metal plate of a screw-press. A dozen of these cloth bags cover the surface of a plate. When one plate is covered, another one is let down and filled.

When the press is filled, pressure is gradually applied by means of an endless chain revolving a screw. The expressed oil constitutes the oleo oil. This liquid fat is conducted, still hot, from the press into barrels or cars, where it is allowed to cool. The finished product is nearly colorless, tasteless, and at ordinary temperatures is a soft, granular fat, rather than an oil. The hard fat remaining in the filter-bags is removed from the press, and forms the beef or oleo stearine, which is used either for making refined or compound lard by the addition of cottonseed oil, or sold to the soap and candle makers.

The manufacture of neutral lard is conducted by essentially the same machinery and at about the same temperature employed in the manufacture of oleo oil. Only the leaf-fat of freshly slaughtered hogs is used. A hog yields from 5 to 15 pounds of leaf-lard, averaging 9 pounds, 100 pounds of which yield 90 pounds neutral. The neutral, however, is not pressed to extract the stearine, but is run directly from the rendering-tank into a very strong iced brine, where it remains for about twenty-four hours, when it is removed, and placed on shelves to drain. The neutral is a white, slightly granular, tasteless, solid fat. The skimmings and scrap from the lard-rendering kettles are strained, and the fat (about 2 per cent of the original charge) obtained from them added to the steam-rendered product. Several factories, however, use the ordinary steam and kettle-rendered lards, and not neutral. Great cleanliness is observed throughout both processes, and there is very little manual handling; machinery being used as much as possible, and the fat carefully guarded from any source of contamination.

The by-products of oleo oil and neutral — viz., stearine, tallow, and lard — are standard merchantable articles. Only fresh and sweet fats are used; and tanks, etc., are thoroughly cleaned before use, as a small amount of fat, if allowed to adhere to the apparatus, is liable to decompose in such a way as to spoil the succeeding batch of materials worked up.

Though there may be slight differences in the details, the range of temperature, size of tanks, etc., pursued by the different manufacturers, the general procedure is as above described, the object being to obtain a neutral fat, melting at butter temperatures.

The vegetable oils are prepared by crushing the seeds, etc., and subjecting the crushed mass to hydraulic pressure, or by extracting the oil by carbon bisulphide or other solvent. The crude oil thus obtained is refined to remove the coloring-matter by treatment with mineral acids, and subsequent neutralization by alkalies, and chilling and pressing, whereby a product is obtained of a light straw-color and bland taste.

The butter used is always selected for its high flavor and taste, and is generally obtained direct from the creamery. Owing to the granular character of oleo oil it becomes necessary to add some softer and smoother fat; and neutral lard and cotton-seed, or other similar vegetable oil, are added for the purpose of making the mixture more closely approach the consistency of butter. The proportions in which these ingredients are used vary with the seasons of the year, the grade desired, and the formulas of the manufacturers. The charge of milk or cream, however, is the same for all grades manufactured by any particular factory, and varies from 10 to 20 per cent. The milk or cream is allowed to become slightly sour.

The churn used is steam-jacketed, of 1,200 to 2,500 pounds capacity; and the whole operation of churning is conducted at a temperature of 85° to 105° F., insuring the melting and thorough mixture of the solid fats used, thus differing from ordinary creamery practice. The oleo oil and neutral lard are melted in separate kettles at a temperature of about 90° F. The charge of milk or cream is first run in, and the paddles kept in motion until the butter begins to form. Then the charge of melted oleo oil is added and stirred. When this is well incorporated, the neutral lard is run in, and finally the annotto, to give the desired butter-color. The butter is added either directly into the churn, being first melted, or it is worked into the oleomargarine after it is taken from the churn. The temperature is carefully regulated, being about 85° F. at the beginning, and gradually increasing to 105° F. at the end, when the whole charge has the appearance of a yellowish, creamy fluid. From twenty to ninety minutes are occupied in the churning. The whole melted charge, after it has been sufficiently churned to thoroughly incorporate all the ingredients, is run either directly into tanks containing chopped ice and constantly stirred, or is met by a stream of ice-water as it issues from the churn. The object is to give the melted mass a fine grain by this sudden cooling. The chilled mass is removed from the tanks, and placed on wooden trays to drain. Here the salt is added and allowed to work itself in, which generally takes from twelve to twenty-four hours. The salted mass is then thoroughly worked by mechanical rollers, to remove the buttermilk and water, following the general practice of creameries in this and subsequent operations of packing, etc.

