[*Continued from first page.*]

ser, and its refrigerator holds about 1,700 lbs. of oxide. The non-congealable liquid is a saturated solution of chloride of magnesium, which has given better results than the glycerin and water mixture. The tension of the oxide vapor varies from 14·7 to 13 lbs. about, and on the return stroke the gas is compressed to ¼ or ⅛ its original volume, having its temperature raised to 200° Fah. The cold water current reduces this temperature to about 61° at the outlet, and then, under the pressure of from 3 to 3½ atmospheres, the gas returns to liquid state. When the ice in the freezing boxes is formed, the workmen, by means of the crane shown in Fig. 1, which moves around an axis in the center of the large tank, lifts out the boxes one by one, and dips them in hot water, so that the block of ice within may become detached. The block is then removed and the box, replenished with fresh water, is replaced. The pressure in the condenser, we are informed, does not exceed 35 to 37 lbs. per square inch above atmospheric pressure—the average absolute steam pressure in the engine cylinder is 30 lbs. maximum. No difficulty is experienced in keeping tight joints, and the loss of oxide per week does not exceed ½ lb. The magnesium chloride or glycerin solution rarely needs renewal and is always cheap.

It is claimed that 1 lb. of acid by volatilization produces nearly 1 lb. of ice. From the apparatus illustrated in Fig. 1 the following data have been obtained: Average horse power of engine, 73 to 75, of which 23 horse power is used for the condensing pump, circulating pump, boiler feed pump, air pump, and acid pump. The quantity of ice produced was 18 to 20 tons in twenty-four hours; coal burned, 2⅓ tons per day; the average production of ice is claimed to be from 9 to 10 tons per ton of coal. The cakes of ice measure 12 inches by 6 inches by 36 inches, and weigh 83 lbs. each.

The following data show the inflammability and explosibility of various substances used in ice-making.

Names of substances used in ice-making.	Boiling point at atmospheric pressure in degrees Fahrenheit.	Pressure of vapor in lbs. per square inch at 65° Fahrenheit.	Specific gravity of liquid at 40° Fah. water = 1.	Specific gravity of vapor at 40° Fah. Air = 1.	Latent heat of vapor by equal weight.	Relative latent heat of vapor by equal volume.
Chymogene, gasolene, and other derivatives of petroleum*	30 to 50	12 to 17	0·6	3·9	170	663
Methylic ether*	—6	90		1·617	240	384
Ammonia†	—30	120	0·76	0·59	900	511
Anhydrous sulphurous oxide‡	14	52	1·49	2·25	170	392

*Inflammable and explosible. †Explosible. ‡Extinguishes combustion, not explosible.

The manufacturers furnish us the following estimate of maximum cost to produce 250 tons per day of 24 hours. Employees, $51.00; oxide, at 4 lbs. per week, 37 cents; oil, $2; coal, 22½ tons at $4.25 per ton, $105.63. Equivalent to 63⅜ cents per ton actual cost of manufacture.

Estimating capital at $250,000, and adding taxes, office expenses, wear and tear, insurance, etc., the total cost comes to $1.05 per ton of ice.

Attention is called to the advantage of the low boiling point of sulphurous oxide, which is 14 Fah. as compared with chymogene, which is 30° to 50°. Also the advantage of the pressure of vapor of the oxide at 65° Fah., namely, 52 lbs., instead of the very low pressure of chymogene, 12 to 17 lbs., which results constantly in the pumps using the latter working almost in a vacuum. The disadvantage on the other hand of the high pressure of ammonia is obvious.

For further information address the Pictet Artificial Ice Company, room 51 Coal and Iron Exchange Building, corner Courtlandt and Church streets, New York city.

