B, which is filled with tepid water. By means of a special apparatus is measured the quantity of water admitted or expelled through the opening, F, in said cylinder, by the contraction or dilation of the volume of the member. The cylinder rests on a plank, E, which is suspended by cords from the ceiling so as to prevent the involuntary movements of the body causing any motion of the arm in its receptacle.

In order to measure the water, the opening, F, communicates by a pipe with glass tube, G, which, bent at right angles, descends to the level, *a b*. A small test tube, M, suitably graduated, is suspended from a double pulley, L, and is equilibrated by the counterweight, N, to which is attached a pen which marks on an endless band of paper (not shown), caused to unroll before it by clockwork or other suitable mechanism. The test tube is so suspended that the pipe, G, is exactly in its axis. Supposing now that the vase, P, placed below the test tube, is filled with water, and that the vessels of the forearm dilate, increasing the volume of the member, a proportional quantity of water will then be expelled from cylinder, B, and will pass into the test tube, M. The latter will then sink in the vase beneath, and so will displace, in its turn, a quantity of liquid exactly equal to that which it has received. The counterweight, N, will of course rise, and obviously a contraction in volume of the arm will produce just the reverse result. In order that the pressure in the cylinder, B, may be constant, it is necessary that the water level in M shall always be in the plane, *a b*, of the liquid in the vase, P To avoid displacements of these levels, a mixture of alcohol and water, of less density than water alone, is used in the vase. With this precaution the test tube may fill and empty, rise and descend, without its variation in weight causing any disturbance of the levels, the cylinder pressure thus remaining invariable.

By using two plethysmographs, Dr. Mosso has obtained pen traces representing the varying volumes of the forearms, the pulse of the carotid, and, in general, valuable physiological data leading to the demonstration of the most important phenomena of the blood vessels. He has been able to make researches on the causes of sleep and the action of substances which favor or hinder the same. One curious result noted is that all the minor emotions translate themselves into modification of the state of the blood vessels. The mere entry of a person, interesting to the individual whose arm was being experimented upon, produced a diminution of volume in the member of from 0·25 to 0·75 cubic inch. The work of the brain, during the solution of any difficult problem, is said also to be always accompanied by a contraction of the vessels, proportionate to the effort of thought and to the cerebral activity. Dr. Mosso, says our contemporary, has opened a new field in experimental therapeutics, in giving us a most convenient method for studying the direct action of remedies on the human economy.




THE PLETHYSMOGRAPH.

### Home-Made Cherry Brandy.

As the cherry season is now at hand, the following description, from the *British Trade Journal*, of how Swiss peasants make cherry brandy will doubtless prove interesting to those possessing large quantities of the fruit and desiring a possibly profitable utilization for a portion of their crop. The soft red-stalked black cherries are principally used, and are gathered as soon as they are ripe. They are preserved in open barrels during fermentation, when the fermenting cherries rise just to the top and form a comparatively thick covering over the cherry liquor: as soon as fermentation has ceased, they sink again to the bottom, and are entirely covered by the liquor. The carbonic acid gas usually escapes with violent precipitation. When the weather is warm, this stormy flight ceases after a few days, but only very gradually; and then, if the manufacturer does not wish to enter into the process of distillation immediately, the cask is hermetically closed. As a rule, distillation is postponed to the winter, not, however, for want of time, but principally because in the meanwhile the cherry brandy acquires a bitter taste, which is the result of the fermentation of the kernels of the cherry stones. This bitter taste is considered of such importance that in some places the cherry stones are specially taken out and pressed, and the results are then infused into the pure liquor.

Distillation among the peasants is effected by means of copper kettles, which have big hollow handles and one or two vapor-diverting pipes. The kettles, in consequence of the rise of the fermenting product, are never quite filled. They are very slowly heated, as their contents easily catch fire, and the brandy possesses the best taste when it has been gradually drawn off at a medium temperature This process in the preparation of the *kirschwasser*, as it is called, is managed by professional distillers. The cooling apparatus is generally nothing more than a stone or wooden reservoir into which the icy waters of a spring continually flow, and through which run one or more pipes (communicating with the still) in an oblique direction from top to bottom. Great care is taken that the distilled liquor is well cooled, as otherwise its quality very perceptibly suffers. That portion which runs over—the so-called precipitate—is carefully collected and poured back into the kettle in order to prevent the ether, of which it is partly composed, from concentrating in any one portion of the cherry brandy before the entire mass is properly boiled: perhaps also to prevent the cherry brandy from accumulating verdigris. When, towards the end of the process, the fluid is not found to possess the necessary strength—a *statu quo* which practised distillers can easily detect by the manner in which the atmospheric bubbles rise to the top when shaken—it is specially drawn off and mixed with the next cask. In large distilleries the process is conducted by steam.

