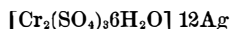


tween the salts formed by the sesquisalts of chrome and alumina. Without denying the possible existence of a salt with $15\text{H}_2\text{O}$ which may be obtained by other methods, the author has sought for a sulphate with $18\text{H}_2\text{O}$, which he regards as normal, and finds that it may be easily prepared by allowing the vapors of ether to react upon a solution of 100 parts Cr_2O_3 in 150 parts of sulphuric acid and 225 of water. The chromic sulphate thus obtained is a fine violet salt, permanent in the air, and of a well defined composition. If dried in the open air its composition is $\text{Cr}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$. At 100° it loses 30.5 per cent. of its weight, and, parting with $12\text{H}_2\text{O}$, it is converted into the green crystalline sulphate $\text{Cr}_2(\text{SO}_4)_3 \cdot 6\text{H}_2\text{O}$. This latter salt, which is deliquescent, loses its six molecules of water at dull redness, and becomes the anhydrous sulphate, $\text{Cr}_2(\text{SO}_4)_3$. Hence the violet sulphate may be formulated as:



From the comparison of these formulæ it would seem that the difference between these two varieties is the result of a super-hydration of the violet salt. Along with chrome alum, regarded in its anhydrous state as $\text{Cr}_2(\text{SO}_4)_3 \cdot \text{K}_2$, may be ranked a crystalline and well defined salt of the formula $\text{Cr}_2(\text{SO}_4)_3 \cdot \text{K}_2$, or in equivalents $\text{Cr}_2\text{O}_3 \cdot 3\text{SO}_3 \cdot 3\text{K}_2\text{O}$. This salt, which is very stable, represents a molecule of anhydrous sesquichloride of chrome, Cr_2Cl_6 , in which the chlorine is replaced by residues of bisulphate of potassa, $\text{Cr}_2(\text{SO}_4)_3 \cdot \text{K}_2$. The bisulphate of potassa acting as a true monobasic acid, the author proposes to call this new double salt potassio-sulphate of chrome. It is easily obtained by putting small portions of the anhydrous chloride, Cr_2Cl_6 , into melted bisulphate of potash, and heating to redness for a few minutes. A sodio-sulphate of chrome and a potassic-sulphate of iron may be obtained in an analogous manner. In these salts the relations between the acid of the sesqui-sulphate and that of the alkaline salt are the same, exactly as in the series of double salts known as Magnesian; $\text{Cr}_2(\text{SO}_4)_3 \cdot 3\text{SO}_4 \cdot \text{K}_2$, potassio-sulphate; $(\text{MgSO}_4)_2 \cdot 3\text{SO}_4 \cdot \text{K}_2$ (triple magnesian sulphate).—*Comptes Rendus*.

HOW STEAM INCREASES ITS OWN HEAT.

STEAM at ordinary pressure sent into saline solutions on which it has no chemical action, gives a rise of temperature that seems at first sight paradoxical, the temperature produced being always higher than that of the steam. M. Muller, of the Berlin Chemical Society, has been studying the phenomenon. Chloride of sodium is one of the best salts to use. A solution of it sufficiently concentrated to have a boiling point of 127° may be raised to 125° simply by sending steam into it at 100° . Here, then, the steam produces a rise of 25° above its own temperature. The more concentrated the solution the higher is the rise. M. Muller points out, in explanation, that saline solutions at 100° absorb the steam at the same temperature, and the result is a rise analogous to that produced when a gas, like ammonia, is dissolved in water. These experiments throw new light on the controverted question, what is the temperature of the steam which escapes from a concentrated and boiling solution? Is it 100° or a temperature near that of boiling of the solution? The new results seem to be against the latter, and common, view.

[PHOTOGRAPHIC TIMES.]

CHEMICAL AND PHOTO. NOTES.

To Remove Silver Stains from Clothing.—This process is especially successful in removing spots from materials which have been several times washed. First prepare a saturated solution of chloride of copper, dip the spotted piece in the solution, and allow it to remain some minutes, according to the character of the stain. Then rub the part with a crystal of hyposulphite of soda. When neutral chloride of copper is used the color of the stuff does not change. This process can be repeated.