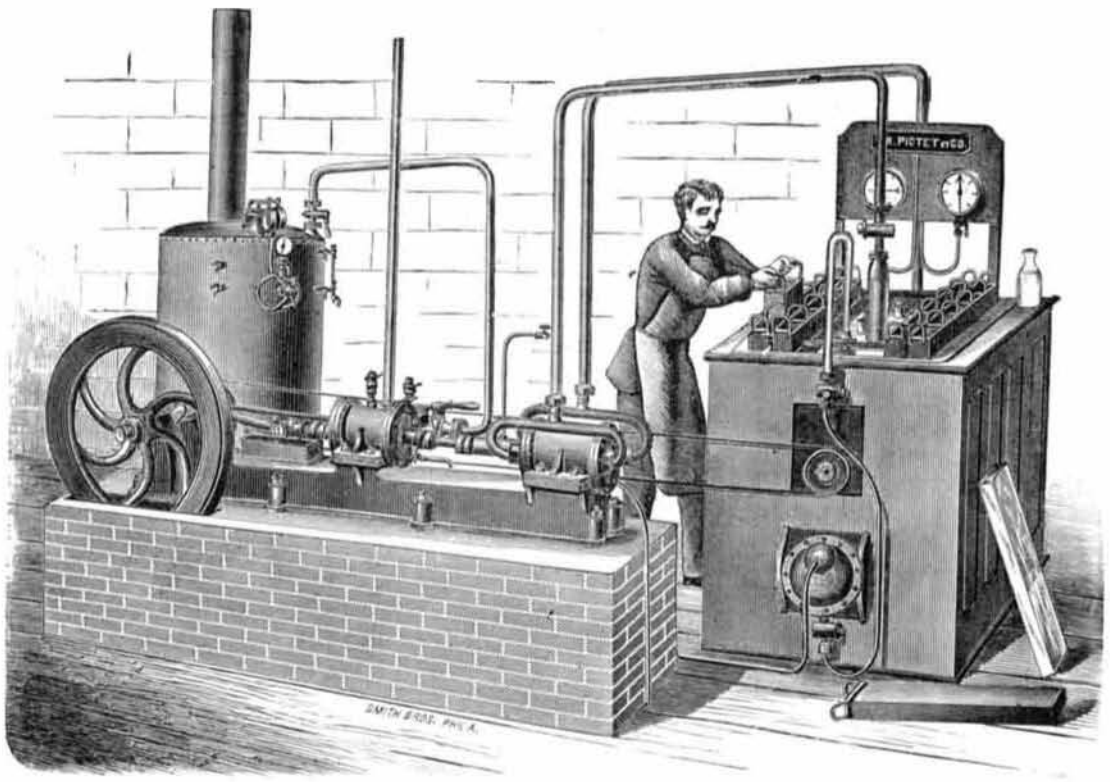


Fig. 3.—THE PICTET ARTIFICIAL ICE MACHINE.

