Oil Refining.

The apparatus employed for separating the various ingredients contained in crude petroleum in the process of obtaining kerosene consists of an iron still having a wrought iron worm pipe, which is submerged in a tank containing cold water. The still having been filled with crude oil, a fire lighted beneath it causes the oil to boil and drives off the more volatile vapors, which at ordinary temperatures pass over without being condensed. By surrounding the coil with ice, or by compressing these gases by means of an air pump, they may be condensed into the form of very volatile liquids, termed rhigolene and chymogene.

After these have been eliminated, the vapors begin to condense in the coil, the resulting oil being received in a tank at its farther end. That first formed has a gravity of 95° Baume, but the product becomes heavier as the process proceeds. It is usually customary to direct the stream into one tank until the gravity reaches from 65° to 59° B., forming crude naphtha, when it is diverted into the kerosene tank, into which it is allowed to flow until a gravity of about 38° B. is reached, or the oil becomes of a yellow color. This second fraction is the burning-oil, which requires a farther purification to fit it for use. The stream is next directed into the paraffine oil tanks, and allowed to run until nothing remains in the still except coke. When, however, very large stills of 1,000 barrels capacity or upward are employed, the distillation is stopped when the residuum has attained a tarry consistence, the remaining oil being extracted in smaller stills.

By slow distillation in high stills, the production of the heavier oils may be avoided, they being "cracked" into lighter oils, so that only crude naphtha, kerosene, and coke result.

The burning-oil is purified by the addition of about ten per cent of sulphuric acid to improve the color and deodorize it. The acid is poured into the oil and the liquid thoroughly agitated and then allowed to stand, when a dark tarry residuum separates. This is removed, and the clear oil is then agitated with water and afterward with caustic soda or ammonia. This neutralizes any remaining traces of acid, and is removed by water. In some instances it is then heated to expel a small proportion of naphtha or benzine which it may contain, or is redistilled.

The crude naphtha is redistilled for gasoline, benzine, or refined naphtha, or is poured into the oil wells, nominally for the purpose of cleaning them. In some instances it is used for adulterating the crude oil sold to the refiner.

In the details of the process of refining, manufacturers somewhat differ. Some blow steam through the crude oil, thus taking off the naphtha previous to distillation. In other instances, the heavier portions of the distillate are separated, forming safer oils than those in ordinary use. Thus, "astral oil," averaging 49° B., flashes at 125° of Fahrenheit's scale, and "mineral sperm," having a gravity of 36° B., only yields inflammable vapor at temperatures above 262°.

Oil which flashes at or above 100° F., is considered safe for ordinary use, but the temptation to allow the heavier portion of the crude naphtha, an article which commands a much lower price than oil, to flow into the tank designed for the latter is so great that many kinds of oil in the market are very dangerous, their vapors exploding at a much lower point.

Instead of continuing the flow of naphtha into its proper tank until a gravity of 58° or 59° B., is attained, it is diverted into the burning-oil reservoir while yet as light as 63° to 65°.

Dr. White, of New Orleans, found that one per cent of naphtha added to an oil which flashed 133° F. caused it to flash at 103°; with 2 per cent added it flashed at 92°; with 5 per cent at 83°; with 10 per cent at 59°; and with 20 per cent at 40°.

Ordinary kerosene, having a gravity of 47° B., flashes at 86° F. An oil which will not flash below 100° may be made by running off the naphtha to 58° B., and exposing the oil in shallow tanks to the sun or a strong light for a day or two.

The average yield of crude Pennsylvania oil is stated to be: Gasoline 1½, refined naphtha 10, benzine 4, refined petroleum or kerosene 55, lubricating oil 17½, paraffine 2, loss, gas and coke, 10, total 100.

By "cracking" it can be made to yield: Crude naphtha 20, burning-oil 66, coke and loss 14.