### Setting Flower Cuttings.

A practical florist gives the following directions for setting cuttings: A healthy plant should be selected, and strong-looking woody pieces cut off: these, with a blossom on the end, rarely fail. Trim off the large leaves and put them in water for a few hours or a day. Cuttings of ivy (*tradescantia*), wandering jew, canary bird flower (*tropæolum peregrinum*), and oleander, should be started in water and kept in water, in the shade, until a little root appears. Each cutting should have a good sized pot, or several cuttings can be put in a wooden box. The best soil for amateurs to use is half good earth and half white sand, well mixed; water well and keep in the shade, but not in damp, until the cuttings have taken, then give full sun. Transplanting geraniums requires skill. An amateur should use pots and keep the geraniums in them, sinking the pots in summer; and if the earth is not rich, they can be watered with fertilizers in winter. A five inch pot will do for a geranium for a year.

### The Pictet Ice Machine.

Anhydrous sulphurous a cid, $SO_2$, is liquid under the atmospheric pressure at a temperature of 14° Fah., and does not give a pressure exceeding four atmospheres for a temperature of 95° Fah. It has no action on metals, or on grease, is not combustible, and at the same time is not expensive. A new ice machine has been devised by M. Raoul Pictet, to produce cold by using anhydrous sulphurous acid.

The experiment which has given the best results, for a type of machine capable of manufacturing 550 lbs. of ice per hour, may be described as follows:

A tubular cylindrical copper boiler, 6 feet 6¾ inches long by 13⅘ inches diameter, is traversed longitudinally by 150 tubes of $\frac{13}{32}$ inch diameter, which are welded at their extremities to each end of the boiler or refrigerator. The vessel is placed horizontally in a large sheet iron vat containing one hundred boxes of $5\frac{28}{100}$ gallons of water. An anti-freezing liquid (salt water) is constantly driven into the interior of the refrigerator by means of a screw. This liquid cools to about 19·5° Fah. for ordinary working, and in returning washes against the sides of the box in which is the water to be frozen. In the reserved space between the refrigerator tubes, the liquid sulphurous acid is evaporated, and its vapors are drawn by a force and suction pump, which compresses them in the condenser. This condenser is a tubular boiler identical with the refrigerator, with this exception, that a current of ordinary water continually passes and repasses through the interior of the tubes to carry off the heat produced by the change from a gaseous to a liquid state of the sulphurous acid by the work of compression. A tube, with a stopcock regulated by hand once for all, allows the liquid sulphurous acid to return to the refrigerator to be again volatilized. The anhydrous sulphurous acid has the exceptionally advantageous property of being an excellent lubricator, so that the solid metallic piston working in the cylinder of the forcing pump does not need oiling. Thus introduction

of foreign matter into the apparatus becomes impossible. The force necessary for manufacturing 550 lbs. of ice per hour is at the outside 7 horse power. A temperature of 19·5° Fah. in the bath is more than sufficient for obtaining in the boxes a rapid and entirely economical freezing. The cost of making ice by this process is estimated at $2 per tun.

### THE CENTENNIAL HORTICULTURAL BUILDING.

On the front page of this issue we publish an engraving of the interior of Horticultural Hall, a building which will be, to many visitors, the most attractive section of the Exhibition. The lightness and airiness of the structure and the beauty and variety of its contents, added to the fact that all their attractiveness is the work of Nature, will certainly secure a large share of the attention of many visitors. The noble palms shown in our engraving, are, many of them, new to this country; and there is, in nearly every department of floriculture and arboriculture, a good selection of native and foreign species. One hundred species are forwarded from Jamaica alone, all of them rare and interesting, many of which have never been in this country. The ferns indigenous to the United States also number one hundred varieties. Moreover, the following interesting and valuable plants will be shown, growing in the soil, and blossoming and bearing fruit: Ginger, pimento or allspice, nutmeg, alligator pear, bamboo, sarsaparilla, Liberian coffee, yam, cashew nut, *lignum vitæ*, teak, Indian or China grass, betel nut, tea. Also, specimens of the pawpaw, mammee apple, mango, black pepper, indigo, breadfruit, and noseberry. A few beautiful specimens of the orchid may also be found in the west wing of this building.