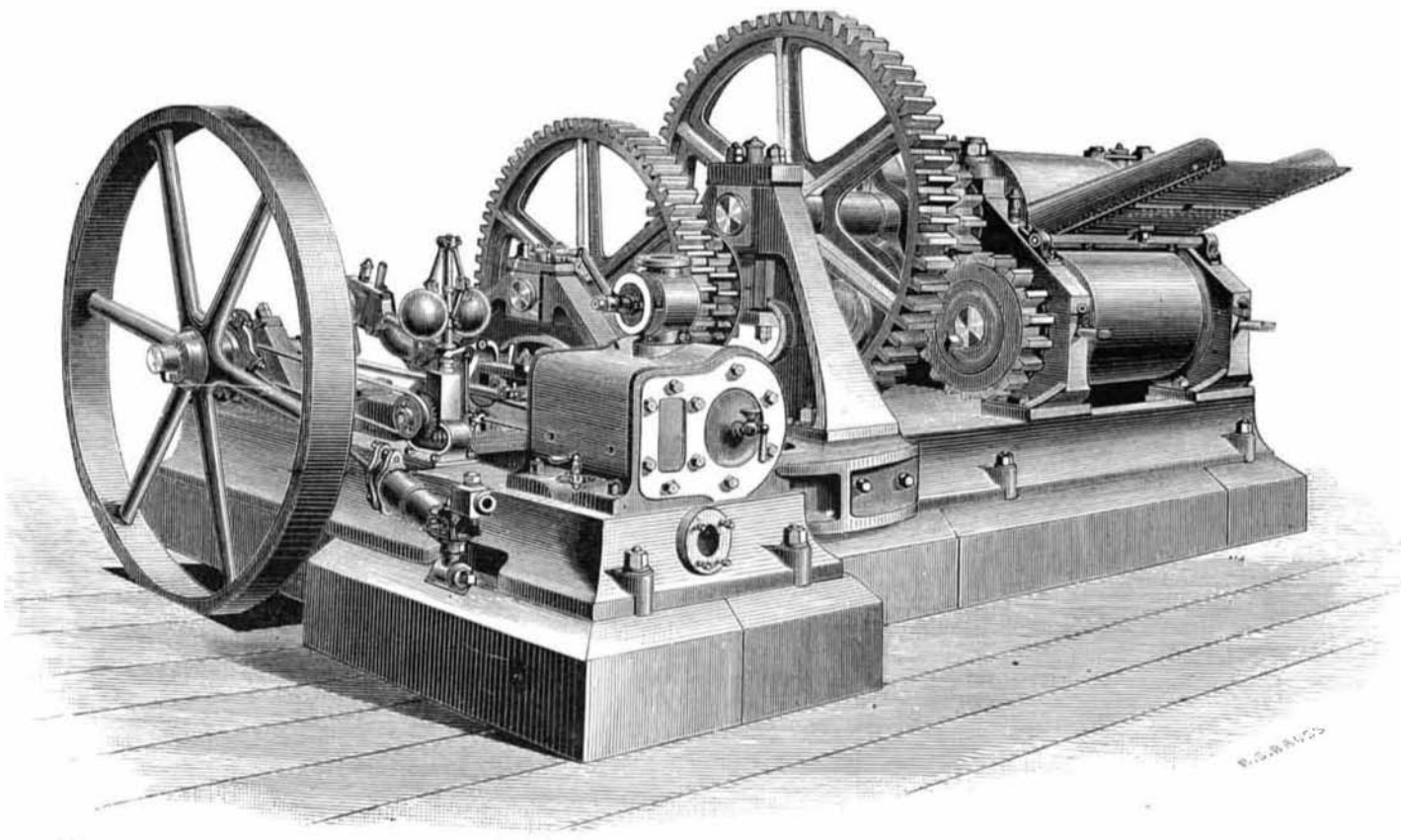
Keeping Fruit Fresh.

The following is said to be a good process for keeping fresh fruit through the winter: Mix rosin 2 lbs., tallow 2 ozs., beeswax 2 ozs., slowly over a fire in an iron pot, but do not boil. Rub each fruit separately with pulverized chalk and dip it in the mixture. Hold it up for a moment to permit the coating to set, and pack away carefully in a cool place.

COMBINED ENGINE AND SUGAR CANE GRINDING MILL.

We select from *Iron* the accompanying cut of a combined engine and sugar cane grinding mill, manufactured by Messrs. Robey & Co., of Lincoln, England.

The mill is especially designed for small plantations. The rollers are three in number and are placed horizontally, one over the other two. These rollers are 20 inches in diameter and 30 inches long, and are keyed on to their respective shafts. On one end of these shafts are pinions, which are driven by a train of strong gearing actuated by the horizontal engine, which is of 8 horse power nominal, but capable of working more than that power. The whole is fixed on strong foundation plates, by which arrangement the fitting up is much facilitated. For the sake of greater ease in transit, these plates are made in two parts. The cane is conveyed to the rolls by a carrier worked from the mill, consisting of chains on a series of wooden rollers.



COMBINED ENGINE AND SUGAR CANE GRINDING MILL.

Vitality of Ants.