The method for ascertaining the degree of heat at which the hydrocarbon vapors of petroleum are liable to explode consists in heating the oil in a porcelain vessel surrounded by a hot water bath. A wire is placed a quarter of an inch above the rim of the vessel, and when a thermometer whose bulb is submerged 1½ inches below the surface of the oil indicates the desired heat, say 90°, a small flame is quickly passed along the wire over the surface of the oil; if no flash is produced, the heat is continued and the test applied at every 3° above this until the flashing point is reached. The operation is then repeated with a fresh sample of oil, fresh water being used in the outer vessel, the source of heat being removed when a temperature approaching that obtained in the first experiment has been reached. This is the English method, but there are other ways of testing petroleum employed in this country, which are, however, similar in principle, and nearly so in detail, to that described above.—*Glassware Reporter.*

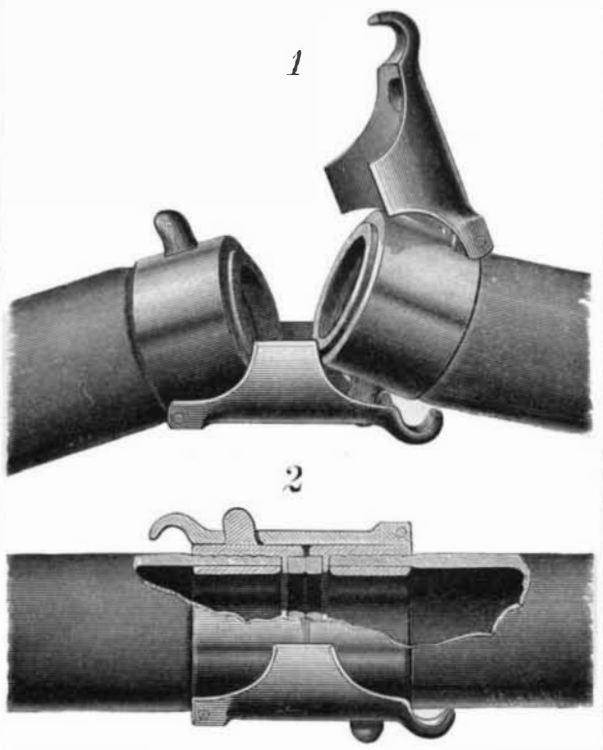
THE Madrid Mining and Metallurgical Exhibition is announced to open in the Park of Madrid on April 1, 1883.

Estimation of Tannin.

G. Simand has been experimenting on Lowenthal's method of estimating tanning by glue or gelatine, in the Vienna Laboratory of the experiment station for the leather industry. As he could not obtain concordant results within it, he had recourse to the use of hide or tissues that contain glue. His experiments are described in *Dingler's Journal* (cxlvi., 133). Unoiled violin strings were used by A. Girard with still better results. The commercial tannic acid contains variable quantities of tannin, and hence cannot be used in these comparative experiments.

NEW HOSE COUPLING.

The difficulties attending the use of the old fashioned hose coupling are too well known to require mention here. The time consumed in effecting a union of the lengths of hose,



CASSEDY'S HOSE COUPLING.

the necessity of having the right ends together, the use of a spanner, and the great liability to injury are all serious objections to the common form of coupling, which are obviated by the invention illustrated by the annexed engravings, in which Fig. 1 shows the coupling partly united. Fig. 2 shows it united, and partly broken away to exhibit the packing rings, etc. Fig. 3 shows the manner of coupling.

The two halves of the coupling are exactly alike, so that it makes no difference how the ends of the hose sections are arranged. Each half of the coupling has a latch hinged to it, which partly encircles it, and is apertured near its free end to fit over a beveled rib on the other half of the coupling. In the face of each half coupling there is an annular space for the packing ring, which makes the joint tight.

CASSEDY'S HOSE COUPLING.

This coupling is adapted to steam as well as water pipes where a temporary connection is required. It has been tested at a pressure of 225 pounds per square inch, and is steam, air, and water tight. One person can connect and disconnect it without the use of tools of any description. It can even be done readily in the dark, and requires only an instant to couple or uncouple it. There is no possibility of its flying apart. A complete coupling for a 2½-inch hose weighs only 5 pounds.

Hon. W. B. Miller, 160 West State street, Trenton, N. J., is agent for this coupling. Messrs. Williams & Cassedy, of Cape May City, N. J., are proprietors.

Tests for Light.