Prevention of Blisters on Albumen Paper.—Henvess & Weise, at Wernigerode, recommend as an absolutely reliable and very effective remedy against blisters on albumen paper an alcohol bath, in which the pictures are allowed to remain, after the gold bath, until they have a glassy appearance; the time required is from two to three minutes. They are then dipped into water, and treated in the usual manner. This alcohol bath can be used about twelve to fourteen days, and may be used in lamps for burning purposes; thus the cost is reduced materially.

To Remove Iron Spots from Clothing or other materials.—This question was answered as follows by Mr. Grüne, in the session of the Society for the Promotion of Photography.

The spots are colored blue with yellow prussiate of potash; wash with caustic soda, treat it with oxalic acid, afterwards washing well with water. Treated directly with oxalic acid, only fresh spots disappear.

Silvering of Glass.—(By Prof. Dr. Himly.)—Dissolve separately in definite proportions of distilled water, seven teen parts of nitrate of silver and twenty-eight parts of potash and soda (the so-called Rochelle salt); mix the solutions. There is a precipitate of cheesy-looking tartrate of silver, which crystallizes in a few minutes; after settling the liquid is to be poured off and replaced three or four times by distilled water (shaking well each time), until the precipitate is thoroughly washed; add a small portion of distilled water, and cork the bottle well, setting it aside for use whenever required. Better kept in a dark place. When used the vial must be thoroughly shaken; a portion poured into a corked bottle; to this add strong ammonia, shaking all the while. To insure success the proportions of ammonia must be accurately observed. Should it be in excess, add small proportions of the silver salt until there is always a small amount of the salt undissolved. In a few moments the commencement of the silvering process can be noticed on the inside of the glass itself, which can be slackened by adding a greater amount of distilled water to the fluid, according to the surface of glass to be silvered. The surplus of the silver salt, which turns black, settles at once to the bottom, after which the clear liquid is to be distributed over the surface of the glass. It acts at once, and in twenty minutes the glass is coated with a fine surface of silver.—*Poggendorff's Annalen*.

Taking Impressions of Negatives.—In Braun's establishment (at Dornach) impressions of negatives are taken and kept between sheets of paper, mainly for the purpose of use in an inverted manner. This is often necessary for light-druck, and is also convenient for pigment prints, because good pictures are produced by simply transferring.

Impressions are taken in the following manner:

Clean the glass plate thoroughly, rub it over with stone

alum. In no case have it albumenized, or an under coating to make it adhere more firmly. The negative is put on in the usual manner. After fixing and washing allow it to become half dry; pour upon it the following mixture: Gelatin, 100 parts; water, 400 parts, 10 to 15 parts glycerin, and 100 parts alcohol. In warm weather the plate dries in a few hours. When dried pour upon it one and a half per cent. plain collodion; dry again, and make a cut in the coating around the picture; it then detaches easily, or comes off itself.

In the copying-frame a greater pressure is necessary for these films than for glass negatives; Braun is using, therefore, layers of vulcanized caoutchouc, about the thickness of a finger.—*Photogr. Mittheil.*

Washing of Photographic Silver Pictures in Zinc Vessels.—(By F. W. Geldmacher.)—It almost invariably happens that in new zinc vessels the pictures receive gray spots, which are nearly the same color as the zinc itself, and have the appearance of grease-spots, especially when the light shines through them. It is only those copies which come directly in contact with the metal which show these spots; those floating in the water, without touching, are not affected. The decomposing effect of metallic zinc upon the copies, which still contain chloride of silver dissolved in hyposulphite of soda, is only seen where it comes in direct contact.

Copies which are entirely free of soda may be washed in such vessels with impunity, showing no spots at all. These spots frequently disappear after drying; occasionally, however, they remain, and the pictures are spoiled.

This can be prevented in two ways:

1st. By washing the copies in a vessel made of some metal substance, before placing them in the zinc vessel.

2d. By placing in the bottom a piece of paper, or oil cloth, so as to prevent the copies from touching the vessel.

When the surface of the zinc has become porous and roughened, and the metallic lustre has disappeared, these measures are no longer necessary, because these gray spots no longer appear.

