burner, and the hole in the latter measured $\frac{1}{16}$ of an inch—a size considerably smaller than we are in the habit of using, but chosen purposely to suit the limited space at our disposal in which to separate the photometer screen from the light.

The gases were carefully adjusted till the light was at its best, and its value was then ascertained by a modification of Bunsen's photometer, in which the candle was fixed at a distance of one foot from the screen, and the two together moved away from the light until both sides of the disc were equally illuminated. This was repeated very many times, and examined by various observers, the result being that a mean of all the observations gave the value of the lime light, under the above conditions, as 115·5 standard candles. In the next experiment, coal-gas was substituted for the pure hydrogen, and, somewhat to our surprise, the result was not to any appreciable extent different, the light being, both as shown by the photometer and in the judgment of those by whom we were assisted, in every respect equal to that given by pure hydrogen.

Between each of the gas-bags and the burners we had introduced one of the gas-meters, and carefully noted the relative quantities of gases consumed, the result being that with pure hydrogen it stood—oxygen 1, hydrogen 1·3; and with coal-gas—oxygen 1, hydrogen 1·1. We are aware that there is a very general belief that the proportions in which oxygen and hydrogen combine to form water (H_2O) are those which ought to give the best results in raising the lime cylinder to the incandescent state; but those who have had much practice with lime-light exhibitions, where the bags have been of nearly the same size, know very well that the hydrogen bag, especially when coal-gas is used, does not get empty much sooner than the one containing oxygen. What may be the true explanation of the apparent anomaly we are not at present in a position to say; but the result of the somewhat careful measurements above recorded is quite in harmony with the opinion that we had formed from our experience with the practical working of lantern exhibitions.

Of course it will be understood that in bringing the light up to only 115·5 candles, we were not seeking to produce the best effect that could be obtained, but only the best under the conditions named, with a view to comparing the pure hydrogen with coal-gas; and we may say that, on increasing the orifice of the jet to .08, and doubling the pressure, we more than quadrupled the illumination, and when it was passed through the ordinary lantern condenser it was roughly found equal to about 405 candles To get at that estimate, however, the candle was fixed at only two inches from the photometer screen, and therefore there was some difficulty in deciding the precise distance from the light at which both sides became equally illuminated.

[Chemical News.]

RAPID MODE OF DETECTING THE ADULTERATION OF BUTTER WITH OTHER FATS.

By J. W. GATEHOUSE.

THE following method is based on the insolubility of potassium stearate in alkaline solutions, when the stearate has been produced at high temperatures.

Before the application of the test, it is essential that all curd, buttermilk, and salt be removed, and for this purpose the butter should be thoroughly washed in boiling water, and, if necessary, dissolved in ether.

Take about 20 grains of the butter, place it in a large test-tube—dimensions about $6 \times \frac{3}{4}$ inch—and fill the tube one third full with water, boil thoroughly, and allow to stand till the fat has accumulated at the top.

Two modes now present themselves—first, either to dissolve the fat in ether, and saponify after evaporation; or, secondly, and I think more conveniently, extract the lower layer of liquid by means of a pipette, which may be readily effected with a minimum of loss in the following way:

Draw out a piece of thin glass tubing, sufficiently long to reach to the bottom of the tube, to a fairly fine point, but not too fine, and bend the top to an obtuse angle. Whilst the butter is still liquid, insert this nozzle to the bottom of the test-tube by placing the finger over the upper end, so that no liquid may get in till it reaches the bottom of the tube. Allow it, now, to remain till the butter is cold and fairly set, when, by means of an inch of small caoutchouc tubing, attach to a sufficiently large pipette, and withdraw the whole of the liquid, the butter will, if sufficiently cooled, remain in the middle of the tube.

This process can be repeated till the washings show the absence of chlorides when tested with nitrate of silver.

The saponification is effected by heating the purified butter with from one third to one half its own weight of solid potassium hydrate perfectly free from salts of sodium (the best being the hydrate purified by alcohol) to a temperature above 420° F.

Eight grains of potassium hydrate easily saponifies the 20 grains of butter.

The heat should be applied gently at first, and when the frothing is becoming less, a higher temperature may be applied till no further apparent action occurs, and a porous mass remains at the bottom of the tube.

