Emulsions of Petroleum and their Value as Insecticides.

BY C. V. RILEY, OF WASHINGTON, D. C.

The value of petroleum for the destruction of insects has long been recognized, and I have for years been endeavoring to solve the question of its safe and ready use for this purpose without injury to plants. The paper contains the results of extended experiments carried on under my direction by several of my assistants, and particularly by Prof. W. S. Barnard, Mr. Jos. Voyle, of Gainesville, Fla., Mr. Clifford Richardson, assistant chemist of the Department of Agriculture, and Mr. H. G. Hubbard, who has for over a year been devoting his time to practical tests in orange groves at Crescent City, Fla.

Passing over the ordinary methods of oil emulsions by phosphates, lactophosphates, and hypophosphites of lime, and various mucilaginous substances, experience shows that, for the ordinary practical purposes of the farmer and fruit grower, soap and milk are among the most available substances for the production of petroleum emulsions.

Ordinary bar soap scraped and rubbed into paste at the rate of 20 parts soap, 10 parts water, 30 parts kerosene, and 1 part of fir balsam, will make, when diluted with water, an emulsion stable enough for practical purposes, as the slight cream, which in time rises to the surface, or the flakiness that often follows, is easily dissipated by a little shaking. Soap emulsions, are, however, less satisfactory and efficient than those made with milk. Emulsions with milk may be made of varying strength, but one of the most satisfactory proportions is 2 parts of refined kerosene to 1 part of sour milk. This must be thoroughly churned (not merely shaken) until a butter is formed which is thoroughly stable and will keep indefinitely in closed vessels and may be diluted *ad libitum* with water when needed for use. The time required to bring the butter varies with the temperature, and both soap and milk emulsions are facilitated by heating the ingredients. Ordinary condensed milk may also be used by thoroughly stirring and beating it in an equal or varying quantity of kerosene.

The diluted emulsion when prepared for use should be finely sprayed upon the insects to be killed, its strength varying for different insects or plants and its effect enhanced when brought forcibly in contact with the insects.

Of mucilaginous substances, that obtained from the root of *Zamia integrifolia*, a plant quite common in parts of Florida, and from the stems of which the Florida arrowroot is obtained, has proved useful as an emulsifier.

These petroleum emulsions have been used with success by Dr. J. C. Neal, of Archer, Fla., against the cotton worm without injury to the plant, but their chief value depends on their efficacy against the different scale insects which affect citrus plants. Experience so far shows that such plants do not suffer from its judicious use, but that it must be applied with much more care to most deciduous fruit trees in order not to injure them.—*Proc. Amer. Assoc.*

Spontaneous Combustion.

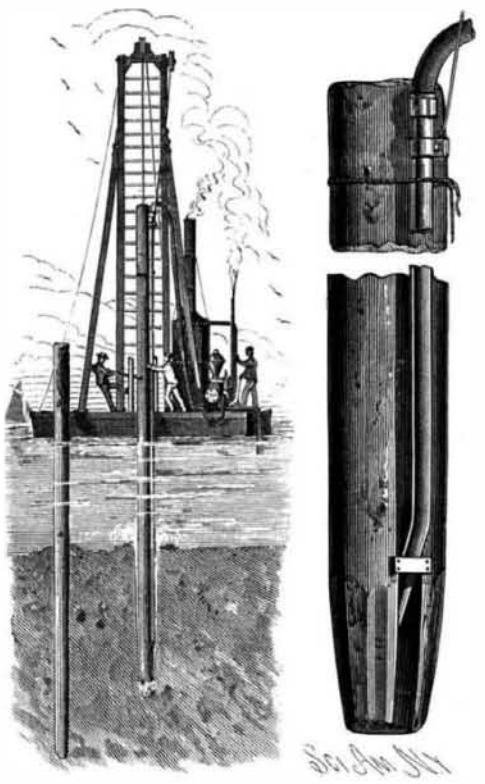
A correspondent of the *Textile Record* says: A fire occurred in a cotton mill at Chester under the following circumstances: A pile of dyed warps was put on the floor of the size house directly after being taken from the drying cylinders. The warps were still warm. Toward morning the watchman noticed smoke issuing from this pile, and upon close examination the warps were found to be on fire. The fire was easily extinguished, but some $300 worth of warps were found to be ruined. The writer visited the mill to study the cause of this fire, and he learned from the superintendent that the heap of warps consisted principally of blue warps with some sized white warps and two bundles of brown warps, the latter being at the bottom of the pile. The superintendent stated that he uses very little tallow in the size for the white and blue warps, but a much larger quantity in the size for the brown warps. He further said that a fire occurred some time ago under similar circumstances in the same place. This former fire was attributed to carelessness of the watchman. We incline to believe that the cause of both the above fires was the combination of tallow and water on the brown warps together with the heat in the warps taken directly from the cylinders, and the pressure of the warps piled on top of the bundles of brown warp. To substantiate this, on examination it was found the brown warps at the bottom of the pile were much more burned than the rest, and that the scorching diminished toward the outside of the pile. Moral: "Never pile up sized warps where taken from the drying cylinder before they have become perfectly cold and dry."