Several interesting observations have been made by the Rev. H. C. McCook on the endurance of extremes of heat and cold by ants. This year a formicary of *F. pennsylvanica* was cut from an oak bough and exposed out of doors to the rigor of a mountain winter, and survived. A number were dropped separately upon ice, and were found alive after forty-eight hours, each in a little depression. *F. rufa* was found active in its formicary at 34° F., sluggish at 30°. The extreme of heat seemed also to be endured by *F. pennsylvanica;* they did not suffer at all from the heat of stones walling in a camp fire, having been driven into this position out of a burning stump. A community of agricultural ants (*M. molefaciens*) lived in a mound upon which some smiths in Texas made their fires for heating wagon tires. Numbers of ants were seen at work by Dr. Lincecum, cleaning out the entrance to their city, before the entire extinction of the fire just used for heating tires. They had learnt all about the fire, and knew how to work in and around the dying embers without injury. A quantity of mason ants (variety of *F. rufa*) observed by Mr. McCook were accidentally flooded under five inches of water, and they appeared to be quite dead, and floated about in this condition for many hours. But subsequently most of them recovered full activity. In Texas Mr. Lincecum found that the agricultural ants are seen in great numbers in wells, forming a sort of floating mass as large as an orange, clinging together. In this condition they get drawn up in the bucket, and though they may have been in the water a day or two, they are all found alive. Yet individuals cannot survive under water more than six minutes; and life in these balls can only be preserved by the mass revolving, either by the continued struggles of the individual insects, or by an instinctive and orderly movement of the outer tier of ants.—*Proc. Acad. Nat. Sci., Philadelphia.*

Boring Power of Magilus.

We have received from Mr. Charlesworth a preliminary note giving briefly a result of his study of the genus magilus, the remarkable testaceous gasteropod that is found immersed in the large hemispherical corals of the genus meandrina. The current belief, as set forth by Sowerby, Owen, Woodward, and other authorities in molluscan biology who have treated of this coral-inhabiting mollusc, is that magilus in its young state effects a lodgment in a crevice of a meandrina, and that as the coral enlarges the magilus extends the margins of the mouth of its shell in the form of a cylindrical corrugated tube, the growth of this tube and of the coral proceeding together *pari passu*, and consequently that there is no penetration of the coral by the magilus at all. Mr. Charlesworth, however, finds that magilus not only drives through solid masses of coral in any direction with apparently the same facility that the bivalve teredo tunnels masses of wood, but he finds that it even surpasses teredo in its power of suddenly reflecting its shell and returning to the point from which it commenced its advance; and this bending back of the shell upon itself is not accomplished in such natural cavities as frequently prevail in large corals, but in the solid coral.—*Nature.*

The Electric Light.

A special division of the Paris International Exhibition will be devoted to electricity, so that all the systems of electric lighting may be tested comparatively. The electric light continues to create the greatest interest in Paris. The experiments which we mentioned some time ago have been conducted during forty consecutive days at the Lyons railway station. A force of about 40 horse power is sufficient to keep going twenty-eight electric lamps, each of which gives a light equal to eighty gas lamps, and works with regularity for ten and a half hours. The effect is splendid, the whole of the station, except the waiting room, being lighted *à giorno*. The question of economy, however, is not yet settled. It is not known whether the company will agree to pay a somewhat higher price in order to multiply the power of its illumination. These experiments have been tried on Lontain's system, a modification of Wilde's and Siemens' principle. M. Lontain has contrived to send the current generated by an ordinary Wilde's machine into an electro-magnetic engine called a distributer. The central part being strongly magnetized by the current from a Wilde's machine, a number of electro-magnets are influenced by its rapid rotation, and in each of these an induction current is generated. These induction currents are powerful enough to feed three electric lamps; and as there are two series of twelve magnets, a single machine could, theoretically, feed seventy-two lamps. Actually, however, it feeds only twenty-eight. Lontain uses a new regulator, which works very well by the dilatation of a small silver wire. By its dilatation this part of the apparatus works a lever system, and brings the carbon electrodes into contact. The French Northern Railway has purchased a number of Gramme magneto-electric machines. They intend to use them at their goods terminus and stores.—*Nature.*

A New Indicator for Alkalimetry.