Oleomargarine is placed on the market either "solid packed" or in prints or rolls. Four grades are generally made, known as "dairy" and "extra dairy oleomargarine," creamery," and "extra creamery butterine," the last two containing from 10 to 25 per cent of the best creamery butter. In the lower grades, from 25 to 60 per cent of neutral lard, from 20 to 50 per cent of oleo oil, from 5 to 25 per cent of vegetable oils, and in some cases from 2 to 10 per cent of butter, with 10 to 20 per cent of milk or cream, are the proportions used. Some factories employ no vegetable oils in their oleomargarine, preferring to use a larger proportion of neutral lard with a small amount of butter to obtain the desired butter consistency. In the higher grades the proportions of oleo oil are reduced, the vegetable oils are discarded, and creamery butter is used to make up the charge.

[To be continued.] EDGAR RICHARDS.

NOTES AND NEWS.

IT is reported that a deposit of coal of good quality has recently been discovered in West Australia.

— The enormous increase in the frozen meat export trade from New Zealand during the past few years must be exceeding gratifying to all persons interested in the colony. The value of the exports to Great Britain in 1882 amounted to only about nine two thousand dollars, while in 1887 it had risen to upwards of two million dollars. Over a million carcases of mutton are now sent annually to England, and there seems to be every prospect that the trade will go on increasing at a similarly rapid rate.

— A very odd result of rivalry between two tiger-snakes is recorded by Mr. D. Le Souef, Assistant Director of the Melbourne Zoölogical Gardens, in a recent number of the *Victorian Naturalist*. One of the snakes was large, the other being small. Not long ago both happened to fasten on the same mouse, one at each end. Neither would give way, and the larger snake not only swallowed the mouse, but also the smaller snake. In about ten minutes nothing was seen of the smaller snake but about two inches of its tail, and that disappeared next day.

— In an experiment made by the North Carolina experiment station, a series of plots was laid out in such manner that one end of each plot should be on land on which cow peas had been previously plowed under, and the other end on land without peas. The whole was sown to wheat, and kainite, acid phosphate, and cotton seed meal were applied to the several plots, singly and in combination, two plots being left without any fertilizer. The result was that on the land which had had no cow peas the highest increase of any of the fertilized over the unfertilized plots was four bushels per acre (for 300 pounds of cotton seed meal), while on the green manured land the increase from the pea vines was from six bushels at the least to fifteen bushels per acre, averaging ten bushels.

— With all their learning and teaching power, the German universities retain some rather unlovely traditions, of which duelling is perhaps the most redolent of barbarism. True, the vast majority of "hostile meetings" between undergraduates seldom result in more than facial disfigurement; but sometimes, when firearms are the weapons chosen instead of swords, danger is inevitable, and even death may occur. A melancholy illustration of this has lately been witnessed at Wurzburg, where, as narrated by the *Lancet*, a highly promising and amiable "candidatus medicus" lost his life. Paul Fleurer, the unfortunate youth in question, seems to have played a truly chivalrous part in the encounter; for after a first, and then a second, interchange of shots, he held out his hand twice in token of reconciliation with his antagonist, but in vain. A third interchange was insisted on, and poor Fleurer fell mortally wounded, and died in a few minutes. At his funeral, which was attended by the students in large numbers, and with all the insignia of mourning, *oraisons funèbres* were delivered, the principal of which referred to the deceased as the victim of an "unfortunately still prevailing prejudice"— surely an inadequate condemnation of a practice which finds no favor in the better-mannered academic life of Great Britain and America.