Dr. Koenig has been making a number of experiments on the quality of different kinds of light by means of the leucoscope, an instrument of his invention. It consists of a rhomboid of calcspar, a quartz plate, and a Nicol's prism. When a ray of light enters the spar it is split into two rays, polarized at right angles. These traverse the quartz and Nicol. When analyzed they show two spectra of absorption bands. and the peculiarity is that where the bands occur in one, the other spectrum is of pristine brightness, so that the two spectra overlaid give a continuous spectrum. The number of bands is increased by increasing the thickness of quartz, and they can be shifted by rotating the Nicol. It is possible, therefore, by rotating the Nicol, to make the colors in each spectrum produce white light together. When different kinds of light are examined by the instrument, different amounts of rotation of the Nicol are required to bring the two spectra into conformity, and the angles of rotation are a gauge of the color-quality of the light examined. According to results communicated to the Physical Society of Berlin, Dr. Koenig finds that the angle for stearin candles is 71·20 deg., for gaslight 71·5 deg., for electric arc light 79 deg., for magnesium light 86 deg., and for sunlight 90·5 deg. For burning phosphorus and the Drummond lime light the angles were between gas and the electric light. It thus appears that the magnesium light more closely resembles sunlight than that of the electric arc, a result confirmed by the fact that the aniline dyes, hardly distinguishable by gaslight, can all be distinguished by the arc light, except a few "bronzes," and even these are clearly distinguishable by magnesium as by sunlight. Dr. Koenig has also tested Swan and Edison incandescence lamps, and finds that the luminosity increases at first in a much greater rate than the current increases; doubling the strength of current very largely increased the luminosity. The highest angle reached was 78, or very nearly that for the arc lamp. These researches are of much interest. They indicate the excellence of magnesium as a standard light giver.

Action of Poisons on the Petals of Flowers.

A. Anthony Nesbit, F.C.S., states in the *Journal of Science* that he has made some experiments on the action of various substances on the life of flowers, and for this purpose selected some of the best known alkaloids, viz., strychnine, solanine, digitaline, quinidine, atropine, quinine, cinchonine, picrotoxine, aconitine, brucine, and morphine, using one-quarter per cent and one per cent solutions. The alkaloid of tobacco being very difficult to obtain pure, owing to its rapid oxidation, 5 per cent and 20 per cent solutions of tobacco (bird's eye) were used in its stead. The flower chosen for experiment was the narcissus, and the results showed that there was here a wide field for long and patient investigation.

Of all the twelve solutions, tobacco proved, in a very marked manner, to be most destructive to the life of the flower of the narcissus; the remaining eleven poisons, though but slowly injurious, nevertheless in some instances showed marked difference of effect, or, it may be said, symptom. Thus strychnine, next in poisonous power to tobacco, drew the petals upward, and made them dry and brittle, symptoms also exhibited by solanine poisoning, while quinidine and several other alkaloids rendered the petals limp and rotten. Morphine, one of the least poisonous (to the narcissus) of the alkaloids experimented with, without destroying the flower, curiously enough imparted to the petals a flaccidity resembling that of the petals of the poppy.

A Gasoline Engine.

A petroleum motor, or rather an engine for obtaining motive power from an explosive mixture of gasoline vapor and air, has been constructed by a Hanoverian firm, and is described by Professor Schottler in the *Wochenschrift des Vereins Deutscher Ingenieure.* The working cylinder is 8 inches in diameter, with 14 $\frac{8}{16}$-inch stroke. The design of the machine is similar to that of a type of gas-engine constructed by Wittig and Hees. The gasoline is led through pipes to the pump cylinder, where it mixes with a definite proportion of atmospheric air. The mixture is then compressed and forced into the working cylinder, where it is ignited by a lamp separately supplied with oil. In four trials with the particular engine in question, the maximum force obtained was 4·5 horse power, with 130 revolutions per minute. The consumption of spirit of sp. gr. 0·675, was at the rate of 1¾ to 2½ pints per horse power per hour. The value of the material is estimated at 1⅝d. per pound weight; and the machine is stated to require as little attention and to work as cheaply as a gas engine.

Silico Copper Electric Wire.

Owing to its greater strength phospborus bronze is used sometimes instead of copper for conducting electricity, since much smaller wire possesses the necessary strength. The resistance offered by phosphorus bronze is considerably greater than that of copper, so that while it answers well for telephone wire it is not adapted to long telegraphic lines. L. Weiller, of Angoulême, has recently alloyed copper with silicon instead of phosphorus, and made a silicon bronze, the conductivity of which is twice that of phosphorus bronze, while its strength is not less, and hence seems well adapted to electric conductors. The relative strengths of copper, silico bronze, and phosphorus bronze are as 28, 70, and 90; conductivity as 100, 61, and 30.

Fireproof Paint.

