WHAT SHOULD BE THE LEGAL STANDARD OF KEROSENE?

There are two widely prevalent errors in regard to the use of kerosene. One is that kerosene explosions are always the result of carelessness; the other, that the use of kerosene is necessarily attended with more danger than accompanies the use of animal or vegetable oils; in other words, that it is impossible to make an illuminating oil from petroleum which will not be more or less risky under ordinary household conditions. Both these errors are due to popular ignorance with regard to the nature and properties of the mixture of petroleum products properly denominated kerosene, and the conditions under which low grade or adulterated kerosenes explode.

Crude petroleum, from the complexity of its composition, has been aptly compared to a book; the products given off at successive temperatures being the leaves, each showing more or less pronounced characteristics. Its more volatile parts are given off at a temperature as low as the freezing point of water. At summer heat appears rhigoline, which boils at 65° Fah.; at temperatures below 170°, gasoline is given off; and between that and 300°, the product is called naphtha. The naphtha distilled at a temperature above 280° is distinguished as benzine. All these products are without oily properties; are volatile at common temperatures; take fire readily, and, when their vapors are mixed with from seven to nine times their volume of air, they burn with an explosion, even when not confined.

Between 300° and 400° kerosene is distilled, a mixture of products ranging in character between benzine and the heavy paraffine oils, too thick for use in lamps. According to Professor Chandler, 100 parts of crude petroleum yield, by distillation, 1½ parts of gasoline, 10 of refined naphtha, 4 of benzine, 55 of kerosene, 17½ of paraffine (lubricating) oil, 2 of paraffine, and 10 of coke, gas, and loss. Benzine is worth about half as much as kerosene; naphtha and paraffine oil about one third as much.

The temptation of refiners of petroleum is to mix their oils with the lighter and cheaper naphthas, then bring up the product to the appearance of kerosene by an admixture of paraffine oil, also lower in price than pure kerosene. It is the naphtha, with its low flashing point, that causes all the mischief.

The legal standard for kerosene in this and many other States is 100° fire test; the United States standard is 110°. In Michigan all oils are forbidden which flash at 140° or below. Obviously if the law is enforced in the last named State, kerosene accidents are quite impossible there.

An effort is being made in Boston to have the standard raised from 100° to 110°; some insist that it should be made as high as 135°. Professor Chandler, President of the Board of Health of this city, asserts that the standard of 135° should be adopted everywhere; in which case there would be an end of kerosene explosions, provided, of course, that the law be rigidly enforced. Should the standard be so raised, the actual cost of the oil, he says, would not be increased more than a cent or two a gallon.

In his report on illuminating oils, for the Colorado Board of Health, Dr. Ambrook says that he found it possible to distill a fairly safe oil at 300°, standing a fire test of 132°; but the process was too slow and costly for commercial purposes. This would seem to indicate that for domestic uses only those products evolved at temperatures, say, between 325° and 400°, should be tolerated, and these only without admixture with lighter or heavier products. In his examination of the oils to be found in the shops in Colorado, Dr. Ambrook found that nine-tenths of the samples gave off on an ordinary summer day, such quantities of inflammable vapors that a lighted match applied to the mouth of an open lamp would cause an explosion. Some samples were composed entirely of naphtha and paraffine; others flashed 55° below the fire test guaranteed. It is needless to add that such fraudulent and highly dangerous mixtures are probably not confined to the Colorado market. It is perhaps also needless to add that while carelessness may enhance the danger attending the use of such oils, they cannot be safe even with the most careful handling. On the other hand, an honest kerosene, with a high flashing point, is as safe an illuminating material as the world has ever known.

THE AILANTHUS AS TIMBER.

The *American Agriculturist*, in an article on that much abused tree, the ailanthus, gives the following information in regard to its great value as timber, taken from a paper on the subject by Prof. C. S. Sargent. In experiments made in the French dockyard at Toulon, where the wood of this tree was tested as to its tenacity, or ability to resist a strain, in comparison with the timber of European elm and oak, an average of seven trials showed that the ailanthus broke with a weight of 72,186 pounds, while the elm in a similar number of trials yielded to 54,707 pounds, and the oak, in the average of ten specimens, broke under a weight of 43,434 pounds. Evidence as to the value of ailanthus timber in exposed situations and as to its durability when set in the ground is yet meager, but the little that we have is favorable. Of its value for interior work and for cabinetmaking there can be no doubt, the wood possessing properties remarkable in so rapid-growing a tree. The wood is at first of a pale straw color, but grows somewhat darker with age, and takes a high polish.