Should the butter be pure, the color of this mass will be, at the utmost, light yellow interspersed with a few light brown patches; but should the butter be adulterated to any extent, it may be almost black. Too much reliance, however, must not be placed on the color.

It is essential that the ultimate temperature during saponification be kept at above 400° for some minutes, else the potassium stearate formed will be soluble instead of insoluble in the alkaline solution. For this purpose in the first experiments, it is advisable to use a bath of molten tin or lead, but having once noticed the series of reactions which occur, the flame of the Bunsen burner can be used quite as conveniently and more advantageously.

Having allowed the tube and its contents to cool, boil the saponified mass with successive portions of distilled water till 6 oz. (or 200 cubic centimetres) altogether have been used. The absolute amount of water used is not material, but having once determined on the amount, it must be rigidly adhered to.

A portion of this solution poured into a test-tube half an inch in diameter will present only a faint opalescence if the butter is pure, but a decided opacity if impure, the degree of opacity depending on the amount of adulteration.

In order to determine the amount of adulteration in any sample, a pure butter should be first obtained from cream, which is easily effected by churning cream for from 15 to 30 minutes in a wide-mouth bottle, and adding to separate portions of its known percentages of lard, etc.

Saponify each of these as stated above, and cork them up in tubes of equal diameter, labelling each with the percentage of lard it contains.

On comparing them, it will be seen that 2 per cent of lard can be clearly indicated.

When a butter is analyzed, all that remains to be done is to saponify, make up the solution to the correct amount, and after cooling, pour out a portion into the tube, when comparison is easily made with the specimen tubes.

It is possible to weigh the amount of potassium stearate thus produced; but as the process of washing is tedious and the weighings never absolutely accurate, the comparison method is to be preferred.

[Manufacturers' Review and Industrial Record.]

ON SILICATE OF SODA IN TEXTILE INDUSTRY.

APPLICATION IN WOOL-SCOURING.

SILICATE of soda is now used in many places with the best success in washing and scouring wool. It must be remembered that for scouring the wool the temperature of the water and silicate of soda may be higher than in the treatment with soap and soda. For scouring the wool in the leviathan, only silicate of soda is added to the first bath instead of soda, and to the second bath only half the usual amount of soap and soda. It is advisable to squeeze the scouring liquor out thoroughly before washing the wool cold in the machine, as this liquor can be kept twice as long as soda or soap liquor, if it is only kept warm. The wool scoured with silicate of soda always appears more white, open, and soft; the latter is the case, however, only if the wool has been thoroughly squeezed before the cold washing. Wool treated in this way is, without question, cleaner, takes the dye more rapidly and better, and turns out whiter after sulphuring.

The same experience holds good of woolen yarn from which the grease is to be removed. It is sufficient to move them simply back and forward in very hot silicate of soda solution, to turn the skein on the stick, then to move them up and down on the stick in the hot solution, to squeeze, wring, or rinse in cold water, in order to obtain in this simple manner not only a beautiful, unfelted, clean white skein; nay, the yarn is much cleaner than if treated with soap, soda, ammonia, etc. (If the yarn is impregnated, also, with Irish moss, a little soda ought to be added to the silicate of soda.) On making a comparative test, for example, in this manner, by introducing a skein scoured with silicate of soda, and another cleansed with soda, at the same time, into an aniline bath, the former will take up the color brighter and purer in a quarter of the time of the latter; if they are now exposed to the sun, it will appear that the color of the former is also faster than the other.

As silicate of soda has no felting properties, it can not be used in fulling cloth. Still it would be difficult to find a better means of cleaning the cloths before fulling than by sprinkling a warm solution of silicate of soda over them while they are running over the rollers in the washing-machine. But the cloths must not be washed cold before the grease has been entirely removed in the washing-machine; on the contrary, they should first run through some pure warm water, which is poured into the machine for the purpose. The dirty liquor is run off, while the goods are being sprinkled with warm water, and they are then rinsed with cold water. This whole manipulation requires scarcely half an hour, as the grease and dirt are at once dissolved by the silicate of soda. Fugitive colors are attacked even less by silicate of soda than by soap; cochineal only, being an animal color, would disappear entirely.

APPLICATION IN BLEACHING.

