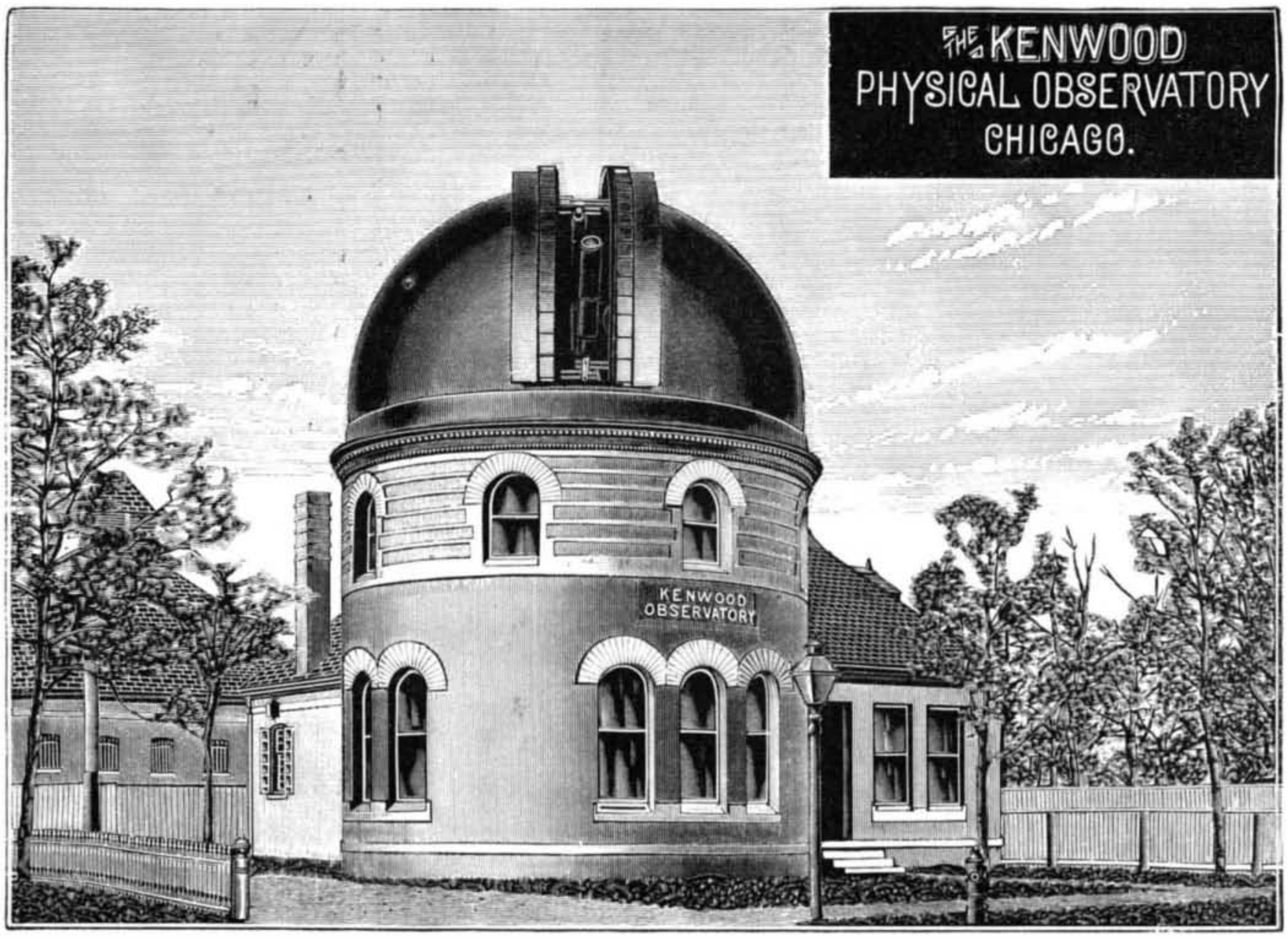
**Improvements in Aluminum Alloys.**

J. W. Langley finds that if pure aluminum be alloyed with between one half per cent and 10 per cent of titanium, the product is harder than aluminum, nearly as incorrodible, and capable of acquiring by hammering or rolling a degree of elasticity and hardness much superior to pure aluminum. These alloys are fusible below the melting point of steel, the temperature required depending upon the percentage of titanium. When the proportion of titanium is less than 5 per cent, the alloy is nearly as malleable as pure aluminum. The presence of iron and silicon in this alloy are injurious, tending to render it brittle and non-malleable, but a small proportion of chromium is of substantial benefit in increasing the elasticity of the product. The alloy is prepared by the action of metallic aluminum on titanic oxide. The method used is also claimed for the preparation of alloys of aluminum with any more electro-negative metal, and is as follows:




A bath of preferably pure fluoride of aluminum and sodium is prepared in a carbon crucible, the oxide or other salt of titanium added, well mixed and allowed to dissolve; when the mass is thoroughly incorporated and quite fluid, metallic aluminum is charged in, the relative proportions of aluminum and oxide or salt being such that the percentage of oxide shall be about twice the percentage of metal required in the alloy. The temperature of the bath rapidly rises on the introduction of the aluminum, and as soon as this ceases, the reaction is completed and the mass is teemed into a suitable vessel, allowed to cool somewhat, and the fluid slag run off from the metal. The latter is remelted before use.