When cut to show the silver grain it presents a satiny luster that is very pleasing, and as regards freedom from warping and shrinking it is superior to walnut and fully equal to mahogany. It is said to cut up economically, seasons readily, is easily worked, is free from unpleasant odor, and has no ill effects on the tools. For the treads of stairs, the floors of offices, mills, and other buildings, where constant use requires a hard, strong wood, it is probably superior to any of the woods commonly employed in such situations. There is one use for which its freedom from tendency to shrink will especially commend it—*i. e.*, interior finishings. Its warm color will make it very effective, when used with both lighter and darker woods. It is a fashion now, more than formerly, to use wainscotings in houses. The ease with which ailanthus timber may be produced will allow those who live where other woods are not obtainable, to adopt this style of interior finish.

The tree grows very rapidly when young, but later its increase in diameter is slow. One of the oldest, if not the oldest, in the country, now 60 years old, has a girth of 9 feet 4 inches. According to observations it appears that the ailanthus grows about as rapidly in a poor soil as in a rich one—a matter of considerable importance to tree planters. It will even grow in blowing sands and on the sea coast, localities where few trees can live. In addition to its usefulness as timber its wood has a higher value as fuel than most of those in general use for burning. The tree is very easily propagated, and, indeed, in cultivated grounds, where for the most part it would be out of place, it propagates from seeds most too easily; the seeds, having a broad wing, are carried to a distance by the wind, and the young plants come up in all sorts of unwelcome places. The northern limit at which the ailanthus will prove hardy is not settled, but Prof. Sargent thinks that a line from Boston to St. Louis will about indicate its northern boundary. He, no doubt, intended to say isothermal line, as the tree is known to be hardy as far north as Michigan.

Hotbeds.

The *Irish Farmers' Gazette* (Dublin) says: If gardeners and others will give a trial to the following plan they will find it less than one fourth the expense of glass frames, and much more useful:

Take white cotton cloth of a close texture, stretch it, and nail it on frames of any size you wish; mix 2 ounces of lime water, 4 ounces of linseed oil, 1 ounce of white of eggs separately, 2 ounces of yolk of eggs; mix the lime and oil with a very gentle heat, beat the eggs separately and mix with the former. Spread the mixture with a paint brush on the cloth, allowing each coat to dry before applying another, until they become waterproof.

The following are some of the advantages these shades possess over glass:

1st.—The cost being hardly one fourth.

2d.—Repairs are cheaply and easily made.

3d.—They are light, they do not require watering; no matter how intense the heat of the sun, the plants are never struck down, faded, or checked in growth, neither do they grow up long, sickly, and weakly, as they do under glass, and still there is abundance of light. The heat entirely arises from below, and is equable and temperate, which is a great object. The vapor arises from the manure and earth, and is condensed by the cool air passing under the surface of the shade, and hangs in drops upon the inside, therefore the plants do not require so frequent watering. If the frames or stretchers are made large they should be intersected with crossbars, about a foot square, to support the cloth. These frames are also well adapted for bringing forward flowers in season. For forcing melons, tomatoes, vegetables, etc., this prepared cloth is especially adapted, as it can be attached to boxes of any size and cut to fit them. Little, though square, boxes of the proper size and height, covered with this prepared cloth, can be placed over the beds in which roots and seeds are planted, and the plants allowed to stand without transplanting until all danger of frost is over, when the boxes may be taken off and placed carefully away for another season.

A Fern Valley.

There is a wide field before the enthusiastic lover of nature for the indulgence of a passion for fern culture, if considerations of cost do not stand in the way. What, for instance, could be more delightful, where the necessary expenditure could be freely undertaken, than the creation under glass of a fern valley? Given a natural valley or gorge between parallel hills, and why might not the space from hill to hill be roofed with crystal, the roof supported at each end with pillars of stone, with glass between? Under such a covering, even if the natural features of the site were not of a nature to provide a home for ferns, masses of rock and a stream of water could be introduced, and, by a proper regulation of the temperature, the most delicate and beautiful as well as the most noble of the cryptogamic growths of the tropics would flourish, and a little fern world of wondrous beauty might be created. On the estates of the wealthy in numerous parts of these islands there is many a rocky glen or valley where the experiment could be tried. If through the course of such a valley, to be thus domed with glass, a natural stream wound its way, on each side tree ferns could be planted. On its margins the larger species of herbaceous ferns might be gathered, and so disposed as almost to hide the streamlet's course under a wealth of glorious fronds. Massed up rocks, too, on each side of a rude pathway, running parallel with the watercourse on each margin, might afford a congenial home for the rock-loving members of the flowerless family. On each hillside above the streamlet many a broad platform of earth or rock would afford space for creeping brake or clustering polypody, while on many a craggy point and in many a moist and sheltered nook, congenial habitats might be found for the fern of the open cliff and the dripping cave. In such a glen or valley, with a climate of moisture and heat, the ferns of the tropics, forgetting that they were no longer in the humid depths of primeval forests, would unroll their great glossy fronds, and rise to a height unknown without the limits of their extemporized world. The maidenhair would no longer miss the air of the sea coast, and the glossy-fronded *Asplenium marinum* would develop as grandly as it could in its wild and dripping rocky cavern.—*Fern World.*

Coniferine and Vanilline.