In bleaching, silicate of soda has a great future before it; according to experiments which I have personally made in large scouring and bleaching establishments, I can positively assert that silicate of soda will displace the use of soda in bleaching. Even goods that hitherto could not be bleached without detriment to the fibre, *e. g.*, jute, become dazzling white in a very short time by the following process: Jute goods (yarn) are laid 15 to 20 minutes into a solution of silicate of soda at a temperature of 158 to 172 degrees F. (6 to 8 lbs. silicate of soda being taken to 100 lbs. of water), and turned several times with a stick; they are next rinsed in hot but not boiling water, followed by cold water, entered, as usual in bleaching, into a weak "bleach," and lastly into a "sour," and the conviction will be gained that jute can be used not only as the finest white material for paper, but also for the finest white fabrics.

Hemp and cotton yarn, instead of being boiled 6 to 8 hours in strong soda solution, are only moved up and down for 10 to 15 minutes in a very hot solution of silicate of soda. For 100 lbs. of linen yarn, about 12 to 15 lbs. of silicate of soda are used, which still cost 30 per cent less than the usual 10 lbs. of 90 per cent soda-ash. After the silicate of soda bath the yarn must be agitated once more in hot, pure water, and then rinsed cold, after which it is poured into a "bleach" and "sour" as usual. . . . . All baths, with the exception of the cold bath before the "bleach," which must be running constantly, can be used at least three times.

Linen and cotton fabrics can not be bleached in the same manner as yarn, as the sizing, consisting of potato-starch, glue, gum, etc., must be first removed by the weaver or by boiling in milk of lime; after this is done, the bleaching can, without a doubt, be accomplished quicker and cheaper with silicate of soda than with soda.

A NEW MATERIAL FOR FINISHING LINEN AND COTTON

Dr. H. Grothe gives the following instructions: Dissolve half the usual quantity of soda and rosin-soap, and for the other half put silicate of soda into the hollander. After these materials have been mixed in the hollander for a few minutes, add the solution of alum. This forms, with silicate of soda, likewise an insoluble gelatine in the shape of an exceedingly fine, snow-white powder, which is precipitated into all the fibres of the paper, whereby the paper not only appears much whiter and smoother, but also becomes more pliable and is increased in weight. The same precipitate of silicate of alumina is also used, instead of china clay, in finishing linen and cotton. It has the advantage of being much whiter, and is formed chemically in the finest fibres of the fabric. To produce it, let the linen or cotton pieces pass first through a hot solution of alum, and then through a hot solution of silicate of soda, to which a little glycerine is added; it is then passed through a weak solution of starch, and lastly between warm cylinders; the goods will come out uniform, and finished beautifully white.—*A. D. Polyt. Zeitung.*

[Gardener's Monthly.]

HOUSE PLANTS.

MANY of our readers have only a few window plants. These are often kept too warm, too wet, have too little sunlight, and have too many insects. In towns, in addition to all these, they have often too much of the fumes of burning gas. Leaks or escapes from the gas-pipe are well known to be an injury to plants, but it is not so well known that plants suffer, though in a less degree, from the common burning of coal-gas. The trouble with most room cultivators is to know when plants get too much attention. Too many insects are easily known, one—a single one—is by far too many. We still think there is nothing like coal-oil to destroy all kinds of insects. A very little, just enough to make a colored scum on the surface of a tub of water, is sufficient, and in this the insect-covered plant may be dipped, inverting the pot and plunging only the plant, and not the pot of course. If too much oil is used the plant may be injured. Too wet, is when a plant seldom gets dry—a healthy plant should get dry, and have light, dry-looking surface soil, every two or three days. As to heat, a temperature of about 55° or 60° is best for room plants; below that they do not flower freely; above they grow weak, especially if they have not a great deal of sunlight. Indeed, heat should be in proportion to direct sunlight on the plants.

Roses, when they are forced, do much better when the pots are plunged in some damp material. When no better plan offers, they may be set inside of a large pot, with moss between the space around. All plants that come into flower through winter should have those positions afforded them that have the most sunlight, especially the early morning light.

Ferneries are now so deservedly popular, that we must have a word to say for them at times, though their management is so simple, there is little one can say. It is probably their ease of management, and the great results obtained for the little outlay of care, that has rendered them so popular. It should not, however, be forgotten that the cases in which they are inclosed are not to keep out the air, but to keep in the moisture, as ferns will not thrive in the dry atmosphere of heated rooms. A few minutes' airing every day will, therefore, be of great benefit to them. Decayed wood (not pine), mixed with about half its bulk of fibrous soil of any kind, and a very small proportion (say a tenth of the bulk) of well-rotted stable-manure, makes a good compost. Most kinds particularly like well-drained pots. This is usually effected by filling a third of the pots in which the ferns are to grow with old pots broken in pieces of about half an inch square, on which a thin layer of moss is placed, before filling the pots, to keep out the soil from choking the drainage.