For very large pictures (such as 2-1, 4-1 sheet and more) the use of zinc vessels is necessary, because those made of other materials are easily broken.

Large zinc vessels should be surrounded by wood which is covered with asphaltum or shellac, in order to prevent warping.

A new Gold Salt for Photography.—(By Dr. J. Schnauss.)—Until now there have been used only the single and double chloric salts of gold for toning. During the past winter Mr. Neumayer, student of chemistry from Munich, visited my establishment and undertook under my directions the preparation of a gold bromide and a gold bromide of calcium, for the purposes of experimenting with these salts and their uses in photography.

Thin leaves of gold are readily dissolved in bromine water and in bromine gas. But a more rational and less disagreeable mode of preparation is by the action of hydrobromic acid, nitric acid, and aqua regia.

During the evaporation of the gold bromide, which has a dark appearance and smells strongly of bromine, great care is necessary owing to the fact that the gold bromide vaporizes easier than the chloride. Bromide of gold is difficult to crystallize. By the addition of an exact equivalent of bromide of calcium dissolved in water, and evaporated, small granule red crystals of double salts are obtained. $\text{KBr} + \text{AuBr}_3 + 5\text{H}_2\text{O}$ can be with difficulty dissolved in water; but a thin solution is of a deep red color, and effloresces in dry air.

I have tried these double salts, also the gold bromide, with several additions, as a toning bath. In its general effects on silver copies it is analogous to gold chloride combinations, except that in the same proportions it acts more energetically.

The addition of soda bicarbonate gives a blue-black tone, melted acetate of sodium a purple-colored tone.

For a lasting gold bath, in form of a *sel encassee*, these salts are recommended.

We make the following extracts from Dr. Phipson's correspondence in the *Moniteur de la Photographie*.

A silver bath, not liable to deterioration, is certainly a photographic desideratum, and, at a risk of being taxed with making an exaggerated assertion, I give the formula of a bath, the author of which, an esteemed London photographer, assures us that he has used for a long time without being obliged either to filter or discolor; and, to maintain its strength, it is only necessary to add from time to time a few small crystals of nitrate of silver and an equal quantity of crystals of nitrate of soda.

Here is the formula of the silver bath in question:

Nitrate of Silver, . . .	2.50 grammes	(38 grains).
Nitrate of Soda, . . .	1.25 " "	(19 " ").
Ammonia,	2 drops.	
Wood Spirit,	7½ cent. cubes	(2 fl. drachms).
Water,	30 " "	(8 " ").

The paper is floated on this bath for three or four minutes. As soon as the operation is finished, the bath is poured into a bottle, which is then corked.

The dry coffee process, of which Col. Baratti was one of the oldest advocates, is still considered one of the best of the published processes. The late Mr. De Constant often used it with the greatest success; and recently a correspondent in Switzerland has sent to the *Photographic News* some excellent results. Moreover, Mr. Haatmann, President of the Photographic Society of Amsterdam, and Mr. Victor Angerer, a well-known photographer in Vienna, are unanimous in declaring the efficacy of the process in question. Mr. Haatmann, who is an amateur photographer, has a great predilection for dry plates. He has tried tannin, tea, tobacco, morphia, and in general all the substances recommended, but nothing appears to him so clean and satisfactory as the coating of coffee. The plates are prepared, moreover, in the most simple manner. The solution of coffee is made thus:

Boiling Water,	100 c.c.	(3½ fl. ozs.)
Pure Java Coffee (roasted),	5 grammes.	(77 grains.)
White Sugar dissolved in a little water,	2.50 " "	(38 grains.)

This infusion, after cooling, is poured on the sensitized collodion coating, and the coating is then allowed to dry.

Chloride of Palladium Process.—Mr. Dubois-Chaplain has communicated to us the following letter, which will be read with interest:

* From the *Moniteur de la Photographie*.

DEAR SIR: I have made use of chloride of palladium instead of chloride of gold to strengthen transparencies after fixing.

It is necessary to eliminate with great care every trace of the fixing and developing liquids, which would precipitate the palladium either as a metal or a sulphate, and in that case the entire solution would be lost.