The proportion of fluoride used is from one to four times the weight of the aluminum. Fluoride of sodium, fluoride of aluminum, sodium and calcium, or generally a fluoride of any metal or metals more electro-positive than aluminum, may be used for the bath, but cryolite is disadvantageous, on account of the iron it contains.

The process must not be conducted in a siliceous crucible, a portion of the silicon being reduced and entering the alloy. Chromium may be introduced as oxide into the fluoride bath, or an alloy of chromium and aluminum may be mixed with the manufactured titanium alloy.

**Price of Rare Metals.**

Iridium, a very heavy metal of the platinum group, so named from the iridescence of some of its solutions, and well known in connection with its use for the points of gold pens, may be bought to-day at approximately $720 per pound. The present price of platinum, the better known tin white, ductile, but very infusible metal, is on a par with that of gold, namely, about $350 per pound. But generally its value fluctuates between its more popular brothers, gold and silver. The rarest metal—and it is so rare that recent discoveries have thrown doubt on its elemental character—is didymium, and its present market price, if one may thus term the quotation of an article that never appears on the market, is $4,500 per pound. The next costliest metal is barium, an element belonging to the alkaline earth group; its value is $3,750. Berylium, or glucinium, a metallic substance found in the beautiful beryl, is quoted at $3,375.

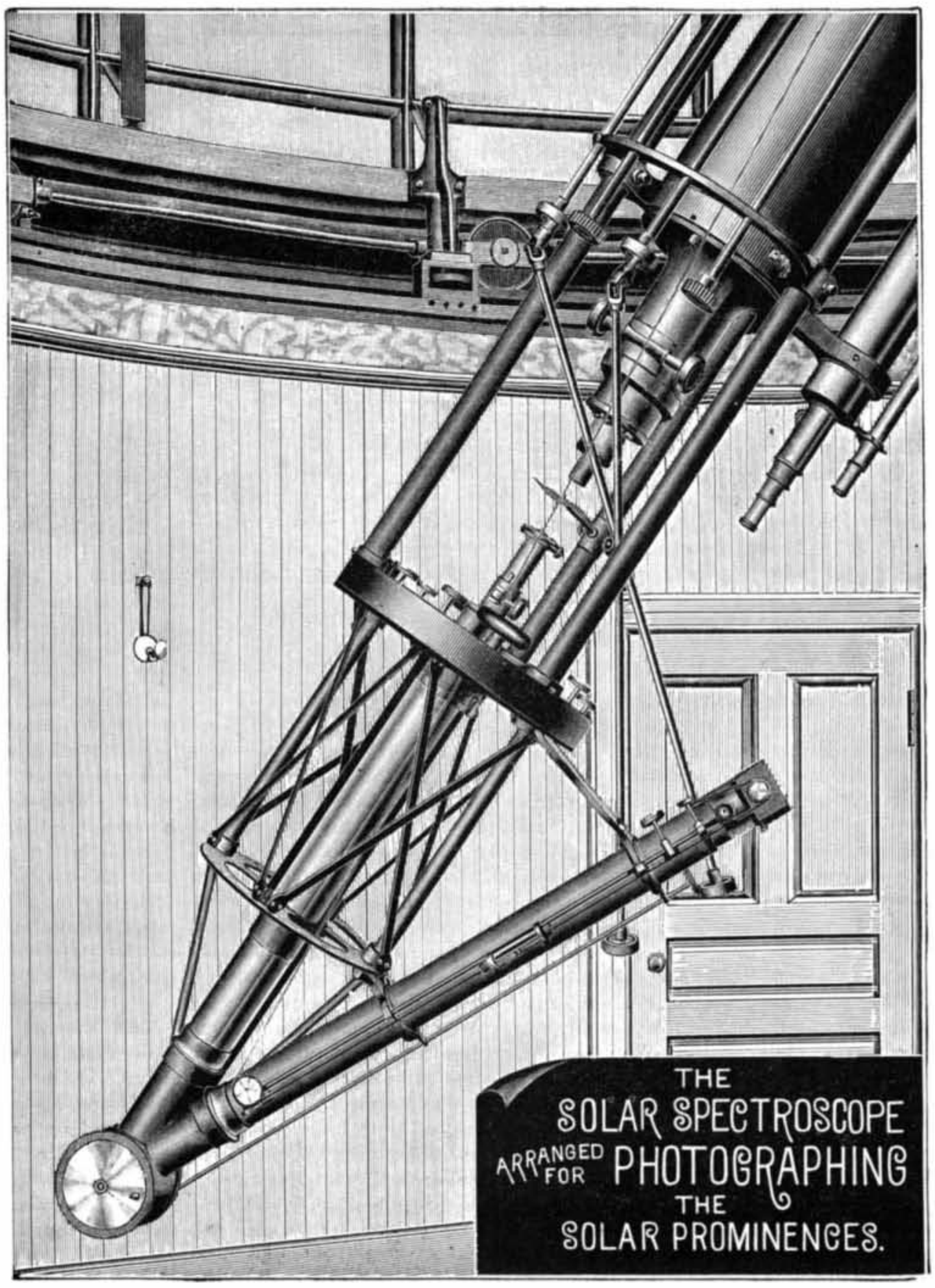
To prevent the feet from sweating, try the following: One part of salicylic acid, one of subnitrate of bismuth, and two of starch. Wash, and apply powder freely.