Various substances have often been proposed as fireproof coatings for the protection of woods employed for building purposes, but most of them have been abandoned as being either too costly or not sufficiently durable. The following process, invented by Messrs. Vildé and Schambeck, is described in *La Papeterie*. The paint consists of 20 parts of finely pulverized glass, 20 parts of finely pulverized porcelain, 20 parts of any sort of stone in powder, 10 parts of calcined lime, and 30 parts of water-glass (silicate of soda), such as usually found in commerce. The solid elements having been powdered as finely as possible and sifted, are moistened, and then intimately mixed with the water-glass. This yields a mass of sirupy consistence that may be employed for painting, either alone or mixed with color. The addition of the lime gives a certain unctuosity to the mass for whitewashing, and its combination with the silicic acid of the soluble glass serves to bind the other materials together. The proportion of the different elements above mentioned may be changed save that of the water-glass, which must remain constant. These elements may even be replaced one by another; but it is always well to preserve the lime. Instead of the silicate of soda (soluble glass of soda), soluble glass of potash might be used; but the former is less expensive. The coating is applied with a brush, as other paints are, as uniformly as possible over the surface to be protected. The first coat hardens immediately, and a second one may be applied six hours or more afterward. Two coats are sufficient. This paint may likewise be employed as a preservative against rust, and used as a coating for iron bridges, etc.

LOG SETTING APPARATUS FOR SAWMILLS.

The engraving shows an apparatus by which the sawyer is enabled to gear the log shifting devices of the carriage with a shaft located alongside of the carriage, so as to shift the carriage farward or backward at will.

The carriage ways or tracks, head block, sliding knees, racks, the adjusting shaft, and pinions are of the ordinary construction.

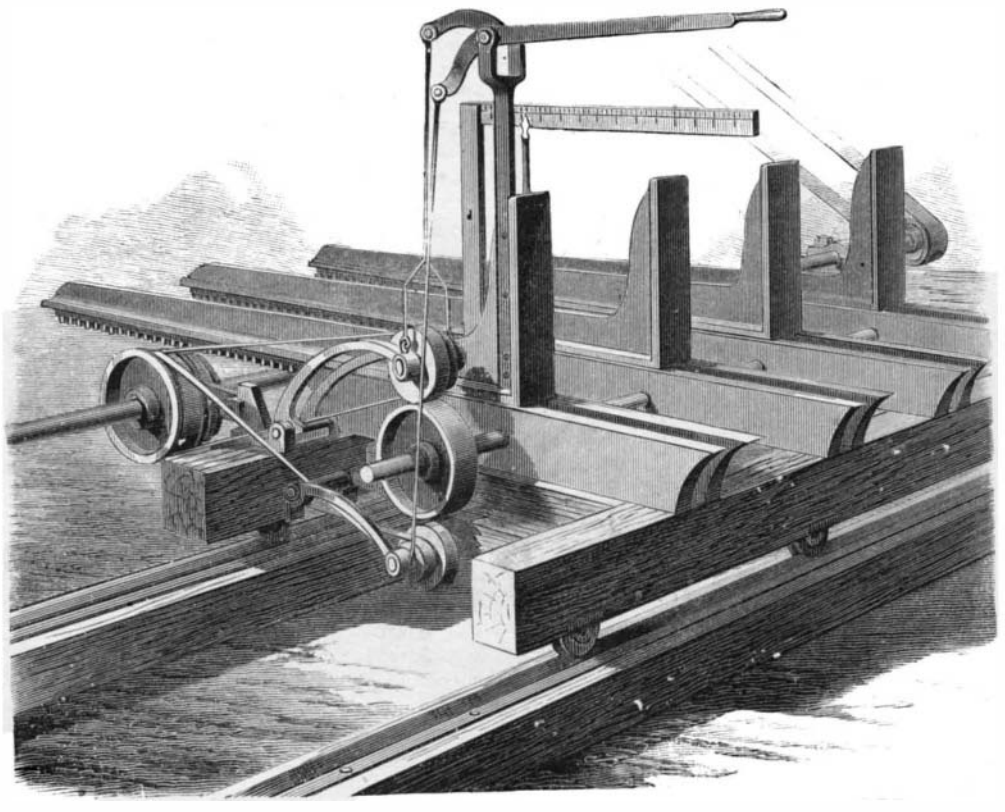
To turn the adjusting shaft and pinions by power at the will of the sawyer, for setting the log up to the saw from time to time, and for shifting the knees back when a new log is to be put on, there is arranged a long shaft at the side of the carriage, at the back. This shaft is revolved continuously by a belt from any suitable driving pulley. On this shaft there is a double pulley arranged so as to slide along it as the carriage goes, the pulley having a feather running in the groove of the shaft, so that it may revolve with the shaft so as to drive the friction pulleys journaled in the swinging frames above and below a pulley on the log adjusting shaft. The upper pulley is driven by a straight belt, the lower one by a crossed belt for reversing the motion.