The great advantage of the use of the chloride of palladium is that, differently from what takes place with the chloride of gold, it may remain upon the pellicle as long as is desirable, without fear of injuring the half-tones; on the contrary, it acts as a *revelateur*, strengthening the image and imparting to it a rich black tone.

The use of chloride of palladium was first made known in the *British Journal of Photography*, but I have forgotten by whom.

The solution is composed of one part of chloride of palladium dissolved in twenty parts of distilled water.

Your price of one franc and a half a gramme (28 cents for 15 grains) is considerably less than what I have paid here, and will certainly induce operators to make use of the salt.

ELLERBECK.

INSTANTANEOUS PHOTOGRAPHY.

A SERIES of articles have recently appeared in the *Bulletin de la Société Française*, from the pen of M. Sahler, on the above subject. M. Sahler seems to have made a profound study, both theoretically and practically, of the subject he has taken up, and we now place before our readers, by way of summary, the formulæ recommended by that gentleman to secure pictures with rapid exposures.

Accelerating Liquid.—Into a bottle capable of holding one tenth of a litre are put sixty cub. cents. of alcohol and one gramme of iodide of cadmium; then drop by drop is added sufficient ammonia until the last drop brings about the slightest turbidity. The clear liquid is poured off, eight cub. cents. of rectified alcohol are added, together with five drops of a saturated solution of nitrate of ammonia, and the liquid is then stirred, while drop by drop so much glacial acetic acid is put in to render the liquid clear again, only leaving at the bottom of the vessel a small precipitate of hydrate of cadmium.

Collodion.—Five grammes of collodion pyroxylin are weighed; this is put into a wide-mouthed bottle and well corked, where it remains a month. The pyroxylin then begins to decompose and gives off acid vapors, and as soon as these are apparent by the smell, the product may be employed.

A litre bottle is taken, and into it are poured three hundred cub. cents. of alcohol; in this are dissolved nine grammes of iodide of cadmium, and then the five grammes of decomposed pyroxylin, together with another five of undecomposed cotton, are added. Stirring the while, there is added by degrees ether (of 62°) enough to dissolve the pyroxylin. Finally, the bottle is filled with a mixture of alcohol and ether.

The collodion is tested by pouring some of it upon a glass plate. If the film is not stout enough, little pyroxylin is added; if it is ropy, more alcohol should be added. Then, in the open air (to prevent one breathing the injurious fumes), thirty drops of bromine are permitted to fall into the bottle.

The decomposition products of pyroxylin oxidize the alcohol and change it into aldehyde; the iodine displaced by the bromine combines with the nitrogenous oxides, when a similar noise will be heard to that made by a hot iron being thrust into water. Iodate of chromium is formed, which subsequently combines with ammonia.

The accelerating liquid is shaken up, allowed to remain for five minutes, so that any coarse particles may sink to the bottom, and then three-fourths of the contents of the bottle is poured into the collodion. If the latter becomes turbid, it is filtered, and then two drops of ammonia are added.

If the collodion does not become colorless within ten days, then one or two drops of ammonia are added. It does not matter if it is a little turbid. It is put into long narrow bottles and permitted to stand until it is clear. It should be of a light-yellow color; if colorless, it is tinted before use every time with a few drops of tincture of iodine. It will keep good a very long time.

If the pyroxylin has been too much decomposed, the collodion will not adhere to the glass; a little ordinary iodized collodion is then added to it. When the collodion grows very old, its sensitiveness may be materially increased by the addition of one or two drops of the undermentioned reducing fluid. In fifty grammes of alcohol are poured six drops of aldehyde and three drops of ammonia. This solution must remain some days before it is used. Still more sensitive becomes the collodion by the addition of one or two drops of an extra accelerating fluid, composed as follows: Into fifty grammes of alcohol are put eight drops of aldehyde and three decigrammes of caustic potash; after standing a fortnight the fluid becomes of a dark-brown color and ready for use. The collodion is allowed to remain for some hours; before use the upper portion is poured off.

The so-called Mann pyroxylin does not yield any acid fumes on keeping. When this is mixed, there should be added, before the iodide of cadmium is employed, eight drops of the extra-accelerating fluid to the alcohol, and no ammonia afterwards.