**THE KENWOOD PHYSICAL OBSERVATORY.**

GEORGE E. HALE, DIRECTOR.

The Kenwood Physical Observatory had its inception in a spectroscopic laboratory erected in Chicago in the summer of 1888. The addition of a tower and wing during the winter of 1890-91 brought the building to its present form, and it now includes a reception room, library, equatorial room, "slit room," "grating room," photographic dark room, general laboratory, and workshop. The grating room contains a four-inch concave grating of ten feet radius of curvature, mounted in the manner employed by Professor Rowland. A shorter girder allows the use of a grating of only five feet radius, in cases when the light source is too faint to admit of the highest dispersion. Sunlight is furnished by a heliostat on a pier some distance to the north of the building, while a Weston dynamo, driven by a gas engine of six horse power, supplies the direct current used in spectroscopic studies of the electric arc. An alternating current of fifty-two volts is also supplied by the Hyde Park Thomson-Houston Company, and this is especially useful in producing heavy electric sparks with a large induction coil, and in lighting the whole observatory with incandescent lamps. A set of thirty-five Julien storage cells can be charged by the Weston machine, and used when desired.

The mounting of the equatorial was finished in March, 1891, by Messrs. Warner & Swasey, and the excellent 12·2 inch object glass, figured from Dr. Hastings' calculations by Mr. J. A. Brashear, was in place and ready for use early in April, 1891. The spectroscope is of very large size, and was also made by Mr. Brashear. A frame of strongly braced steel tubing carries the collimator and observing telescope, which make with each other a constant angle of 25 degrees. The objectives are exactly alike, of 3¼ inches clear aperture and 42½ inches focus, corrected for work in the visual region. The grating is a 4 inch flat, and in many respects is the finest ruling I have ever seen. In addition to the grating there is a 30 degrees white flint prism, silvered on the back, which is used in photographing the spectra of the fainter stars. The large size of the spectroscope, and the necessity of a perfectly rigid attachment to the equatorial, have caused us to mount the spectroscope and tube as if in one piece, the declination axis coming at the center of their combined lengths. As the object glass of the equatorial has a focal length of 18 feet, the total length of the combination is 22 feet 9 inches. The mounting is built very large and heavy, and carries also a four-inch Clark telescope and a small finder. The weight of the driving clock can be controlled by electric connection with an excellent Howard clock.




APPARATUS AT THE KENWOOD OBSERVATORY.

As my recent photographic investigations of solar prominences and their spectra have shown the necessity of employing specially corrected objectives in a continuance of the research, it has been decided to supply the telescope with a photographic object glass of exactly the same aperture and focal length as the present visual glass. A double tube will replace the single tube now used, and the object glass will be so supported that either one may be used on either tube. The spectroscope will thus form a part of the instrument, as before, and the eye end of the second tube will be left free for the attachment of any desired apparatus, such as an amplifying lens and camera for photographing sun spots on the Janssen method. Various improvements of the spectroscope will be made by Mr. Brashear, one of the most important being the construction of a new device of the writer's for prominence photography. A new observing telescope with an objective of about six feet focus corrected for the K region is to be constructed for the spectroscope, and used for further study of the prominence and chromosphere lines recently discovered. Mr. Brashear also has the order for the twelve-inch photographic object glass, for which the whitest possible flint will be secured from the Jena factories, while the crown will be furnished by Mantois. The writer will spend some time visiting the European observatories in search of new ideas in apparatus and methods of work, which will be embodied in the improved instruments.