### Illustrations of the Centennial.

We give on our front page an elegant illustration of the interior of Horticultural Hall, for which we are indebted to *Harper's Weekly*. We will take this occasion to say that the picture of the Woman's Pavilion and New Jersey building, given in our number for June 3, were also from that journal, credit for which was inadvertently omitted at the time of publication. The arrangements of the Messrs. Harper for the illustration of the Exhibition have been made on a most extensive scale, regardless of cost, and the numbers of their popular weekly teem with artistic productions of the highest merit.

## Correspondence.

### The Extraction of Gold.

*To the Editor of the Scientific American:*

The variety of the elementary bodies found in ores of the precious metals renders it extremely difficult to furnish any single formula that will in all cases meet the requirement of the metallurgist; but a large class of placer gold and auriferous ores will admit of treatment by the following process, which may, by slight alteration, be made to suit others.

Gold is generally found in Nature accompanied by other metals; and those are often in combination with other elementary bodies, such as sulphur and tellurium, in variable proportions. These are subject to decomposition by the action of oxygen, or water, or carbon; in the change, sulphuretted hydrogen is generated, and perhaps a union with sulphur and carbon is effected. The former is readily absorbed by gold, communicating to it a negative quality as regards mercury, forming what is called unamalgamable or rusty gold. The ordinary amalgamating process takes up a large part of the coarse gold. This favorable condition is due to its greater specific gravity, which favors superficial cleaning by the attrition received, while it presents less surface of the gold to chemical action. The finer particles escape amalgamation.

A quantitative analysis of the tailings at any of the quartz mills or placer washings will determine the difference of the assay value and the amount obtained by the mills; and the difference between the two estimates will excite some surprise. To obviate some of the inconveniences above mentioned has long been desirable, and resort has been had to other methods of treatment. Smelting, one of the most perfect processes for the reduction of metals, is unfortunately one of the most costly, and therefore cannot be employed in case of poor ores. The next in importance is the chlorination process, the invention of the celebrated metallurgist Plattner, of Freiburg, Germany. This process presents advantages of economy which have caused it to be adopted in California and elsewhere; yet unfortunately it entails certain conditions, difficult to comply with in many cases, which greatly impair its value. It is necessary that the ore should be free from most of the base metals and earthy bases. The weak attraction for oxygen and want of stability of the former, and the absorption of chlorine by the latter, will defeat the object in view. Under the most favorable conditions, very great skill and attention are necessary to insure success. To avoid the cost of smelting, and the restrictions narrowing the sphere of usefulness of the chlorination process, the following process has been devised:

The auriferous sulphides or fine sulphurets are roasted in the ordinary reverberatory or other furnaces, under the conditions commonly employed. The sulphurous vapors arising are passed through a broad-based chimney, partially filled with ore, rock, or coke, of egg size or thereabouts, resting upon a grating. A small stream of water is introduced and allowed to impinge on the top, and will percolate through the whole mass. The water arrives at the bottom highly charged with sulphurous acid from the ascending vapors; this acid may be converted into sulphuric by the use of hyponitric acid in a similar chimney arrangement. After roasting, the ore may consist of sulphate, sulphide, and oxide of iron, copper, etc. If the roasted ore is treated to a warm solution of dilute sulphuric acid, as above mentioned, there will result the following reaction: $FeS + HO, SO_3 = HS + FeO\ SO_3$. The sulphuretted hydrogen passes off as vapor; the iron sulphate and other soluble salts, if present, may be leached out. The insoluble salts remaining with the gold exert no action in separation by mercury. The addition of a little caustic lime at end of the process, excluding it as much as possible from atmospheric influence, will give rise to the formation of the hydrated protoxide of iron, a powerful deoxidizer, which acts by keeping both mercury and gold clean and active.

JOHN TUNBRIDGE.

Newark, N. J.

### Working Men's Reading Rooms.

*To the Editor of the Scientific American:*

I am happy to see that the working men have in you a true champion. They are to the country what his staples are to the farmer, to be relied on when other things fail; and it is in their behalf that I wish to speak.