Dry Collodion.—The collodion above described requires no covering or preservative. Its sensitiveness is improved by a solution of fifteen centigrammes of resin for every hundred cub. centimetres of collodion. The maximum sensitiveness of this collodion is, however, reached by employing with it a solution of tannin.

PHOTO-LITHOGRAPHIC PAPER.

By PROFESSOR J. HUSNIC, at Prague.

THE ordinary photo-lithographic paper, which is used for reproducing pictures in line or stipple, is prepared either from albumen or gelatin.

Each variety requires separate treatment, and each has its advantages and disadvantages. Owing to the latter, they are seldom used in practical printing, being confined principally to experimental work.

These papers are sensitized with chrome salts, exposed under a negative; then blackened with a fat paint thinned turpentine, and after drying placed in water. The paper will be thoroughly soaked by the water, and the paint with the coating (when consisting of albumen) can be removed from the unsensitized plates by means of a sponge, or the coating (when of gelatin) will remain upon the paper; the paint alone can be removed by rubbing. The chief advan-

tage of the albumen method consists in the ease and rapidity with which the picture is developed. Its disadvantage being, however, that the preparation of the albumen paper requires much time and trouble, and that only a few sheets can be prepared at a time, about enough for each day's use.

The white of eggs should be beaten until it resembles snow; allow it to stand awhile, and add the chrome salts. Frequently it happens that we have to throw away the solutions after the preparation of a few sheets, because neither the paper nor solution will adhere. There is another disadvantage which this method possesses, namely, that in developing the picture the surface of the soaked paper is easily rubbed off, thus spoiling the picture.

The gelatin papers can be prepared in great quantities, because the gelatin may be applied separately, and the prepared sheets can be sensitized in the chrome salt bath, which is capable of holding itself. This advantage of the gelatin process is greatly counteracted by the fact that the papers allow of no rapid and easy development of the picture, requiring several kinds of skilled treatment, especially the use of a paint roller to remove the superfluous paint. Whenever excellent results are produced, it is only by very skillful treatment. Whoever has tried to roll out a sheet of paper will appreciate this difficulty. In fact, skillful hands are requisite to discover the places where the color is to be removed or the shades require to be more or less opened. The development must be quickly accomplished, and only by means of a sponge. This is a simple process, and should enable amateurs, even when they understand nothing of drawing, to execute the operation skillfully.

Sometimes the picture is spoiled by an oily tone of the whites, which is hard to remove.

The photo-lithographic paper which I prepare embodies all the advantages and none of the disadvantages of these processes. There is nothing necessary but a constant chrome salt bath, which when required is to be carefully poured from the bottle without filtration, in which may be immersed the number of sheets required for each day's use, or the operation may be repeated several times in the day, as the drying of the paper requires only one and a half hours. The development of the picture is a fast and sure process, and the stroke and graining manner appears excellently. The reprinting is sure; the papers are not crushed, and there is no tone shown in the whites.

The advantages of this paper are security to work, especially such as those fine maps, reduced to one-third, which are executed by the Imperial Printing Office for the technical military committee and the topographical department of another imperial establishment at Vienna.—*Photogr. Notizen*.

PRIZES OFFERED BY THE VIENNA PHOTOGRAPHIC SOCIETY.

THE Vienna Photographic Society offers the following prizes for the solution of various problems connected with photography:

a. VOIGTLANDER MEDALS.

1. A gold medal worth 140 ducats for a method of increasing the sensitiveness of wet plates.
2. A gold medal worth 140 ducats for a certain and rapid dry process of superior excellence.
3. A gold medal of 40 ducats for a thorough research into the asphalts.
4. A silver medal for a collection of natural history studies.
5. A silver medal for a collection of instantaneous pictures.
6. A silver medal for a collection of lantern transparencies, for illustrating science, art, or technical matters.
7. Medals in gold (of a value from 40 to 100 ducats), silver, and bronze, for scientific research, inventions, or improvements which are communicated to the society or to its organs.

b. SOCIETY MEDALS.