The pivoted frames carrying the friction wheels are suspended from the hand lever at the top of the first knee rods, so that by shifting the lever in one direction one of the friction wheels will be made to drive a wheel on the adjusting shaft in one direction, and by shifting it in the other direction the other wheel will drive it the other way, while in the middle position both wheels will be disconnected and the wheel on the log adjusting shaft will be inoperative.

A scale is so located with reference to a pointer on the first knee as to gauge the movements of the knees.

With apparatus of this kind the setting of the logs is greatly simplified, and at the same time it may be done accurately and quickly.

This invention has been patented by Mr. Walter P. Schofield, of Cedar Keys, Fla. Further information may be obtained by addressing Messrs. Schofield & Bailey, at the same place.



SCHOFIELD'S LOG SETTING APPARATUS FOR SAW MILLS.

Manufacture of Aluminum.

The English patent of James Morris is as follows: Powdered charcoal and lampblack are mixed with a strong solution of chloride of aluminum and dried by heat to a stiff mass. When the heat has expelled the HCl, they are formed into pellets. These pellets, consisting of 5 of carbon to 4 by weight of alumina, with a little water, are placed in a retort and heated, while for fifty hours a current of carbonic acid is passed through. Carbonic oxide is formed, and while in the nascent condition takes oxygen from the alumina till the carbon is mostly consumed and a sponge of aluminum is left. This is then melted in a crucible with cryolite.

The Anthracite Product of Pennsylvania.

The past year's output of the anthracite coal mines of Pennsylvania was the largest on record. It was, in round numbers, 29,500,000 tons, or nearly 1,000,000 tons more than in 1881.

IMPROVED VISE.

We give engravings of a vise which is novel both in form and in the principle upon which it operates. Only two styles are shown, one being a band vise, the other a brace wrench. In addition to these, vises on the same general principle are made in larger sizes for bench work, for smiths, and for all other purposes where a substantial and reliable vise is required. It not only acts as a parallel vise, but it has greater gripping power than vises of the usual form, and is much more powerful than the ordinary parallel vise.

All of the parts are of steel, drop forged, and finished by the most approved machinery, so that the pieces of any particular style of vise are interchangeable, admitting of renewing broken or worn parts if required.

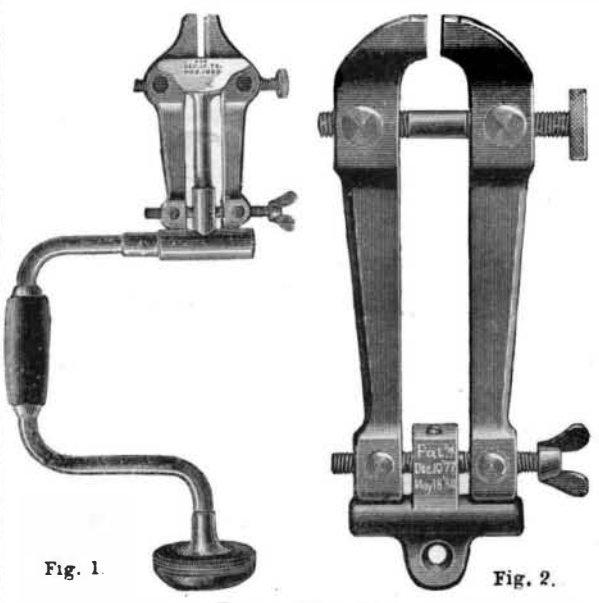


Fig. 1. Fig. 2.

COMPOUND POWER VISE.

Being made wholly of steel, these vises are not only lighter but stronger than iron vises.

The jaws are provided with two screws, each right-handed on one end and left-handed on the other, so that by turning the screws in one direction the jaws will be approached toward each other, and by turning them in the other direction the jaws will be separated. The nuts in which these screws work are cylindrical, and are capable of turning in their bearings in the jaws, so that the screws always have a direct bearing. The movement of the jaws is very quick, and by turning both screws alike, the jaws are kept parallel with each other. When the jaws are nearly approached to the object to be grasped, or in contact with it, the tightening or principal pressure is secured by turning the screw farthest from the jaws.