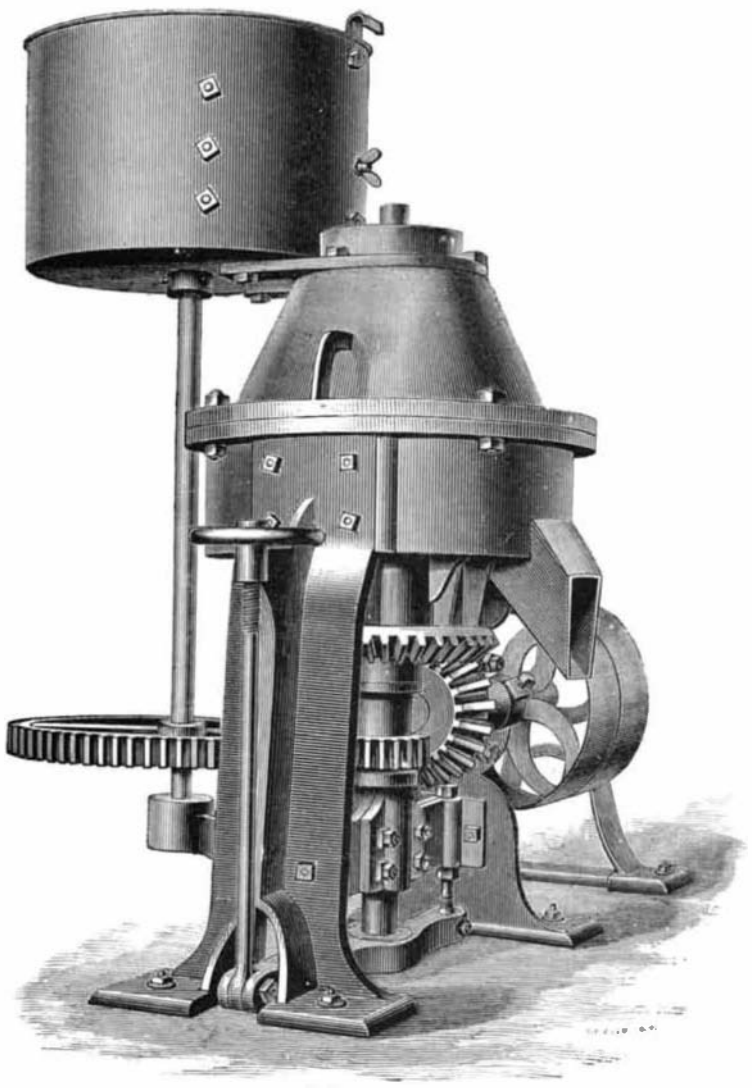
E. Luck proposes to employ, as indicator for volumetric estimation of acids and alkalies, phenolphtalein, a new dye stuff, prepared by Baeyer by heating together phenol (carbolic acid), anhydrous phtalic acid and sulphuric acid. In dilute aqueous or acidified liquids this dyestuff is colorless, but the addition of the slightest excess of alkali produces an intense purple red color, which is destroyed again by a trace of acid. For use, 1 part of phenolphtalein is dissolved in 30 parts alcohol, and 1 or two drops of this solution added to every 100 c. c. of liquid to be titered. If the liquid is acid it becomes opalescent at first, but clears on stirring. One drop of dilute soda lye or acid is more than sufficient to cause the change of color.

THE ROSS BURR STONE GRINDING MILL.

The annexed illustrations represent the Ross burr stone grinding mill, which is adapted for the grinding of flour, corn meal, paints, spices, and other dry materials, besides printers' ink, chocolate, paste blacking, and other substances of similar consistence. It runs at high speed, is claimed to grind fine and fast, and to consume but little power. The chief feature in the construction is that the grinding is done at the circumference and near to the center of motion instead of by the flat face of the stone.