1. Gold medal of 140 ducats for the production of type blocks having half-tones.
2. A gold medal of 140 ducats for a critical study of the reactions of chrome acids and their salts upon albuminates, albuminoids, carbon hydrates, and resins, with particular reference to the different heliographic processes.
3. A silver medal for *genre* pictures.
4. A silver medal for carbon prints produced in Austro-Hungary.
5. A silver medal for a collection of monuments.
6. A silver medal for a collection of ethnological studies.
7. A silver medal for a collection of anthropological studies.

Competitors must qualify by becoming members of the society. Further particulars may be obtained by addressing the President, Dr. Hornig, Vienna III, Hauptstrasse 9.

MOUNTING PHOTOGRAPHS.

By WALTER B. WOODBURY.

Most amateurs, when mounting their photographs—say of the favorite cabinet form—have no doubt, been astonished to find that, although all the pictures had been cut with the same shape, leaving perhaps a margin of one-eighth of an inch at the top and sides, some of the prints nearly covered up the card in the length, while others had the opposite fault.

The subject of expansion of the paper in one direction has lately been brought forward, as tending to give two different ideas of the same portrait; but the slight difference can hardly be perceptible except to a very critical observer.

When it is a question of mounting a number of photographs to a shade within a line, then the matter becomes serious, and it is an absolute necessity to have two different shapes, one for those prints cut across the paper and the other for those cut lengthwise. The former will have to be (for cabinet size) nearly one-sixteenth of an inch shorter, and the latter one-sixteenth longer.

It is best to mark the paper cut across the sheet before printing, so as to know which shape to use; but, in case this has been neglected, the two classes of prints may be easily separated by slightly warming them, the cross prints forming themselves into a short roll, and the others into a long one. They can then each be cut with their own shape, and when mounted will be found to occupy the same position on the mount.

In using an alcoholic solution of glue, where very little water is present, the stretching of the paper is reduced to

its minimum. This is best made as follows: Soak common gelatin (glue will answer) in as little water as will just dissolve it. While hot pour in gradually methylated spirit, stirring all the time until the spirit is in about the proportion of three to one of the gelatinous solutions. A species of precipitation takes place, which, however, redissolves on well stirring. A little glycerin or sugar can then be added.

Great care is necessary in mounting with this material, as if once the print is laid on the mount it is almost impossible to remove it.—*Br. Jour.*

HOW TO ENLARGE AND PHOTOGRAPH MICROSCOPIC OBJECTS.

By M. A. RUTOR.*

VERY few have till now occupied themselves with micro-photography, notwithstanding the magnificent results which microscopists have obtained, and the obvious utility of productions of this kind. This abstention is due either to ignorance of photographic manipulations, or to an exaggerated fear of the difficulties which present themselves. Nevertheless, the difficulties are far from being so insurmountable as is generally believed, and in proof thereof I present the Society some micro-photographs of various kinds obtained in a very simple way by M. Hempel, member of the Belgian Photographic Association. I may remark, in the first place, that the examples are far from representing the best examples which M. Hempel has obtained; on the contrary, they are the first essays, made by an amateur which I place before your eyes. With a little more experience of photographic operations much better clichés will be obtained, I have no doubt, than those which are now laid before you.

The manner of operating is as follows: In any department into which the morning sun enters M. Hempel places his microscope upon a table. The instrument he employs is simply a small one of Hartnack's construction, upright, and bereft of its eyepiece. Above the microscope is fitted vertically, by the aid of a support, an ordinary camera (quarter-plate) capable of taking pictures nine by twelve centimeters, furnished with a focussing glass. The camera is in connection with the microscope by means of a little cone of black cloth, fixed to the photographic apparatus by the metal rim (where the lens fits in) and to the microscope by means of a rubber washer.

The object is put under the microscope in its proper place upon the object stand, and the sun's rays are directed upon it in the usual way by a mirror. The operator looks upon the focussing screen of the camera, and then, by the aid of the screw of the microscope, the enlarged image is focussed. If the image appears too small, it may be enlarged by gradually elongating the body of the camera; or if too big, the reverse operation is performed.

