

cast which will cause it to separate before long from the gelatine. It is well not to hasten the process of separation by the application of any force besides the slight strain set up by the knife blade, but repeated moistening of the back of the plaster cast generally facilitates matters. At any rate, if the whole is left overnight, it will generally be found in the morning that the separation has taken place.

A plaster cast having been made, mouldings in other materials can readily be obtained.—*Photo. Review.*

AMERICAN "TRIPOLI."

By E. O. HOVEY.

TRIPOLI is a term which was originally applied to an infusorial earth, resembling clay or chalk in appearance, coming from the country of the same name in Northern Africa. It crumbles or powders easily between the fingers, is a little gritty to the teeth and scratches glass when rubbed on it. This earth consists almost entirely of silica in the opal or soluble state, and is made up mainly of the siliceous skeletons of the minute animal organisms known as polycystines or radiolarians and of the equally minute plants called diatoms. Similar deposits, frequently of great thickness, occur in many other parts of the world, notably in Barbadoes, Sicily, Calabria, Greece and the Nicobar Islands. The well known "Barbadoes earth" consists mostly of these siliceous skeletons, but contains, besides, a variable proportion of the calcareous shells of foraminifera. This deposit rises to heights of more than 1,000 feet above the level of the sea, while that of the Nicobar Islands reaches an elevation of about 2,000 feet. According to Haeckel, the eminent German naturalist, there are not less than four hundred and there may be more than five hundred species of polycystines in the Barbadoes earth, very many of which "are to-day extant and unchanged in the radiolarian ooze of

A well sunk in the northern part of the property gave the following section:

Earth, from the surface.....	0 — 4	ft.
"Tripoli".....	4 — 20	"
Stiff red clay.....	20 — 21½	"
Mixed chert, clay and ocher....	21½ — 40	"
Cherty limestone.....	40 — 93	"
Cherty limestone, bearing galenite.....	93 — 103	"
Limestone.....	103 — 128	"
" bearing galenite and sphalerite.....	128 — 136	"
Soft magnesian limestone.....	136 — 173	"

The drill was lost in this soft rock at about 173 feet. The first 53 feet of the well was sunk by digging, the remainder by using a six-inch plunger drill.

Not only is the bed of tripoli everywhere underlain by a relatively thin stratum of very stiff red clay, but it is traversed in every direction by seams 1 to 2 inches thick of the same substance. These seams and other joints divide the rock into masses which vary in size up to 30 inches or more in diameter. In color the material varies from an almost pure white, through a cream tint, to a delicate rose, depending, probably, on a difference in the small amount of iron present.

The rock is very even in texture, and is so minutely porous that it forms a most excellent natural filter. For this purpose it is shaped into disks and cylinders for use where gravity alone is to be depended on for forcing the water through the filters, and into thick walled tubes for use under pressure. The disks in actual use range from 4 inches to 20 inches in diameter, and the cylinders and tubes are from 2 inches by 3 inches to 12 inches by 20 inches in dimensions. Even larger sizes than these could be obtained, if desired. The filters are very simple in operation, as they retain on the surface all the impurities of the water, and are cleaned by merely brushing them. They are coming

"Silica soluble in a 10 per cent. solution of caustic soda, on boiling three hours, equals 7.28 per cent."

The credit of developing this industry is due to Mr. T. T. Luscombe, of Carthage, Mo., who is president of the American Tripoli Co. The quarries were first opened in 1872, but the great growth of the business has been within a very few years. The company received a medal and diploma award at the World's Fair, Chicago.

LARD.

By H. W. WILEY, Chemist to the U. S. Department of Agriculture.

Butcher's Lard.—The small quantities of lard made by butchers are usually "kettle rendered," after the manner practiced by small farmers in making lard for home consumption. Often the scraps are saved up for a considerable length of time by the butchers before rendering, and that is likely to increase the free acid present. This lard is also frequently dark colored and contains a considerable quantity of glue. In New York this lard is known as "New York City Lard."

Compound Lard.—The term refined lard had long been used to designate a lard composed chiefly of cotton oil and stearine. The largest manufacturers of this kind of lard have now abandoned this term and are using the label "lard compound" instead. This is but just to the consumers of this article, who are likely to be misled by the term refined lard. The prime steam lard in a state of fusion, the stearine also in a liquid condition, and the refined cotton oil are measured in the proportions to be used and placed in a tank at a temperature of 120 deg. to 160 deg. F.

In this tank the ingredients are thoroughly mixed by means of paddles operated by machinery. After mixing, the compound lard passes at once to artificial coolers, where it is chilled as soon as possible. It is thence run directly into small tin cans or large packages and prepared for market.

PHYSICAL PROPERTIES OF PURE LARD.

(The degrees of temperature referred to herein are Centigrade.)

Specific Gravity.—The specific gravity of a pure lard varies rapidly with the temperature. It is not convenient to take the specific gravity of a lard at a lower temperature than 35 deg. or 40 deg., inasmuch as below that temperature solidification is apt to begin. The specific gravity, therefore, is usually taken at 35 deg. or 40 deg., or at the temperature of boiling water, viz., 100 deg. At 40 deg. the specific gravity of pure lard is about 0.890, and at 100 deg. about 0.860 referred to water at 4 deg. The specific gravity of pure lard does not differ greatly from that of many of the substances used in adulterating it, but it is distinctly lower than the cotton oil, and is of great distinctive value in analysis.

Melting Point.—The melting point of a pure lard is a physical characteristic of great value. The melting point of the fat of the swine varies with the part of the body from which it is taken. The fat from the foot of the swine appears to have the least melting point, viz., 35 deg. The intestinal fat seems to have the highest, viz., 44 deg. In fat derived from the head of the animal the melting point is found to be 35.5 deg., while kidney fat of the same shows a melting point of 42.5 deg.