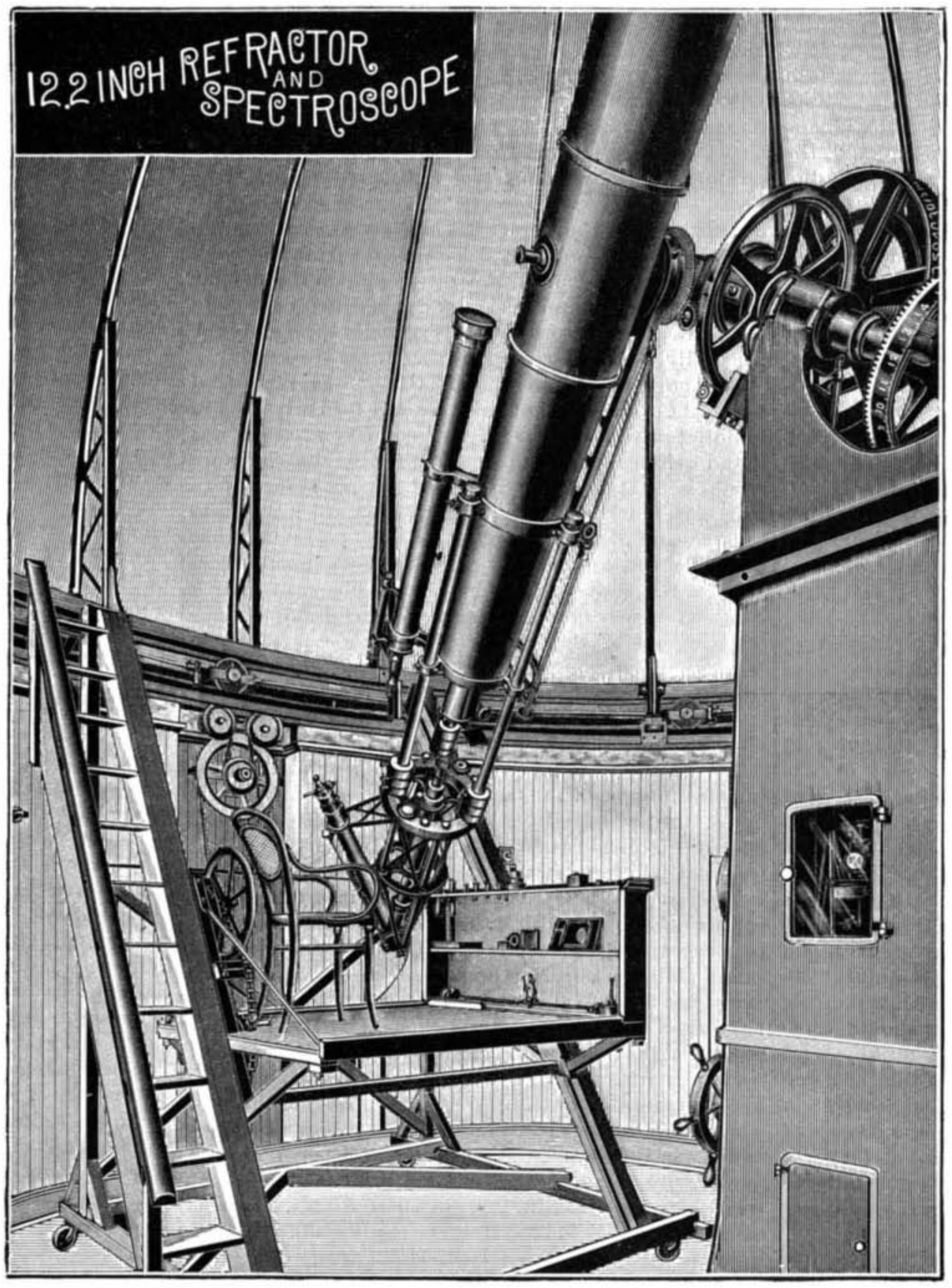
The Kenwood Physical Observatory was dedicated to scientific research on June 15, 1891. Addresses were made by Professor C. A. Young, Professor G. W. Hough, of the Dearborn Observatory, Mr. J. A. Brashear, President E. D. Eaton, of Beloit College, and several others. The observatory has been incorporated under the laws of the State of Illinois, and its control is vested in a board of trustees. The plan of work laid out for the future includes a thorough study of solar phenomena, and particular attention will be given to spectroscopic investigations of the spots, chromosphere, and prominences.—*Sidereal Messenger.*