Many very pretty ferneries are made up entirely of native ferns, some species of which are within the reach of every one. Of the exotic ones, however, that are now general in most florists' establishments, and are remarkable for their elegance and beauty, we may name, Selaginellas (formerly Lycopodiums), S. stolonifera, S. densa, S. Mertensii, S. denticulata, S. cordifolia, S. flabellaris; Adiantum concinnum, A. pubescens, A. cuneatum; Pteris longifolia, P. serrulata, P. hastata; Polypodium Sieboldii, P. glaucum; Doodia caudata, Gymnagramma chyrsophylla, Platyloma rotundifolia, Nothoclæna nivea, Pteris geraniifolia, Hemionites palmata. This will form a good and easily obtained collection to commence with. Ferns are easily raised from seed. Shallow pans of very sandy soil should be procured and filled within an inch of the rim. The seed, which is obtained from the brown lines or spots (called by botanists, Sporangia) on the under surface of most mature fronds, should be sown on the surface of the soil, well watered with a very fine rose, window-glass placed closely over the pans, to keep in the moisture and keep out small insects, and the pans themselves set in a heat of about 50°, when the spores will germinate in about two months.

Where the air is dry, if in rooms or greenhouses, frequent syringings are of much benefit to plants. Besides, cleanliness keeps down insects and checks disease in plants as in animals. Most old-fashioned lady gardeners (and may we ever bless them for the many lessons they have taught us!) take every opportunity to set their window-plants out of doors when a warm shower happens to occur. In winter a rain at a temperature of 40° or 45°, which often occurs, might be called a "warm shower." Cold water does not have half the injurious effect on plants that cold air has. When plants get accidentally frozen, the best remedy in the world is to dip them at once in cold water and set them in the shade to thaw.

It is better to keep in heat in cold weather by covering, where possible, than to allow it to escape, calculating to make it good by fire-heat, which is, at best, but a necessary evil. Where bloom is in demand, nothing less than 55° will accomplish the object; though much above that is not desirable, except for tropical hot-house plants. Where these plants are obliged to be wintered in a common greenhouse, they should be kept rather dry, and not be encouraged much to grow, or they may rot away.

After Cyclamens have done blooming, it is usual at this season to dry them off; but we do best with them by keeping them growing till spring, then turning them out in the open border, and re-pot in August for winter flowering.

Mignonette is much improved by occasional waterings with liquid manure.

In managing other plants, where there are several plants or varieties of one species, and command of different temperatures, it is a common plan to bring some forward a few weeks earlier than others in the higher heat, thus lengthening the season of bloom. This applies particularly to camellias and azalias; the former are, however, not so easily forced as the latter, being liable to drop their buds, unless care be taken to regulate the increased temperature gradually.

NEW-YORK ACADEMY OF SCIENCE.

THE Chemical Section of the Academy met January 10th, 1876, President J. S. Newberry in the chair. The president made some interesting remarks in regard to the age of the coal deposits of China, which he believed to be more recent than the carboniferous of our own country. The fossil plants found in them indicate that they belong to the Triassic and Jurassic. Plants, he contended, if carefully studied, are quite as reliable as other fossils in determining the age of strata.

Mr. W. Falke stated his observations in regard to the death of frogs. When frogs die a natural death, he said, a short time before they die they become boisterous, make a peculiar audible sound, and frequently jump out of the aquarium where they are kept. Frogs that are nearly starved become quite pale, but the color returns almost instantly when they are fed, some parts of the body becoming deeper in color than others, which intensity of color shifts about.

An interesting discussion followed in regard to the Emma Mine. The president stated his belief that it was a true mineral *vein*, and in fact the formation of *pocket* of silver was apparently an impossibility. This idea of the true fissure nature of the deposit, although the vein had apparently stopped, owing to some dislocation or fault, was confirmed by the discovery of a similar deposit of ore some 250 feet lower down in the same line by the tunnel company that are now piercing the Emma Hill.