In steam lards, representing the lards passed by the Chicago Board of Trade, the melting point for ten samples was found to vary between 29.3 deg. and 43.9 deg. In general it may be said that the melting point of steam lards is about 37 deg., which is the mean of the ten samples examined. In pure lards derived from other localities the melting point was also found to vary. A sample of lard from Deerfoot Farm, Southborough, Mass., was found to have a melting point of 44.9 deg., while a pure lard from Sperry & Barnes, New Haven, Conn., melted at 39 deg. The mean for eighteen samples was 40.7 deg.

While the melting point cannot be taken as a certain indication of the purity of a lard, nevertheless a wide variation from 40 deg. in the melting point of a lard should lead at least to a suspicion of its genuineness, or that it was made from some special part of the animal. Perhaps one reason why the melting point has not been more highly regarded by analysts is because of the unsatisfactory method of determining it; but when it is ascertained by the method used in these investigations, it becomes a characteristic of great value.

Color Reaction.—The coloration produced on pure lard by certain reagents serves as a valuable diagnostic sign in the analysis of lard and its adulterations. Various reagents have been employed for the production of characteristic colors in fats, but of these only two are of essential importance. They are sulphuric and nitric acids. Pure lard when mixed with sulphuric and nitric acids of the proper density, as indicated hereafter, gives only a slight color, which varies from light pink to faint brown.

The variation produced in the colors by pure lards is doubtless due to the presence in various quantities of certain tissues of the animal other than fat. For instance, a variation in the amount of gelatinous substance mechanically entangled with the lard, or of the tissues composing the cells in which the lard was originally contained, would be entirely sufficient to account for the slight differences in color produced by lards of known purity. It might, therefore, be difficult to distinguish accurately between a pure lard containing a considerable amount of other tissues from the animal and one which contains a small amount of adulteration.

The coloration produced, therefore, by the acids named should not be relied upon wholly in distinguishing pure and adulterated lards, but the character of such coloration should be carefully noted in the analyst's book. In the steam lards examined some of the remarks describing the coloration produced are as follows: "Trace of color," "faint pink," "bright pink," "light red," "yellowish," etc. For pure lards of miscellaneous origin some of the descriptions are as follows: "Brownish pink," "trace of yellow," "marked red brown," "no color," "slight coloration," etc.

There are many other hog fat products not used in the manufacture of lard or compound lard, a description of which may prove useful here.



THE AMERICAN TRIPOLI COMPANY'S QUARRY, SENECA, MO.

the deep Pacific Ocean." In Bohemia there is a celebrated deposit of tripoli ("Polir-schiefer"), largely used as a polishing powder, which is composed almost entirely, if not entirely, of the siliceous framework of diatoms. In the United States there are great deposits of diatomaceous earth near Richmond, Va., and Monterey, Cal., of which the former is about thirty feet thick, and extends for more than a hundred miles from north to south across the State, while the latter exceeds fifty feet in thickness and is of unknown extent. All the beds noted above are of Tertiary age.

Tripoli is used very extensively in the form of powder as an abrasive, and forms the base for many polishing pastes and other similar preparations. The extreme fineness of the natural grain, combined with the hardness of the individual particles, composed as they are of silica, gives this substance its advantages for this purpose. It is also largely employed in mixing with nitro-glycerine in the manufacture of dynamite.

Within a comparatively few years there has developed at Seneca, in the extreme southwestern corner of Missouri, a large business in the quarrying and manufacture of a rock which is called "tripoli," for the want of a better term, and because the material in some respects resembles what has so long gone by that name. This rock appears to have been derived from the flint of the country rock, which is a cherty lower carboniferous limestone, by some process of decomposition which has left behind a bed of very fine grained, rather soft, porous material, which has considerable strength when cut into disks and other forms. This particular deposit is known to underlie between eighty and one hundred acres of land as a rude ellipse, with its longest diameter approximately north and south. Numerous prospect holes show that the bed is from 2 to 4 feet below the surface of the ground, and that it varies from 10 to 25 feet in thickness, with an average of about 15 feet. The main quarry of the company working these beds at present shows a section 18 feet thick.

into general use rapidly on account of their efficiency, cheapness and durability. On account of the great absorptive power of the rock, blotting pads have been made from it. These work excellently, but are rather dusty in use. Last year (1893), the American Tripoli Co., which owns and operates this deposit, put on the market more than 20,000 disks, cylinders and blotters. These articles are patented.

A second and fully as important a branch of this industry is crushing the rock and grinding it into flour for use in polishing all kinds of metals, horn, shell, etc. The company grinds the rock in a common mill between burr stones, and sifts it through two bolts of 70 and 120 mesh, similar to those used for bolting wheat flour. Last year the company sold upward of 20,000,000 lb. of this ground and bolted tripoli flour.

A portion was scraped off from a crude piece of the rock and mounted for the microscope. Examination with powers magnifying up to 450 diameters failed to show any remains of the skeletons of radiolarians or diatoms. The particles were extremely minute, by far the most of them bring not over 0.01 mm. (= 0.0004 inch) in diameter, though an occasional grain measured 0.03 mm. across, and one was 0.05 mm. through. The particles are doubly refracting and are probably chalcedony, while the infusorial tripoli consists of opaline silica.

The following analysis was furnished the company by W. H. Seamon, professor of chemistry in the Missouri School of Mines, Rolla:

Silica (Si O ₂).....	98.100
Alumina (Al ₂ O ₃).....	0.240
Iron oxide (Fe ₂ O ₃ and Fe O).....	0.270
Lime (Ca O).....	0.184
Soda (Na ₂ O).....	0.230
Water (ignition).....	1.160
Organic matter.....	0.008

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