### Artificial Ivory.

Attempts have been made to produce a good artificial substitute for ivory. Hitherto none have been successful. A patent has recently been taken out for a process based upon the employment of those materials, of which natural ivory is composed, consisting, as it does, of tribasic phosphate of lime, calcium carbonate, magnesia, alumina, gelatine, and albumen. By this process, quicklime is first treated with sufficient water to convert it into the hydrate, but before it has become completely hydrated, or "slaked," an aqueous solution of phosphoric acid is poured on to it; and while stirring the mixture the calcium carbonate, magnesia, and alumina are incorporated in small quantities at a time; and lastly the gelatine and albumen dissolved in water are added. The point to aim at is to obtain a compost sufficiently plastic and as intimately mixed as possible. It is then set aside to allow the phosphoric acid to complete its action upon the chalk. The following day the mixture, while still plastic, is pressed into the desired form in moulds, and dried in a current of air at a temperature of about 150 deg. C. To complete the preparation of the artificial product by this process, it is kept for three or four weeks, during which time it becomes perfectly hard. The following are the proportions for the mixture, which can be colored by the addition of suitable substance: Quicklime, 100 parts; water, 300 parts; phosphoric acid solution—1·05 sp. gr., 75 parts; calcium carbonate, 16 parts; magnesia, 1 to 2 parts; alumina, precipitated, 5 parts; gelatine, 15 parts.

### New French Railway.

There has just been inaugurated with great *éclat* the opening of a new railway from Brive to Gourdon, the construction of which has called into force the utmost skill and ingenuity of the engineers engaged on the project, and has entailed an enormous expense. It has no fewer than seven viaducts, one of which, near Le Boulet, measures 476 meters, and twelve tunnels, several of which are over 1,000 meters long. The new line will shorten the journey between Paris and Toulouse by two hours, and when quite ready for traffic will considerably expedite the transport of goods between France and Spain.




APPARATUS AT THE KENWOOD OBSERVATORY.

### Manufacture of Rubber Water Bottles and Fountains.

So much has been said about white compounds and the methods of making up the goods into which they enter, that it may seem like a rehash of an old story to talk on this subject; but there are some few points that have not as yet been touched upon, which is my excuse for this article. Of course any fairly furnished rubber manufacturer knows how to make white rubber, or at least ought to, for, even while I say this, I recall the fact of a man well posted in black mixtures who had so been brought up in the belief that litharge must enter into every compound that he put it into a white compound, and could not understand why after vulcanization it was not white. Without dwelling upon this, or giving any specific compounds for white goods, I am going briefly to give an idea of exactly how the goods are made up.

The part of making up, perhaps, begins with the spreading of the stock. In this, however, if the calender and the calender man are all right, there should be no trouble in turning out exactly the thickness wanted and in having the texture all right for the best results. After the stock has been stripped from the apron upon which it is spread, the next thing is to give it the peculiarly ribbed appearance that many of the goods have. This, to be sure, is not a necessity, as many water bottles are made up plain. One method of producing this ribbing was to press the rubber after it had been cut up into small sheets between metal plates that acted as dies and gave a fine appearance. Another way is to have a grooving roll so arranged that it may be run against one of the calender rolls, and thus give this result.

The stock after being thus ribbed is sent to the cutting room, and here the parts for the water bag are shaped. These parts consist of the bag shape proper, the neck, the binding, the rubber handle and the tail piece. The bag proper is cut out by a die, two sheets of the stock being laid together with the ribbed sides out, and the cutting of the die through the two sheets of rubber in a measure catches them together, so that this is really a part of the making up. These large pieces are put in cloth books, and then sent to the tables where the making up takes place. This work is all done by girls. The bag maker's table is, as a rule, covered with zinc, has a hanging shelf above it and a shelf below it, also zinc covered, for receiving finished work. Each worker at a table is provided with a tin cement cup, with brush and cover, a stitcher made after the fashion of the well known tracing wheel, and a smooth iron hand roller for setting the seams after cementing.

The first process in the manufacture after the different parts reach the bag maker is that of cementing. In order that the cement may not touch the portions of the bag that are not to be covered with binding, a metal form is laid lightly over the bag, leaving the edge free, which is brushed lightly over with the best white rubber compound dissolved in naphtha that can be produced, as upon the integrity of the cement depends a great deal of the strength and durability of the water bottle. After the various parts have been cemented, that is, the various parts of the bag proper, the binding and the neck, the double bag piece is opened out at the mouth and slipped over a curved rod of half round iron, somewhat similar to a section of a wheel tire. The binding is then put over the edges of the bag pieces, holding them together, is rolled down by the roller, and then run over by the tracing wheel, which latter gives it a finish, and also helps to set the two portions of unvulcanized rubber more closely together. The neck piece is then formed separately, and after being cemented at its lower edge is placed around the metal bottle top, the thread of which has received a generous coating of cement. This is sometimes wound in with wire to keep it solid and to keep it from leaking, and sometimes it is not. A piece of binding is run around the neck of the bottle, the flexible rubber handle, which is made of friction cloth covered with rubber, is next cemented to the shoulders of the bag, the tail piece is cemented on, and, if it is a solid piece, is eyeleted. If the bag is a combination syringe and water bottle, an outlet pipe is put at the lower end of it, and the whole dusted over with French talc and laid upon the zinc-covered shelf, out of the way of the workers.