Having determined the size of the image, a diaphragm of very small aperture (about a quarter of a millimeter) is placed under the object, and a slight turn of the screw then furnishes the requisite amount of sharpness: the object may then be said to be focussed. In micro-photography the focussing should be rigorously exact, and a strong magnifier must be employed to view the image upon the ground glass; and to be able to judge the better of the half-tones, the operator should surround his head with a black cloth, to keep away the light. The focus properly adjusted, the operation of photographing may be commenced.

Before going any further, I may here call attention to a grave difficulty which may possibly occur; it is possible that the image may be perfectly sharp upon the ground glass, and yet when the collodion film is substituted there is a lack of sharpness and detail. In this case the operator has to do with a lens in which the chemical focus does not coincide with its optical focus. Nevertheless, the evil is not an irreparable one, and a series of experiments properly undertaken will soon show how much the screw of the microscope should be turned to yield a good result. I may, however, state that I am convinced that defective lenses of this kind are much less frequently met with than is supposed to be the case, and good achromatic lenses always give good images. At the same time, in the case of colorless objects, or such as are of a monotone, like the diatoms, polycystines, and a large number of other organisms, the employment of very achromatic lenses is not indispensable.

In support of what I have just advanced, I may mention that the microscope which M. Hempel makes use of was not chosen for any special purpose, and gives with each of its true lenses pictures which have not the least trace of chemical defect.

The image of the object having been focussed, the latter is covered with a small piece of black cardboard; the ground glass is removed and there is substituted for it the dark slide with the prepared plate. The slide is withdrawn, and by stooping down it is easy to direct upon the diaphragm the little luminous circle formed by the concentration of solar rays by the mirror then, without loss of time, the piece of cardboard is removed from the object for a short time, and again replaced without hesitation. This brief period suffices to impress an image upon the collodion film; the dark slide is drawn, and the plate carried into the dark room to be developed, washed, and intensified if necessary, and finally fixed. From this negative may now be printed an indefinite number of positive forms.

So far as concerns the disposition of the apparatus, I would remark that I do not recommend the vertical arrangement, which M. Hempel is compelled to have recourse to because his microscope is a vertical one. It is better to work with an inclined microscope, which allows one to place the camera in a horizontal position, by which means all the operations are considerably facilitated, and the whole affair assumes a proper stability.

In regard to objects to be reproduced in the micro-camera, two points have to be considered, their thickness and color. As in the case of looking at an object under the microscope, the difficulty is to focus an object in every part, for some portions are sharp, while others are blurred, from the fact that they are not all in the same plane. Nevertheless, the photographic process offers many resources, and it is possible to obtain very extensive enlargements, even with very feeble lenses. To do this, the exposure in the camera should be lengthened, the object, whether opaque or transparent, being always well lighted.

So far as regards color, it is well known that certain of them—such as yellow, red, and green—do not reproduce themselves in photography according to their intensity, and that the prints appear with much darker tones than the originals appear to the eye. In cases where the objects present

non-photogenic tints, they should be very powerfully illuminated, but with a very small diaphragm, polarized light being employed with advantage. Many organic substances of brown and yellow color may have their tints reversed, or their outline lighted upon a black ground, by using polarized light.

The photographic process employed in micro-photography should be a very rapid one, and for this reason wet plates are the best; but now that dry-collodion processes, and especially the so-called emulsion methods, have been so much improved in England, these should be particularly applicable to micro-photography. By employing such a process, the operator might prepare in advance a whole series of plates, and these he would merely have to slip into the micro-scope one after another, in order to secure twenty, thirty, or as many even as fifty photographs of different subjects in one morning.

BUTTERFLY COLOR.—It has long been supposed that the colors of the butterfly's wings suffer from exposure to concentrated light, and, according to the *Institut*, M. Capronnier has recently been making experiments with a view to ascertaining what sort of light bleaches most strongly. The result arrived at is that, as in photography, after the white light the blue light is the most actinic.