— A bulletin of the Ohio Agricultural Experiment Station, now in press, gives the results of an experiment in feeding sugar beets to milch cows, made during the past winter, together with a summary of two similar experiments, one made by the station in 1889 and one by the farm department of the Ohio State University in 1879. In the last named experiment eight cows were kept under test for eleven weeks; in 1889, twelve cows for eight weeks; and in 1890, twelve cows for nine weeks, the cows in each case being weighed daily, as well as their feed and milk. In each of the three experiments the cows ate more hay and more total dry matter when feeding on beets than on other foods (hay, meal, and bran in 1879, corn silage in 1889 and 1890), and in each case more milk was given from the beets than from the other foods, but it is not yet demonstrated that the increase of milk was produced economically. For twelve years records have been kept on the farm now occupied by the station, which shows that the average yield of beets over this period has been nearly sixteen tons per acre, against an annual yield of about fifty-five bushels of shelled corn per acre. But a crop of fifty-five bushels of shelled corn, with its fodder, will contain nearly twice as much dry matter as sixteen tons of beets, and these experiments indicate that, whether fed dry, as corn meal and dry fodder, or as corn ensilage, the dry matter of the corn crop will be found about as effective, pound for pound, as the dry matter of the beet crop. It is possible to raise much more than sixteen tons of beets to the acre. One crop of two acres is reported at thirty-seven and one-half tons per acre, and smaller areas have given still larger yields, but such crops require very rich land and thorough culture. Whether it is possible to produce a pound of dry matter in beets as economically as it can be done in corn is not yet definitely settled, but the probabilities are against it.

— A Royal Commission has been appointed in England to inquire and report "what is the effect, if any, of food derived from tuberculous animals on human health, and, if prejudicial, what are the circumstances and conditions with regard to the tuberculosis in the animal which produce that effect upon man." Lord Basing is chairman. The other Commissioners are Professor G. T. Brown, Dr. George Buchanan, Mr. Frank Payne, and Professor Burdon Sanderson.

— The following method for preserving ice in a pitcher will not come amiss to those who need it for use all night or in the sick room. Fill the pitcher with ice and water, and set it on the centre of a piece of paper; then gather the paper up together at the top and bring the ends tightly together, placing a strong rubber band around them to hold it close, so as to exclude the air. *The Medical and Surgical Reporter* says that a pitcher of ice-water treated in this manner has been known to stand over night with scarcely a perceptible melting of the ice.

—The corrosion of steel by salt water is said to be much greater than that of iron. Mr. David Phillips stated in a recent address before the British Institute of Marine Engineers, says *Engineering News*, that he had experimented from 1881 to 1888 with two plates of Bessemer boiler steel, two of Yorkshire and two of B. B. Staffordshire boiler iron. The plates were, as nearly as possible, 6 by 6 by $\frac{5}{8}$ inches, and were kept immersed in salt water. The results show a great difference between the behavior of steel and iron. The steels lost 120 per cent more than the irons the first three years, when the plates were in contact; 124 per cent more the second three years, when they were insulated; and 126 per cent more for the whole period of seven years.

— The number of vessels passing through the Suez Canal at night by means of electric light is increasing with extraordinary rapidity. The regulations for the use of the electric light went into operation in March, 1887, and during the remainder of that year (according to statistics given in *Engineering*) the number using it was 394. In 1888 the number rose to 1,611, and in 1889 it reached 2,445. Prior to March, 1887, the privilege of travelling by night with electric light had been restricted to vessels carrying the mails. Since then all ships which conform to the regulations are allowed to proceed by night. The average time of transit has also been considerably shortened. In 1886 it was 36 hours; in 1887, 33 hours 58 minutes; in 1888, 31 hours 15 minutes; and in 1889 it had been reduced to 25 hours 50 minutes. The average time for vessels using the electric light in 1889 was $22\frac{1}{2}$ hours. The shortest time taken by a steamer in the transit of the canal in 1889 was $14\frac{3}{4}$ hours, which is ten minutes less than the fastest passage on record previously.