In finishing up the work of the bag, the next process is to carry it to the vulcanizing room, where it is laid in an immense sheet iron pan that is practically filled with a layer of French talc pressed down very smooth. A little of the talc is put inside of the body of the bag to keep it from sticking together, and then the whole is covered about three inches deep with another layer of talc. This forms in reality a mould for the water bottle, the whole design being to hold it in place after it is exposed to the heat, and until vulcanization is complete. A two or three hour heat is commonly given goods of this sort, after which they are taken out, the French talc is carefully blown out from the interior of the bottle, and the goods go to the packing room, where they are gotten ready for shipment.—*Rubber World.*

### To Restore Faded or Obliterated Ink.

The following suggestions are from Haldane's "Workshop Receipts:"

1. Wash in warm water to remove salt if the paper has been immersed in sea water, and then soak in a solution of gallic acid, 3 grains to the ounce of water.

2. Wash in clean water and soak in solution of ferrous sulphate, 10 grains to the ounce.

3. Apply a solution of potassium ferrocyanide with a brush, when the writing will appear in blue, if any iron is left of the original ink.

4. *Falsified Writing.*—Gobert has found that if writing is ever so carefully scratched out, there are still left sufficient traces of the oxide of iron in the ink to become visible in a photographic copy. Light reflected from paper that has not been written on acts in a different way on the photographic materials from that reflected from places which have been once covered with ink.

### Rubber Cement.

To fasten glass letters, figures, etc., on glass (show windows) so that, even when submerged in water for several days, they will not become detached, use an India rubber cement. The best for this purpose consists of one part India rubber, three parts of mastic and fifty parts chloroform. Let stand for several days at a low temperature to dissolve the cement. It must be applied very rapidly, as it becomes thick very soon.

### Aluminum.

A. E. Hunt stated in a lecture before the Boston Society of Arts that the extravagant claims made concerning the production and properties of aluminum had constituted the chief difficulty in its introduction and extended use. The pure metal is soft and weaker than the commercial variety containing 3—4 per cent of impurity. The tendency of aluminum to become coated with a thin film of oxide in exposure to air gives it a dull appearance and makes it unsuited for table ware. It loses its tensile strength and much of its rigidity at 400°—500° Fah., becomes pasty at 1,000 Fah., and melts at 1,300° Fah. It does not roll or cast well, and its conductivity for heat and electricity is only about half that of copper, its tensile strength is not greater than that of common cast iron and only about one-third that of structural steel, while its strength in compression is only about one-sixth that of cast iron.

A bar of aluminum 1 inch square and 4 feet 6 inches between its supports deflects 2 inches with a load of 250 pounds, while a similar bar of cast iron requires double the load to give an equal deflection. The modulus of elasticity of cast aluminum is about 11,000,000, being only about one-half that of cast iron and one-third that of steel. Its presence in iron is stated to be deleterious, and it is said not to lower the melting point of steel, statements to the contrary notwithstanding. The theoretical cost of 1 pound of aluminum as made by the Pittsburg Company is 20 cents per pound, the items being, 2 pounds of alumina, 6 cents; 1 pound of carbon electrode, 2 cents; chemicals, carbon dust, and pots, 1 cent; 22 electrical horse power for one hour (water power being used), 5 cents; labor and superintendence, 3 cents; general expense, interest, and repairs, 2 cents (this amounts to only 19 cents).

Although the value of aluminum has been much overrated, both it and its alloys have many useful qualities. The difficulty of soldering it is alleged to have been overcome by the use of a special flux (nature not stated). Hard or soft solder, zinc or an alloy of zinc and aluminum are the solders used. The difficulty caused by the softness of aluminum is also said to have been overcome by alloying it "with a few per cent of hardening metal," or hammering or drop forging.

### The New Artificial Quinine.

Artificial quinine, writes the Paris correspondent of the *Lancet*, may be considered one of the discoveries of the year. The synthesis of that useful, nay, indispensable substance, quinine, has long been a desideratum, and now, thanks to MM. Grimaux and Arnaud (the former professor of chemistry at the Ecole Polytechnique, and the latter having succeeded the late illustrious centenarian, Chevreul, at the Museum d'Histoire Naturelle), the chemical dream has been realized. The method adopted by these gentlemen is as follows: The base cuprein contained in the shrub *Remijia pedunculata* growing in Brazil is treated with sodium, then the combination thus obtained with chloride of methyl. The product is quinine absolutely identical with the substance with which we are familiar. This important discovery should have the effect of bringing down the price of quinine, and of rendering us independent of supplies from the usual sources. The discovery presents a further interest in that, by the substitution in the foregoing process of compounds of ethyl and other higher alcohols for those of methyl, new bodies analogous to quinine may be manufactured—bodies whose therapeutical value may be great.