Some time since I saw a reading room for working men suggested in your paper, and some of the towns in this vicinity have established such, to their benefit. Now there are many, perhaps hundreds, of working men, especially those employed in watch factories and the like, whose occupations during the day demand such a strain upon the eyesight that reading by lamplight is both difficult and injurious. There is also a class of working men whom my plan is more especially intended to help, namely, those whose limited education has not given them tastes which are calculated more to elevate character than to make money. A mechanic of the humbler class spends his life so much among the real, practical, and prosaic that, unless he has a very spiritual nature, he is apt to become coarse in his perceptions; and if he has no natural taste for instructive books, he will not be likely to acquire one in following his business. In almost every town, there are ladies and gentlemen who can spare at least one evening in the week, and who have enough literary talent to fill an interesting programme for an audience of working men, giving readings and addresses, which may be interspersed with music, thus making a pleasant and profitable evening for those who otherwise would find time hang heavily on their hands.

Many a workman who has yet to know what it is to receive wages that do not necessitate the strictest economy feels a pardonable hesitation in taking his family to any kind of meeting where broadcloth and velvet abound, and where people look askance at his worn clothes and hardened hands; but the entertainment I suggest would be his and his alone, and he and his fellow workers could meet thereat without restraint.

This suggestion is respectfully offered, not in opposition to that of the SCIENTIFIC AMERICAN, but to meet a want which that, in some instances, would not entirely cover. These ideas are, of course, subject to modifications; but I feel sure that such an institution, organized in any manufacturing town, would not be long in existence without a marked change for the better.

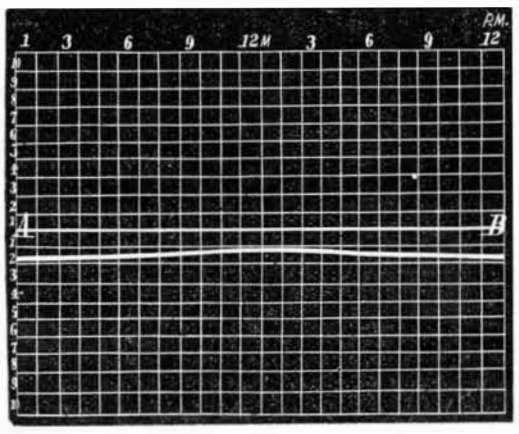
M. P. P.

Rockton, Ill.

### HOME-MADE PROBABILITIES.

We are indebted to an old and valued subscriber, Dr. Levings, of this city, for a suggestion which we think will be of much use to farmers. It is a modification of the plan recently adopted by the New York *Tribune*, for exhibiting, graphically, barometric fluctuations over a given time; and its object is to enable every farmer, by the aid of barometer and thermometer, to cast up his own weather probabilities.

A blackboard, say two feet wide by three feet long, is preferable, but a barn door will answer. On this is ruled the horizontal center line, AB, in the engraving, say in red paint; above and below this are ten horizontal divisions, and




the board is also divided vertically into twenty hour sections, numbered to represent the hours as shown. The red line marks a barometric hight of 30 inches, and the other horizontal lines tenths of inches above and below. It is evident that on this the course of barometric variation can be indicated by an irregular line. For example, our engraving shows that at 12 P. M. the instrument registered 29·82, 12 hours later it had risen to 29·88, then it declined to 29·84. The board thus prepared is hung at any convenient place, near the barometer; and at noon or at any other time, whoever may pass it has only to glance at the clock or his watch, look at the barometer, and carry on the line to mark the indication with a bit of chalk. Then in the evening, say, if the farmer is desirous of knowing whether the weather will be fine on the morrow, he merely glances at the board, and the direction of the line tells the story. Being only a chalk mark, the line is rubbed out and made over every day. By observing the weather following changes of barometer, the farmer can soon learn to interpret the indications. As a general rule, however, says the *Tribune*, when the curved line is above the line of mean pressure and varies but little, fair weather may be relied upon; but if there are sudden and excessive fluctuations, a northeasterly storm is likely to follow. The time of its approach is indicated by the frequency of the fluctuations, its violence by the excess of the movement. When the curve is below the line of mean pressure, uncertain weather, mainly from the southward, with increased temperature, will follow. A descent of the curved line from above to below the line (30) evinces a tendency from good to bad weather; while an ascent, from below to above it, points as unmistakably to pleasant weather, which may, however, not be of long continuance. The diagram is the measure for all storms likely to occur. The proportional distance above and below the central line marks the excess of changes. As temperature corresponding to barometric indications is also an aid to predicting the weather, a second board might be constructed to mark changes in the thermometer, and hung beside the one already described.