Water Test.

A French periodical, *La Culture*, gives the following simple method for testing the purity of water. In an ordinary quart bottle three parts filled with water dissolve a spoonful of pure white sugar, cork it well, and put it in a warm place. If at the end of forty-eight hours the water becomes turbid and milky, there can be no doubt of its impurity; but if it remain limpid, it may be considered safely drinkable.

HYDRAULIC PILE DRIVER.

The lower end of the pile is provided with a longitudinal groove, which gradually increases in depth toward its lower end, and terminates at the end of the pile. A pipe is so bent that it fits closely against the side of the pile and the bottom of the groove, and its lower end is flush with the bottom of the pile. The pipe is held in place by a block nailed on the pile and across the pipe at its bend, and a rope is passed around the upper end of the pipe and the pile. On the upper end of the pipe is a screw collar, on which a hose coupling can be screwed. Just below the collar is a band having a ring to which is attached a rope passing to a windlass or other hoisting device. When water is forced through the pipe, the earth is washed away from the end and the pile sinks. After it has been sunk to the proper depth the pipe is pulled up by means of the rope, and is then used with another pile. Driving piles by this plan is easily effected, rapid, and gives satisfactory results.



HYDRAULIC PILE DRIVER.

This invention has been patented by Messrs. J. W. Surprenant and J. E. Ferguson, of Astoria, Oregon.

A NOVEL RUSSIAN BOAT.

Our engraving, which is reproduced from a Russian illustrated paper, represents a peculiar form of boat similar in some respects to the catamaran. It consists of two independent hulls, in the center of each of which is an opening in which the traveler thrusts his feet. When standing, he propels himself by the aid of a long two-bladed paddle, and regulates the distance between the two boats by manipulating the ropes which lead from each bow to the middle of the paddle. When tired he brings the boats alongside one another, places the cross bars in position, elevates his umbrella for a sail, and thus skims swiftly over the water.

A NOVEL RUSSIAN BOAT.

THE herring fisheries of Scotland employ nearly 500,000 people, one-seventh of the population. The boats represent a money value of $3,600,000. The annual yield of cured fish has risen from 99,000 barrels early in the century to 1,290,000, and has trebled in fifty years, while in the same period the value of the nets has increased 75 per cent.

Suggestions to Inventors.

One of our subscribers, a lady, residing in a "thriving portion of the rural West," where the population largely patronize the reaper, sewing machine, and barbed wire manufacturers, sends us the following suggestions:

Practical needle women need another improvement in the sewing machine. The family sewing machine of to-day gives only the two thread stitch; the cheap sewing machines of twenty years ago gave only the one thread, or chain, stitch. Now, the chain stitch is desirable in some cases as an ornamental stitch; it is useful also in cases in which the seamstress expects the seam to be only temporary, and finds the two thread stitch too difficult to rip. We therefore want a machine which can be made to form the lock stitch and the chain stitch, alternately. The most difficult point about the invention will lie in the simplicity of the means used to bring about the change in the stitch. If it could be as easy to cause the machine to change from two thread stitch to one thread stitch as it is to put a hemmer or a ruffler on the machine, the invention would be practical and therefore successful.