Less than twenty years ago Hartig discovered the glucoside, called coniferine, in the descending sap of *Larix Europœa*, and its presence has since been detected in all pines and firs submitted to examination. But the importance of the discovery has only become apparent since it was found by Tiemann and Haarmann, in 1874, that coniferine might be readily transformed into a kind of acid called vanilline, identical in composition with the white odoriferous substance in vanilla pods. Thus the sweet-smelling product of the vanilla, the fruit of a tropical orchid, can, by this wonderful discovery of modern chemistry, be manufactured from the sap of the coniferous trees of our own climate. During the last two years coniferine has been collected in North Germany by hundreds of pounds. The process of manufacture is as follows: When the various kinds of coniferous trees are cut down for the sake of their resinous products, etc., in spring or at the commencement of summer, the trunks are sawn across, the bark stripped from them, and the sap scraped from the surface of the wood by means of a large blunt knife. The product thus obtained is at once placed over a fire and heated to a boiling point in order to coagulate the albuminous substances, and thus clarify the fluid, which is reduced by evaporation to about one fifth of its original bulk. By being then left to itself in the cold it gradually deposits crystals of coniferine, while the mother-liquor of these crystals retains certain saccharine products, the chief of which is the curious variety of sugar known by the name of pinite. The price of the product varies from $12 to $16 per kilogramme (2¼ lb.); and as the operation of collection and preparation can be easily and economically performed by women, this industry will add another source of income to the forest population of Germany. A tree of medium size, in vigorous health, is said to yield from seven to nine pints of sap, and each pint of sap contains about 100 to 125 grains of pure dry coniferine.

Vanilline is obtained from coniferine by heating the latter with sulphuric acid and bichromate of potash, and then distilling the mixture. By washing the product with ether (in which the vanilline is soluble), and subsequently evaporating the ether, the odoriferous substance is obtained in the form of star-like crystals. The sodium salt of vanilline acted on by anhydrous acetic acid yields a body like coumarine—the odoriferous principle of the Tonka bean—and which boiled with caustic potash is converted into ferulic acid—the acid obtained from assafœtida; so that by careless or improper manipulation, instead of the sweet-scented vanilla a product far from odoriferous might be obtained.

Immigration in 1878.

The Chief of the Bureau of Statistics reports that during the calendar year 1878, the number of immigrants arriving at the several ports of the United States was 153,207, an increase of about 17 per cent over 1877. The occupations of the immigrants of 1878 were as follows:

Professional, 1,516; skilled, 16,837; not specified, 631; without occupation (mainly women and children), 72,121. The countries of last permanent residence or citizenship were as follows: England, 19,581; Ireland, 17,113; Scotland, 3,700; Wales, 311; Germany, 31,958; Austria, 4,881; Hungary, 632; Sweden, 6,176; Norway, 5,216; Denmark, 2,688; Netherlands, 652; Belgium, 454; Switzerland, 2,051; France, 4,668; Italy, 5,163; Greece, 13; Spain, 432; Portugal, 648; Russia, 4,216; Poland, 554; Turkey in Europe, 23; Syria, 38; India, 9; China, 8,468; South Africa, 7; Africa (not specified), 4; Quebec and Ontario, 24,533; Scotia, 3,282; New Brunswick, 1,458; Azores, 873; Iceland, 168; Australia, 634; and the rest scattering.

The large proportion of skilled laborers among the male immigrants is very encouraging. The indications are that during future years a still larger increase of national wealth will accrue from the same source.

Defeat of the Patent Bill.

We are not familiar with the patent laws, nor are we well enough acquainted with the subject to say what should or should not be law so far as the rights of inventors are concerned, says the editor of the *Hudson River Chronicle*, but we have watched with admiration the pertinacity with which the SCIENTIFIC AMERICAN has combated, in the interest of inventors, the late attempt of the appropriators of other men's brains to obtain Congressional sanction for their stealings. We happen to know that hardly one inventor in a thousand ever obtains a fair equivalent for his nights and days of toil, but it seems to us that the one in a thousand is indebted to the SCIENTIFIC AMERICAN that even he is saved, for under the bill proposed there was not a living chance even for one in a thousand to escape being stolen out of his boots.