— Artificial musk is a recent chemical achievement. A process for its production has been patented in Germany, the inventor being Herr A. Bauer, of Gisparsleben, in the Erfurt district. It is a familiar experience in organic chemistry, that on introduction of nitro groups (NO_2) into organic bodies, by action of nitric acid, a smell like that of musk is often noticed. In the present process, as described by *Nature*, pure butyl-toluol is treated with a mixture of sulphuric and nitric acid, and the nitro-compound is purified by crystallization from alcohol, the yellowish white crystals smelling strongly like musk. According to Dr. Paul (*Humboldt*), the smell is not perfectly pure, and it can be distinguished from that of musk by the perfumer, but not by the general public. Curiously, a one per cent alcoholic solution has not the smell of musk. Only after dilution with water does this come out, and the dilution may be carried far before the smell is lost. With 1 in 5,000 it is still quite distinct. Certain properties of the new product seem to render it very useful in the perfuming of soap.

— In the new quarterly statement of the Palestine Exploration Fund, Mr. Flinders Petrie gives a short report of his recent excavations at Tell Hesy, in Palestine, which, *Nature* says, prove to be remarkably interesting. The remains of Tell Hesy consist of a mound which is formed of successive towns, one on the ruins of

another, and an enclosure taking in an area to the south and west of it. The lowest wall of all—28 feet 8 inches thick, and formed of clay bricks, unburnt—is believed to be that of Lachish, the ancient Amorite city, erected probably 1500 years B.C. Phœnician pottery of about 1100 B.C. is found above its level. Later constructions are the supposed wall of Rehoboam, and remains of the fortifications made in the reigns of Asa, Jehoshaphat, Uzziah, Jotham, and Manasseh. The pottery discovered on the spot is very valuable. "We now know for certain," says Mr. Petrie, "the characteristics of Amorite pottery, of earlier Jewish, and of later Jewish influenced by Greek trade, and we can trace the importation and the influence of Phœnician pottery. In future all the tells and ruins of the country will at once reveal their age by the potsherds which cover them."

— The Brooklyn *Medical Journal* quotes from a German authority the following review of the physiological effects of saccharin, the new sweetening agent. According to the investigations of Plugge, a .03 per cent solution of saccharin entirely destroys the action of ptyalin, and hinders the action of pepsine and pancreatine. On this account it is injurious to diabetics, to whom a good digestion is very important. On the other hand, E. Gans, Stevenson, and Wooldrige express the opinion, based upon their experiments, that saccharin is not injurious to the digestive processes, but it hinders the secondary decompositions of the contents of the intestinal canal. The Royal Academy of Medicine at Madrid has given the opinion that the addition of saccharin to foods and drinks should be regarded as an adulteration, and that articles of food, or drink, so treated should be refused entrance into Spain. A similar judgment has been given by the Academy of Medicine at Rio de Janeiro. France has adopted laws forbidding its use in foods.

— The British Vice-Consul at Los Angeles, California, in a late report, has some observations on the vine and orange pests in that region. As summarized in *Nature*, the report states that the vine disease now seriously menaces the existence of the viticultural industry in the vicinity of Los Angeles. At first it attacked chiefly the "mission" vines; now, other varieties of red vines are dying, and the white varieties are also suffering. The disease first appeared in its present dangerous form in the southern part of California, and destroyed many vineyards. Professor Dowlen, an expert employed by the Viticultural Commission to ascertain its cause, and, if possible, discover a remedy, inclines to the opinion that it is due to a fungus. On the other hand, Mr. Wheeler, Chief Executive officer of the Viticultural Commission, reports that he is fully convinced that the fungus found on the dead vines is not the prime cause of their decadence, and that it attacks them only when they have been weakened by other causes. As to the *Icerya*, or "white scale," which has ravaged the orange-groves, the Vice-Consul says that a year ago many of the principal orange-growers in the vicinity of Los Angeles had abandoned their efforts to exterminate this pest, concluding that their trees must die. Fortunately, it was learned that an Australian parasite, the *Vedolia cardinalis*, had exterminated the white scale in Australia. A colony of the bugs was imported, and placed on the trees in an orchard in Los Angeles. They multiplied so rapidly that in a few months the scale was entirely exterminated in the district, and many trees which a year ago were nearly dead, have revived and borne half a crop this season.