### Black Tea and Green.

Mrs. Scidmore, in her "Jinrikisha Days in Japan," says:

The tea plant, as every one knows, is a hardy evergreen of the camellia family. In the spring the young leaves crop out at the ends of the shoots and branches, and when the whole top of the bush is covered with pale, golden green tips, generally in May, the first picking takes place. The choicer qualities of tea are never exported, but consumed at home. The average tea brought by the exporters for shipment to the United States and Canada is of the commonest quality, and, according to Japanese trade statistics, the average value is eleven cents a pound.

For green tea, the leaves are dried over hot fires almost immediately after picking, leaving the *theine* or active principle of the leaf in full strength. For black tea, the leaves are allowed to wilt and ferment in heaps for from five to fourteen days, or until the leaf turns red and the harmful properties of the *theine* have been partly destroyed.

Tea which is to be exported is treated to an extra firing, to dry it thoroughly before the voyage, and, at the same time, it is "polished," or coated with indigo, Prussian blue, gypsum and other things, which give it the gray luster that no dried tea leaf ever naturally wore, but that American tea drinkers insist on having. Before the tea leaves are put in the pans for the second firing, men, whose arms are dyed with indigo to the elbows, go down the lines and dust a little of the powder into each pan. Then the tossing and stirring of the leaves follows, and the dyeis worked thoroughly into them. . . . This skilled labor is paid for at rates to make the Knights of Labor groan, the wagelist showing how impossible tea culture is for the United States until protectionist tea drinkers are ready to pay ten dollars a pound for the commonest grades. During the four busy months of the tea season the firers are paid the equivalent of eleven and four-tenths cents, United States gold, for a day's work of thirteen hours. Less expert hands, who give the second firing, or polishing, receive nine and six-tenths cents a day. Those who sort and finally pack the tea and who work as rapidly and automatically as machines, get the immense sum of fifteen cents. . . . Each year the United States pays over $7,000,000 for the nerve-racking green tea of Japan.

### The Northern Pitch Pine.

Inquiries about this tree often reach us from Europe, especially from France and Germany, where the impression prevails that it is the species which produces the pitch pine of commerce, generally known in this country as Southern pine or Georgia pine, and now exported from the maritime region of the southern Atlantic and Gulf States to Europe and South America in large quantities. The vernacular name is, in part at least, responsible for this confusion. It should be remembered that all our pines on which the leaves appear in twos or in threes in the same cluster, and which produce coarse resinous wood distinctly marked by broad bands of dark colored cells, are called pitch pines, and that the pitch pine in New England and in New Jersey is an entirely different tree from the pitch pine of Georgia or from the pitch pine in California; and that there are more than a dozen different trees in the United States to which this name is applied by the people living in the regions which these trees inhabit.

The northern pitch pine is the *Pinus rigida* of botanists. The wood of this tree was formerly used in building in those parts of the country where it was found before cheap transportation brought the more valuable material of the Southern pine forests to Northern markets. Now it is rarely manufactured into lumber, and during the last twenty years it is not probable that a single foot of it has been exported from the United States. The two pitch pines of North America, which now possess commercial importance are the pine of the South, *Pinus palustris*, and the Western or Oregon pine, *Pinus ponderosa*; and it is from the forests of the former that the pitch pine so largely used in the North is derived, and that furnish all the American hard pine sold in Europe.

The Northern pitch pine is a valuable and interesting tree in spite of the fact that the lumber it yields is not of the best quality. It grows naturally on poor and sterile land, usually on sandy barrens, and less frequently in sour, swampy soil. Its presence is a good indication that the soil which bears it is too poor to supply other trees with sufficient plant food to compete successfully with this tree. Once in possession of a sandy plain on our Northern seaboard, no other tree can wrest this advantage from the pitch pine, and its hold upon existence is strengthened by the peculiar power it possesses of reproducing itself from seed. Seedlings spring up in great quantities in the neighborhood of seed-bearing trees, and grow rapidly in what would appear to be most unfavorable situations; and it can be raised from seed sown in the open ground more easily and with greater certainty than any other tree which is hardy in the Northern States. In this capacity of the seed to germinate readily will be found the greatest value of this tree, which seems destined, sooner or later, to be used in covering the great tracts of unproductive land which occur in the neighborhood of our Northern seaboard. Its value and adaptability for this purpose has already been proved. Thousands of acres of the New England coast have been covered with forests of this tree, raised from seed at a mere nominal cost, and nothing but the dread of fire prevents the extension of these forests over still larger areas. What appears to be barren soil, such as occurs on some parts of Cape Cod, in Massachusetts, and in southern New Jersey, will, in forty or fifty years, produce a forest of pitch pine of considerable money value for the fuel which it contains. No other method has yet been found by which such waste lands can be made to yield any return whatever, and any comprehensive system of agriculture must look to covering, sooner or later, these lands with trees.