Fig. 1 represents the mill with mixer attached, by which the materials to be ground are thoroughly mingled before entering the mill. In grinding paint the addition of the mixer is considered advantageous, the paint is thus kept cool, owing to the top of the mill being open so that the heat escapes instead of being absorbed by the paint. From the sectional view, Fig. 2, the internal arrangement of the machine will be clearly understood. The contents of the hopper are drawn down between the stones by the screw, A. The moving stone, B, is in the shape of a conical frustrum, and is attached to a vertical shaft which is rotated by the gearing shown. The outer stone is inclosed in the casing and is of a shape to receive the stone, B, in internal contact, adjustments of the latter being effected by the nut, C. As D is a small pipe to conduct the lubricating oil to the shaft bearing. The entire construction is simple and strong. The manufacturers claim that the mill now grinds nine tenths of all the printers' ink made in the country, and submit to us records of numerous premiums received (notably two gold, seven silver, and two bronze metals from the American Institute) besides many excellent testimonials from parties experienced in its use.

For further information address the manufacturer, Mr. Charles Ross, Jr., 81 and 83 First street, Williamsburgh, N. Y.



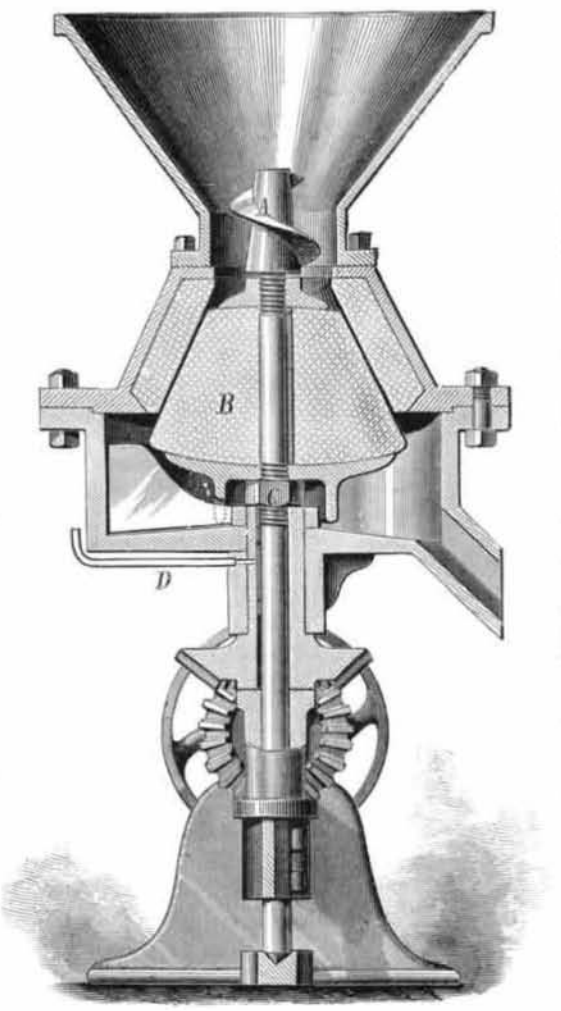
THE BURR STONE GRINDING MILL.—Fig. 1.

Restoring the Color of Lace.

LACE may be restored to its original whiteness by first ironing it slightly, then folding it and sewing it into a clean linen bag, which is placed for twenty-four hours in pure olive oil. Afterwards the bag is to be boiled in a solution of soap and water for fifteen minutes, then well rinsed in lukewarm water, and finally dipped into water containing a slight proportion of starch. The lace is then to be taken from the bag and stretched on pins to dry.

Electricity for Sleeplessness.

That galvanization of the head has an hypnotic effect has long been known: hitherto, however, it has not been used to counteract sleeplessness. Vigoureux asserts (*Allg. Wiener Med. Ztg.*) that he has daily obtained the finest results in this direction, and has failed only in exceptional cases, as, for instance, when sleep has been disturbed or prevented by severe dyspnœa. His method is to place the broad, flat electrodes (carbon covered with chamois leather) on both temples, and allow the current of from three, at the most five, Trouvé's elements to pass for a half or a whole minute. When the application is made in the morning, the patient experiences a more or less pronounced inclination to sleep. Occasionally the effect of the galvanization is prolonged after the first night, for a night or two.



THE BURR STONE GRINDING MILL.—Fig. 2.

Soup Kitchens.