In its application to the brace, as shown in Fig. 1, the vise may be used to turn nuts and bolts, also drills, bits, and other tools.

The vise represented in Fig. 2 is designed to be used as an ordinary hand vise, or as a vise for line men in running telegraph, telephone, and electric light wires. Provision is made for a ring to receive a strap, and the small ends of the jaws slide in ways in the crosspiece, so that no strain is put upon the screw.

Further information in regard to this useful invention may be obtained by addressing Messrs. Cook & McLane, 81 Centre Street, New York City.

Surgical Instruction for Engineers.

It is pretty generally recognized among surgeons that the successful practitioner of that art has need of not a little mechanical ability. Indeed, many if not most surgeons of eminence have shown a genius for mechanics of the finer sort, and have owed to their mechanical skill and dexterity no small portion of their professional success.

On the other hand, it is beginning to be understood that a limited knowledge of operative surgery, certainly enough of the art to enable a man to tie an artery, stanch a flow of blood, or bind up the wounds of an injured workman or traveler, is highly desirable, if not vitally necessary, to mechanics and engineers. This is especially true of the foremen of machine shops, engine drivers, and civil and mining engineers. In many manufacturing operations and in all works of constructive and mining engineering, accidents are always liable to happen; and not unfrequently the needed surgeon is miles away. In any case, the advantage of having close at hand some one familiar with the first treatment of serious hurts, who can do what is needful to be done in such emergencies to keep the patient's life from wasting before the regular surgeon's help can be obtained, is beyond question.

Hitherto, so far as we know, provision for this important line of instruction for young engineers and foremen in constructive works has never been made by our technical institutions. The trustees of the University of Pennsylvania, however, have now taken the first step in a movement in this direction, and have engaged a lecturer on operative surgery to give a course of lectures on surgery to the senior scientific classes of the collegiate department of the University, especially the mining and engineering sections. The innovation is a good one, and it is to be hoped that the results will be so encouraging that the lectures will be not only continued, but imitated in all high grade technical schools.

Progress in Florida Drainage and Exploration.

A press dispatch states that the dredge of the Okeechobee Drainage Company, working up the Caloosabatchee River, entered Lake Okeechobee December 25, thus completing a navigable channel from the Gulf of Mexico to the heart of the Everglades. The canal is also expected to be an important factor in the draining of large areas of rich sugar land about Lake Okeechobee.

Though Florida was the first settled of all the Atlantic States, the great swamp country of the Everglades remains one of the least known regions of the globe. The first party of white men known to have crossed that part of the State completed their venturesome trip December 14. It was an exploring party sent out by the New Orleans *Times-Democrat*, with two boats. Their route was from Kissimmee City, across Lakes Tohopekaliga, Cypress, Hachewaha, and Kissimmee; down the Kissimmee River to Lake Okeechobee (exploring Lake Okeechobee on the eastern and western shores); across the lake to the entrance to the canal of the Atlantic, Gulf Coast, and Okeechobee Land Company, at which point their boats were hauled to the dredge boat in the canal, down the canal to Lake Hickpochee; through Lakes Hickpochee, Lettuce, and Flirt to the Caloosahatchee River, and down the river to Fort Myers, a distance of about 500 miles. The explorers say that the garden spot of Florida is there in the unsettled interior.

American Ochre.

In a communication to the Tariff Commission, Mr. Junius Gridley, Secretary Bermuda Ochre Co., of this city, states that until the year 1871 no ochres were found in the United States that could successfully compete with the ochres imported from France, in point of color and other characteristics. Common ochres, however, were abundant and largely mined, especially in Vermont and Pennsylvania, which are extensively used by oil-cloth manufacturers for a filler in the body of the cloth where the color or tint is of no account.

In 1872, a deposit of ochre equal in quality to the French product was discovered on the Appomatox River, at Bermuda, Va. From this deposit are now taken 1,000 tons a year, or about one-third the fine ochres used in the United States. The Virginia deposit contains about 10 per cent of sand or grit, which has to be washed out before the ochre can be ground and bolted. The French (Rochelle) ochres are so pure that they may be mixed and ground without washing. They are shipped as ballast freight for much less than the cost of transporting the Virginia ochre from City Point to New York by steamer. Since the Virginia deposit was opened the price of Rochelle ochre has fallen from 3½ cents to 1¼ cents a pound, the effect, it is claimed, of the competition of the home product.