— In a recent article on slag cements, a French authority, as quoted in a recent issue of *Engineering*, states that these cements are made by finely grinding blast-furnace slag, and mixing it with a suitable proportion of fat lime. The grinding has to be very fine, because as the cement is made by a simple mixture it is necessary that the surface on which the two constituents, the lime and the slag, react on each other should be as large as possible, if proper chemical combination is to ensue. As manufactured in France, the cement leaves only 20 per cent on a sieve containing upwards of 25,000 meshes per square inch, and only 8 to 10 per cent on a sieve with 4,500 meshes per square inch. The density of slag cements is much less than that of Portland, weighing bulk for bulk, but from .8 to .88 times as much. In general, this cement also sets somewhat more slowly than Portland, but when hardened, has, in many cases, a greater strength, particularly at early dates after setting. In some experiments still unfinished, the following results were attained with a slag cement from the Department of Isère:

Age	1 week,	1 month,	3 months.
Breaking load, pounds per square inch	473.5	568.8	678.3

These figures are higher than any attained in the tests made on Portland cements for the new Croton aqueduct. Experiments were also made with slag-cement mortar mixed with and allowed to harden in sea-water, and gave the following results; the mortar consisted of six parts by weight of cement to ten of sand.

Age.	Breaking Weight,	Pounds per Square Inch.			
8 days	252.0	319.9	275.1	273.0	285.8
28 "	375.4	327.0	327.0	248.4	341.2

The main objection to slag cement seems to be that if it is allowed to harden in dry air its strength is very materially reduced, and it is then liable to crack. In the town of Villefranche-sur-Saone it has been largely used for paving foot-paths.

— The dangerous overcrowding of the London cemeteries has been often commented on by the medical press of that city, says the *Medical Press*, but the evil remains almost wholly unabated. The Sanitary Committee of the London County Council has reported that no time should be lost in closing burial grounds such as the Brompton, which contains 155,000 bodies, and the Tower Hamlets Cemetery, with its 247,000 bodies crowded into only seventeen acres. The average grave is seven by three feet, and contains eight adults and fourteen children, the covering of earth being about one foot. In one instance, a committee of inquiry regarding this cemetery found eighty infants in a grave or trench of less dimensions than that of the average grave. There are twenty-one burial places, with a total extent of less than three hundred acres, holding a million and a quarter of bodies. The soil in most of these places is clay, and the process of decomposition goes on so slowly that bodies buried for a dozen years remain remarkably well preserved.

— The use of preservatives for articles intended for food and drink is an important one, both for the manufacturer and consumer, says the Brooklyn *Medical Journal*. From a sanitary point of view, it is doubtful whether any of the preservatives ordinarily added to articles intended for human consumption ought to be encouraged. Laws exist in Continental European countries prohibiting the use of certain of these preservative agents. Salicylic acid is prohibited by most of them, and the manufacturers are there beginning the use of benzoic acid, which is preservative in small amount and is not easy to detect. After a discussion at a convention of chemists at Speyer, Bavaria, on the 10th of September, 1888, the conclusion was reached that boric acid, as a preservative for foods, is to be regarded with caution. Sanitary authorities have generally spoken in stronger terms of the use of boric acid, and yet it enters into the composition of a large number of the preservatives in the market. Hirschsohn gives a description of several different boro-glycerides which he recommends for preserving foods. Boro-glycerine is prepared by heating glycerine with boric acid, in the proportion of 124 of the former to 190 of the latter. He also recommends sodium, calcium, and magnesium glyceroborates. These compounds are mostly tasteless, and quite soluble in water and alcohol. Magnesium borate is recommended as a remedy in throat affections. A. R. Rosen recommends the following method for preserving meats: Boric acid or its salts are dissolved in water and the solution is then frozen. The article to be preserved is then covered with this ice, with the result that the meats are preserved after the ice melts. Dr. E. Polenske has made an examination of ten commercial preservatives intended for meats. Three of the ten contained sulphurous acid or sulphites; two contained borax, and five boric acid; one each contained alum, arsenious oxide, salycylic acid, and free phosphoric acid; two contained glycerine, and two boroglycerine; three contained nitre, and six common salt. The one containing arsenious oxide was the only one actively poisonous, but several of the others was decidedly objectionable. Indeed, we should object to the addition of anything to our meats which is not a natural ingredient of food or cannot be converted into a compound natural to the human body.