Aside from the question of establishing soup houses for the poor in large cities, the question of the minimum amount of food at the lowest cost which shall be sufficient not to maintain life merely, but health and strength, is a subject of frequent discussion at the present day, and in this connection some extracts from Professor Voigt's report to the Munich magistrates may prove of value. Professor Voigt's first problem was to determine the quantity of the chief constituents of food which a soup kitchen ought to give to each person for a noonday meal. He decided that a grown up laboring man required 59 grammes (910 grains) of albumen, 34 grammes (524 grains) fat, and 160 grammes (2,569 grains) or carbohydrates.

From the reports of several of these soup houses in various parts of Germany, and the bills of fare in them, he calculated the amount of each substance given by them, and found to his dismay that none reached the required standard, and some fell far below. We give his table of results:

	Albumen.	Fat.	Carbohydrate.
Required amount.....	59	34	160
Munich soup house.....	14	3	32
Leipsic Volk's kitchen.....	24	8	71
Dresden " "	37	10	100
Berlin " "	35	19	178
Egestorff's " in Hanover	35	8	110
Eating Institute of Hamburg	41	5	133
Hamburg Volk's kitchen....	50	11	187
Cologne " "	49	—	188
Carlsruhe eating house.....	58	16	180

Here is evidently a shrewd exception, says Voigt. Even if people are contented with the volume of the meal and feel sated, still they have not necessarily taken sufficient nourishment for noon. Only a small portion of the volks kitchens furnish a sufficient quantity for an old and feeble beneficiary or pauper, namely, 40 grms. albumen, 30 grms. fat, and 85 of carbohydrates, and none sufficient for a working man. In most cases, to be sure, the carbohydrates are in sufficient quantity, but not the albumen. In most cases throughout the list the fat is lacking to a surprising extent, and it appears as if they were ignorant of its importance: and yet a good suet soup is craved by the common people.

In these institutions it is evident that more attention has been paid to cheapness than to the proper composition of the food; it is just impossible for most of them to afford the necessary quantity at such low prices. It was only in Carlsruhe that the dinner came tolerably near the scientific requirements. Such food was prepared there for 30 pfennige (7½ cents), and Professor Voigt's model recipe could be carried out with twenty changes, in Munich, for that price. Voigt also calls attention to the actual nutritive value of the so-called relishes or seasoning, which impart an agreeable flavor to the food, and also to the animal gelatin to be extracted from bones and sinews, which protects the albumen in the body from decomposition. The excessive use of bread and potatoes should be combated by the broad influence of these people's kitchens.

In an able-bodied working man, the waste which should be supplied amounts to 118 grammes albumen, and 265 grammes carbon, partially in fat and partially in the carbohydrates. Of the carbon not more than 209 grammes should be carbohydrates, or bread, potatoes, and farinaceous food generally, and 56 grammes as fat.

The report concludes with Voigt's model recipes for the requisite amount of nutriment, but as these apply only to Munich, we will not reproduce them here.

The difficulty in prescribing any given regime, whether for health alone or for economy combined with health, is the great diversity of tastes which exists among every class and makes true the saying that "what is one man's food is another man's poison." It is seldom the case that the system is benefited by an article of food not demanded by the appetite, much less by food that provokes disgust or nausea, however perfect it may be from a scientific point of view.

Laundries Spreading Disease.

The London *Lancet* says that incidents confirming the belief that diseases are spread by laundries are constantly reported as occurring in England and on the continent. Clothing worn by diseased persons or persons who have died of infectious disease are washed together with other clothes. The germs thus sown soon propagate, until an epidemic is created, as has been several times the case. Too much care cannot be exercised in this respect. The clothing should either be burned or thoroughly disinfected and washed apart.

Cleaning Engravings.

Put the engraving on a smooth board, cover it thinly with common salt finely powdered; squeeze lemon juice upon the salt so as to dissolve a considerable portion of it; elevate one end of the board, so that it may form an angle of about 45 or 50 degrees with the horizon. Pour on the engraving boiling water from a tea-kettle until the salt and lemon juice be all washed off; the engraving will then be perfectly clean and free from stains. It must be dried on the board, or on some smooth surface, gradually. If dried by the fire or sun, it will be tinged with a yellow color.