A Western farmer asks why a horse hedge trimmer has not yet been invented. If an ordinary mower could be made into a hedge cutter by changing detachable parts, it would be widely used. Thousands of farms on the Illinois prairies are inclosed by Osage orange hedges, which are yearly trimmed with shears.

The Pulse of Animals.

The health of animals as well as that of human beings may often be guessed at very shrewdly by simply feeling their pulse. In a horse a good and strong but quiet pulse beats forty times a minute, in an ox fifty to fifty-five, in sheep and pigs not less than seventy nor more than eighty for ordinary health. It may be felt wherever a large artery crosses a bone. In the horse it is generally felt on the cord which crosses over the bone of the lower jaw in front of its curved position, or in the bony ridge above the eye; and in cattle over the middle of the first rib. In sheep it is, perhaps, easiest to place the hand on the left side, where the beating of the heart may be felt. A rapid, hard, and full pulse in stock points to inflammation and high fever; a rapid, small, and weak pulse also to fever, but to fever accompanied by a poor and weak state of the subject. A very slow pulse in stock will often be found to indicate brain disease, while a jumping and irregular pulse shows something wrong with the heart.—*London Graphic.*

The Java Earthquake and the Telephone.

It has been before observed that earthquakes and volcanic eruptions have a disturbing effect on telegraph lines, setting up powerful earth currents in them, and rendering communication difficult. Recent advices from Mr. Weaver, the Superintendent of the Oriental Telephone Company at Singapore, also announce the fact that during the recent earthquake of Java and eruptions of the volcano of Krakatoa, the telephone lines in Singapore were unworkable, owing to a deafening roar which drowned the voice. Only shouting could be heard on the lines because of the noise, which resembled that of a distant waterfall. On one line, in which a small subaqueous cable about a mile in length, from Singapore to Ishore, formed part of the circuit, the roar was mingled with occasional reports like that of a pistol. The volcano of Krakatoa is situated on the island of that name in the Staits of Sunda, between the southern end of Sumatra and the northern end of Java. It is about 500 miles south of Singapore, with a corner of Sumatra intervening. The noises in question were heard during the eruption on August 27 last, but can hardly be considered, says *Engineering*, as due to acoustical effects, notwithstanding the violence of the eruption. The cause is perhaps rather to be sought in the disturbance of the terrestrial magnetic field or in the electric state of the atmosphere by the terrific explosion. The first signs of the eruption were noticed on August 25, when shocks or earthquakes were felt as far as Batavia, and a fine ash began to fall, intermingled with redhot stones. The waters of the straits then began to boil, their temperature rising some 20° C., and great blocks of lava fell on the neighboring coasts of Java and Sumatra. On the 26th the earthquakes became more pronounced, and at noon the Maka-Meru, the largest of the craters, began to break forth into flame. The Goumang-Gunter and the smaller craters then joined in, until forty-five neighboring craters were in action. Torrents of sulphurous mud and lava burst out, and at intervals tremendous explosions were heard, followed by showers of stone and ashes. The clouds were heavily charged with electricity, and lightnings played vividly. Next day the shocks and eruptions increased, accompanied by tidal waves. The island of Krakatoa, a cut of which we gave in the SCIENTIFIC AMERICAN last week, disappeared, and the destruction was frightful

WITHIN three years the number of sawmills in Arkansas has increased from 319 to over 1,200.

Ancient Ruins in Sonora, Mexico.

Ancient ruins have recently been discovered in Sonora, which, if reports are true, surpass anything of the kind yet found on this continent. The ruins are said to be about four leagues southeast of Magdalena. There is one pyramid which has a base of 1,350 feet, and rises to the height of 750 feet; there is a winding roadway from the bottom leading up on an easy grade to the top, wide enough for carriages to pass over, said to be twenty-three miles in length; the outer walls of the roadway are laid in solid masonry, huge blocks of granite in rubble work, and the circles are as uniform and the grade as regular as they could be made at this date by our best engineers. The wall is only occasionally exposed, being covered over with debris and earth, and in many places the sahuaro and other indigenous plants and trees have grown up, giving the pyramid the appearance of a mountain. To the east of the pyramid a short distance is a small mountain, about the same size, which rises about the same height, and if reports are true, it will prove more interesting to the archæologist than the pyramid.