PURPURIN.—Dr. Vogel gives a few details with regard to the sensitiveness to light of purpurin, which has been so much talked of recently in connection with the sight purpurin of the eye and the recent experiments of Kuhne with the eyes of oxen, rabbits, etc. Purpurin—a dyestuff found along with alizarin in madder—gives a solution which, in the presence of a little alkali, is extraordinarily sensitive to light. Other solutions of dyestuffs, themselves actually more sensitive to light—such as fuchsin, alcarina red, and santalin—do not lose their color after several days' exposure to light. In clear weather a wine-red colored solution of purpurin becomes colorless in about ten minutes; and even by lamp-light, at a distance of twenty centimetres from the lamp, in about half an hour it will be distinctly apparent that the color has begun to fade. Dr. Vogel's former experiments show that in this bleaching its power of absorbing yellow rays plays an important part. An alkaline solution of carmine is also sensitive to light in the same way, though not to the same extent, as the alkaline purpurin solution. Schunk and Römer found that alkaline purpurin also lost its color in the dark, and that when deprived of air it did not bleach either in the light or the dark. It follows from their experiments that oxygen is necessary to the bleaching of purpurin. Any one can, however, convince himself by a simple experiment that purpurin is much more readily bleached in the light than in the dark.

Mix with ten cubic centimetres of distilled water about ten drops of a saturated tincture of purpurin and one drop of ammonia; divide the beautiful rose-colored fluid so obtained into two equal parts, and put each part into a test-tube. Cover one of the test-tubes with black paper, and place both in the window. After the lapse of ten minutes compare the two glasses, when, even if there be only daylight without sunlight, the liquid in the uncovered one will be found to be a good deal bleached, while that in the protected tube will scarcely be changed at the end of a couple of hours.

THE *Mittheilungen* contains Herr Goltz's third article on the advantages of reviving stereoscopic pictures, this one being devoted to stereoscopic portraits. The same number also contains a statistical account of the number of photographic establishments in Germany—estimated at a little over three thousand—and of the quantities of chemicals they consume, an average of three pounds per establishment being allowed as the consumption of nitrate of silver, and its cost being estimated at about £27,900 sterling. Of this large quantity it is supposed that about sixty per cent., or the value of £16,400, is annually lost in one form or another as waste. The value of the gold salts used is estimated at a quarter or, at most, a third of the sum allowed for silver, that is, at about £9,000. Owing to the quantities of albuminized paper exported through dealers, and of French mounts imported, it has been found almost impossible to assign figures to these last two items. The number of frames made in Berlin—of which, however, only a portion is used in Germany—is stated at an annual product representing £7,500.

BEET ROOT AND BEET ROOT SUGAR.

By EDW. LEFROY CULL.

A MODIFICATION of the diffusion process might, we think, be advantageously used by the farmer as follows. It has never been tried, that the author knows of, but it is a matter of common sense, and, as such, one person can form as good an opinion on it as another: When the ground root is thoroughly pulped mix it with a sufficient proportion of wheat or oat chaff, or clean chopped straw; put in a high tub, possibly six feet deep; sprinkle water on the top, which, percolating through the mass, would, from the well-known laws which govern diffusion of all substances, take out the sweet and other matters from the pulp, and pass off at the bottom of the tub quite as strong or but very little weaker than the juice itself. There must, of course, be a false bottom in the tub, pierced with holes, the juice being allowed to run freely off from the bottom into the boiler. It would come off quite fine and clear. A good arrangement of this plan would be to have a series of tubs, say two feet deep each, the bottoms being all pierced with holes, the tubs just fitting into each other. The number should be six. In the first place fill them all with the mashed root and chaff or cut straw; then pile them up one on the top of the other. The lower one must, of course, stand in a tray. Continue your leaching until the liquor begins to get weak; then, by a convenient arrangement, remove the top vessel, which by this time will be entirely exhausted. Raise the pile of vessels and add a newly-charged tub to the bottom and proceed as before.

This arrangement would save the press, the pressing and the cloths, and be entirely within the farmer's own means. I do not pretend to say that it could be done on the very largest scale, although I am sure it could be done on a small scale with great effect. The spent pulp and chaffed straw might be used a second or even a third time in Winter. It could be used over and over again, until there was a fear that souring or fermentation would commence. The pulp and chaffed straw would be in the most favorable state possible for feeding purposes.

The principle of diffusion is this, in short: When water is mixed with a substance, such as pulp or chopped beet root, which contains a heavy, thick strong juice, the

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