The pitch pine planted on barren soil will not grow to a large size or produce anything more valuable than firewood. It will, however, in a comparatively short time yield on the poorest land several cords of fuel to the acre; and the fuel value of this wood is unsurpassed by that of any other inhabitant of our Northern forests, and for many purposes, such as brickmaking and for charcoal, it is extremely valuable. When individual specimens have happened to grow in good soil they have sent up tall, stout stems two or three feet in diameter. These trunks were eagerly sought for in the early settlement of the country, and were manufactured into timber and flooring of excellent quality and remarkable durability. In some parts of New Jersey houses timbered and floored with this wood a hundred years ago are still standing, and are in a perfect state of preservation. Such trees have now almost entirely disappeared, however, and there will probably never be a question of planting the pitch pine for timber, for where the soil is good enough to produce large individuals, with straight, clean trunks, it will support a forest of more valuable species.

As an ornamental tree, *Pinus rigida*, although it is not suited to decorate a trim lawn, can be used sometimes to advantage when it is desired to produce bold, picturesque effects, or to clothe a barren knoll with verdure. It grows rapidly; the trunk, covered with dark, deeply furrowed bark, broken into large, square plates, is always a handsome object, and the color of the coarse, pale green foliage makes a good contrast with the other trees of our woods and plantations.—*Garden and Forest.*

### Spontaneous Ignition of Coal.

In the chemical section, British Association, was a paper read by Professor Vivian B. Lewes on the "Spontaneous Ignition of Coal," the true explanation of which he held to be partly physical and partly chemical, but not dependent upon the percentage of pyrites. Freshly won coal had, he said, the power of absorbing from a fraction over one to three times its volume of oxygen from the air, and the oxygen being rendered chemically highly active, partly by compression and partly by the elimination of nitrogen, it attacked some of the bituminous hydrocarbons in the coal, converting them into carbon dioxide and water vapor. With regard to the bunker fires which are now becoming perilously frequent on some of he fast liners, Professor Lewes attributed them entirely to rise of temperature, from the bunker bulkheads being too close to the hot air upcast shafts from the boilers and furnaces. In the course of a discussion which followed, pretty general agreement was expressed with the views of the reader of the paper. In reply to a question by Sir Frederick Bramwell, Professor Lewes pointed out that in case of coal bunkers in ships the necessary safety could be obtained by having a thin water jacket between the smoke shaft and the bunkers. The remaining papers were of interest only to experts, and the same may be said of all the numerous communications submitted to the mathematical and physical science group. Such subjects as the surface tension of ether and the measurement of Hertzian oscillations could allure only the initiated.

### Arsenic Poisoning from Coal.

A source of contamination with arsenic recently pointed out is from coal. When coal is burnt it is roasted out and it is the only product of the coal which is at first volatile and afterward non-volatile. A part of the smoke that goes into the air is arsenious acid mixed with carbon, and a large part of it lodges in the chimneys. Now take a city like London, or any of the great English cities where coal is burnt very freely, there the quantity of arsenious acid that is given into the air must be very considerable, and it would be interesting to make comparative tests of the urine of persons in a city like Boston and in a city like London. The English coal is very bad coal in this respect. Every ton of coal burns off about twenty to forty pounds of sulphur. That sulphur is transformed into sixty pounds of sulphuric acid, which has left its stain on every marble building in London. I speak of the sulphur because the sulphur is largely accompanied by arsenic.—*Professor Crafts in Boston Medical and Surgical Journal.*

### The Green Ray.

Mr. C. Mostyn, in a letter to *Nature* on the well known appearance of the green ray at sunrise or sunset, caused by the refraction of air, states: "This 'green ray' is seen to best advantage at sunrise, owing I imagine to the eye not being wearied with watching the previous glare, as is apt to be the case at sunset. At the same time, I had many very satisfactory observations at sunset, one in particular, when we were running before a very heavy sea in the Southern ocean, and the 'green ray' was seen no less than three times in as many seconds, as the ship rose and fell on the huge waves, causing as it were two sunsets, with a sunrise between them. The best displays took place when the refraction near the horizon was of such a character that the sun assumed a balloon, or vase, shape as he came close to the sea line. When, on the contrary, the sun appeared flattened out in its horizontal diameter, the 'green ray' was either entirely absent, or was seen only in an indistinct and uncertain manner."

### Copying Ink without Press, Black.

| | | |
|---|---|---|
| Nigrosine, C. P., fine | 10 | ounces. |
| Glucose "A" | 1½ | " |
| Hot water | 1¾ | " |
| Glycerine | 1¼ | " |

Dissolve the nigrosine by trituration in the hot water and then add the other ingredients and strain through a piece of silk. If too thick when cold, dilute to the proper consistence with water.