There seems to be a heavy layer of species of gypsum about half way up the mountain, which is as white as snow, and may be cut into any conceivable shape, yet sufficiently hard to retain its shape after being cut. In this layer of stone a people of an unknown age have cut hundreds upon hundreds of rooms from 6 x 10 to 16 x 18 feet square. These rooms are cut out of the solid stone, and so even and true are the walls, floor, and ceilings to plumb and level as to defy variation. There are no windows in the rooms and but one entrance, which is always from the top. The rooms are about eight feet high from floor to ceiling; the stone is so white that it seems almost transparent, and the rooms are not at all dark.

On the walls of these rooms are numerous hieroglyphics, and representations of human forms with hands and feet of human beings cut in the stone in different places. But, strange to say, all the hands have five fingers and thumb, and the feet have six toes. Charcoal is found on the floors of many of the rooms, which would indicate that they built fires in their houses. Stone implements of every description are to be found in and about the rooms. The houses or rooms are one above the other to three or more stories high; but between each story there is a jog or recess the full width of the room below, so that they present the appearance of large steps leading up the mountain.

Who those people were, what age they lived in, must be answered, if answered at all, "by the wise men of the east." Some say they were ancestors of the Mayas, a race of Indians who still inhabit southern Sonora, who have blue eyes, fair skin, and light hair, and are said to be a moral, industrious, and frugal race of people, who have a written language and know something of mathematics.—*Chihuahua Enterprise.*

Metal Castings of Insects, Flowers, Etc.

One of our foreign exchanges gives the following mode for producing metallic castings of flowers, leaves, insects, etc.: The object, a dead beetle for example, is first arranged in a natural position, and the feet are connected with an oval rim of wax. It is then fixed in the center of a paper or wooden box by means of pieces of fine wire, so that it is perfectly free, and thicker wires are run from the sides of the box to the object, which subsequently serve to form air channels in the mould by their removal. A wooden stick tapering toward the bottom is placed upon the back of the insect to produce a runner for casting. The box is then filled up with a paste with three parts of plaster of Paris and one of brick dust, made up with a solution of alum and salammoniac. It is also well first to brush the object with this paste to prevent the formation of air bubbles. After the mould thus formed has set, the object is removed from the interior by first reducing it to ashes. It is, therefore, dried slowly, and finely heated gradually to a red heat and then allowed to cool slowly to prevent the formation of flaws or cracks. The ashes are removed by pouring mercury into the cold mould and shaking it thoroughly before pouring it out, and repeating this operation several times. The thicker wires are then drawn out, and the mould needs simply to be thoroughly heated before it is filled with metal, in order that the latter may flow in all portions of it. After it has become cold, it is softened and carefully broken away from the casting.

RINGED ADDERS CREEPING OUT FROM THE EGGS, IN THE BERLIN AQUARIUM.

About the middle of August a basket of serpents' eggs was sent to the Berlin Aquarium. They were found by some laborers in a heap of dirt, the old serpents having been killed under the impression that they were poisonous. There were about two hundred eggs adhering firmly together, forming a mass resembling the cocoons of the silkworm.

To the great joy and surprise of Dr. Hermes, the director of the Aquarium, who summoned numerous observers, the eggs began to show signs of life on the second day after being placed in the egg house. Twenty or thirty small serpents known as ringed adders (*Tropidonotus natrix*) broke through the leather-like shell, and after a few minutes crept quickly around the cage. These adders were 16 to 18 centimeters in length, and in color were exactly like their parents, having the well known yellow spot on the back part of the head. Some of the serpents showed at once their love for the water, gliding into the basin and showing great skill in swimming.