### Solvay's Ammonia Soda Process.

This new method of making soda ash from common salt seems likely to prove as great a success in practice as it is remarkable in theory. In technology revolutions take place slowly. Although this process was exhibited at the Vienna Exhibition and attracted a great deal of attention there, it has been slow in coming into practical use. Professor A. W Hofmann did not hesitate then to prophesy for it a brilliant future, but some details of the operation were not yet perfect, and, while capitalists hesitated to risk on a thing so new, old manufacturers fought it as their direst foe. The operation depends on a principle discovered a long time previous, namely: that bicarbonate of ammonia is able, under certain circumstances, to decompose the much more permanent compound, chloride of sodium, the result being chloride of ammonium and bicarbonate of soda. A patent was taken out in 1838, in England, for making soda ash in this way, but it seems not to have come into practical use.

E. Solvay took out several patents abroad, the first being in 1863. His method, we understand, as now employed, is nearly as follows: In one tank a saturated solution of common salt is first prepared, and then slightly diluted with water until it stands at 67° or 70°. This solution is then filtered and run into a second tank, and ammonia gas forced up through the brine in small bubbles, which are rapidly absorbed. When the brine has become saturated with ammonia gas and its density falls to 16°, it flows automatically into the third tank, first, however, passing through a worm placed in cold water to cool it. This third vessel, called the absorber, is the most important part of the apparatus, for it is here that the carbonic acid is admitted, which seems at first to combine with the ammonia to form a bicarbonate of ammonia, then, gaining fresh power, it attacks the chloride of sodium, driving out the acid and combining with the base. The operation may be represented thus; $(NH_4)HCO_3 + Na\ Cl = NH_4\ Cl + Na\ HCO_3$. The absorber is a cylinder 37 to 53 feet high, provided with numerous perforated, convexed, horizontal partitions, or false bottoms, with teeth-like openings around the edge. The absorber is filled with liquid and carbonic acid forced in at the bottom under 1½ to 2 atmospheres of pressure; and ascending, it comes into intimate contact with the liquid. The bicarbonate of soda collects as a crust on the false bottom. The liquor is frequently drawn off, and the absorber filled with water to dissolve the soda salt, which can then be evaporated in vacuo and the excess of carbonic acid driven off and caught in receivers for use a second time. The carbonate of soda resulting from calcining this bicarbonate is quite pure if the salt employed be pure, and is at all events free from sulphur, an ever-present and inavoidable contamination of crude soda ash made by the Leblanc process.

What becomes of the waste products? The chief by-product is, of course, chloride of ammonia, which by treatment with an alkali is decomposed, and the ammonia gas liberated for use over and over again. If quicklime be employed to decompose the sal ammoniac, the operation is as follows: $2NH_4Cl + Ca\ O, H_2O = Ca\ Cl_2 + 2NH_3 + 2H_2O$. The chloride of calcium thus obtained being an article of very little value, it is preferable to decompose the sal ammoniac by means of caustic magnesia, thus obtaining a chloride of magnesia, which can in turn be decomposed very readily by the action of steam into caustic magnesia and hydrochloric acid, the latter a valuable commercial article, the former for use again.

It will be seen that there is no waste, every product being utilized; and the question of practicability rests chiefly on the one question: Is bicarbonate of ammonia able to decompose all, or very nearly all, the chloride of sodium in the brine? Ordinarily, no; but under pressure and by a proper adjustment of conditions it seems to have become possible, else the success of the process reported abroad could not have been attained.

### Moths.

This is the period when moths begin to fly, and those who have not packed away winter garments and furs should lose no time in doing so. Beat the articles thoroughly, and expose them to bright sunlight and air for several hours. Seal them up in tight paper cases, or put them away in close trunks, with plenty of gum camphor, pepper, tobacco, chips of Russia leather, or cedar dust.

A GOOD cheap paint for rough woodwork is made of melted pitch 6 lbs., linseed oil 1 pint, brick dust 1 lb,