RINGED ADDERS CREEPING OUT FROM THE EGGS, IN THE BERLIN AQUARIUM.

The hatching of the other serpents was quite remarkable. The high temperature of the room and the lack of moisture from the decaying earth dried the covering of the eggs, and made it very difficult for the young reptiles to make their longed for entrance into the world. They could only stretch out their heads, their bodies being firmly held by the parchment-like shell. Without assistance the young serpents would have perished. A large place was cut in the shell, and it could be plainly seen how the snakes, firmly twisted together, lay in their narrow prison. They stretched themselves out at once, so that a few minutes afterward none of them could have been forced back into the empty shells. The ringed adder is perfectly harmless, the crescent-shaped yellow spot distinguishing it from the poisonous adder, which has black zigzag lines on the back.—*Illustrirte Zeitung.*

By going a few minutes sooner or later, by stopping to speak with a friend on the corner, by meeting this man or that, or by turning down this street instead of the other, we may let slip some impending evil, by which the whole current of our lives would have been changed. There is no possible solution to the dark enigma but the one word, "Providence."—*Longfellow.*

Varnish.

How many, in looking at a handsomely varnished surface, stop to think that the varnish has other uses than that of imparting a fine finish. Few, we imagine, give it a second thought, so accustomed are they to seeing the lustrous mirror-like surface of carriages and coaches; hence the curiosity which at first may have been excited, and the wonder as to how such results could be obtained, soon become dulled by everyday contact.

The degree of transparency or paleness is one of the means of determining the grade or quality of varnish. A fine sirup has much the appearance of a good varnish. The word varnish covers a very wide field, as the term in its fullest sense can embrace all the thousand and one preparations compounded for as many different purposes, but we shall refer only to one branch, that of varnishes for coach and car work, as it is here that the highest perfection is reached, and the greatest skill and intelligence are required in manufacturing.

Almost any encyclopedia will give the constituent parts of varnish, but the art of making good varnish is not found in type, and can only be learned by patient, painstaking effort and intelligence.

An essential quality of varnish is that it must harden without losing its transparency, as it must not change the colors it is intended to preserve. It must exclude the action of air, because wood and metals are varnished to protect them from rust and decay. It must also be waterproof, else the effect of the varnish would not be permanent. And a point of primary importance is that it must possess durability.

In combining its various ingredients so that the varnish will answer these requirements, and at the same time work freely under the brush, lies the secret and mystery of varnish making, and he who best succeeds in accomplishing it confers upon the world a blessing and upon himself a fortune.

Let us look at a carriage and observe the brilliant surface—smooth as a mirror, and like it, reflecting one's features, though possibly somewhat distorted by a concave or convex panel, as the case may be. The luster appears to have considerable depth, yet we know that it is but slightly removed from the bare wood. Would you suppose that fifteen or sixteen separate coats had been put on to attain this, beginning with the priming or first coat, and following it with various layers, each successive coat suited for its special purpose in this outgrowing process? All must be perfect, else the finished job will suffer, for one coat cannot remedy the defects of another.

New uses are constantly being found for varnish, by which it embellishes the article to which it is applied, affording satisfaction to the buyer and profit to the manufacturer. For it is a truism, that whatever adds to the appearance, whether on animate or inanimate nature, whether the addition comes from "a grace snatched beyond the rules of art" or otherwise, increases the pleasing power of the one and the selling power of the other in a corresponding degree. Art, which in one sense is synonymous with excellence, is entering more and more into the various mechanical pursuits, and the future will reveal a more decided advance than has yet been accomplished.—*Charles Howard, in Western Carriage Journal.*

Boride of Aluminum.

Joly obtained a boride of aluminum, BoAl, in hexagonal golden plates by reducing boracic acid with aluminum in graphite crucibles. These crystals were studied before by Deville and Wohler, being known as boron diamonds. Hampe has taken up their study again. He also obtained Bo_4Al as large black lamellar crystals; also yellow quadratic crystals with brilliant luster inclosing carbon and aluminum. Fourthly, he obtained one or more compounds of boron and carbon, which have not yet been investigated.