should be above all suspicion, to insure a steady sale of his product, be the times good or bad.

Weights of shingles differ according to the character and specific gravity of the timber from which they are cut. In ordinary white pine a car load of 22,000 pounds of green shingles will be about as follows:

18 inch, green.....	52,000 to 55,000
18 inch, dry	60,000 to 65,000
16 inch, green.....	60,000 to 65,000
16 inch, dry.....	70,000 to 75,000

The above for an average. The writer has loaded 90,000 18-inch shaved shingles, five butts to two and one-quarter inches. Shingles one year old, seasoned under cover, on a ten ton rate.

ESTIMATING ROOFS AND WALLS.

If you wish to make an off-hand estimate of the number of shingles required for a roof at one-quarter pitch, multiply the ground surface of the house in square feet by 10. Example, a house, 20x20 on the ground, has 400 square feet, multiplied by 10, gives 4,000 shingles; if it is one-half pitch, add one-tenth more. For a close estimate it is better to obtain the square feet of roof surface (after allowing four inches on each side for lap of gables, and 10 inches on each eave, for lap over the moulding), then multiply by six, the product will give the number of shingles laid, five and one-half inches to the weather.

If 16-inch shingles are to be used, laid four and one-half inches to weather, divide the square feet by nine and multiply the product by 11.

To estimate lath, allow 14 pieces to the square yard. In estimating, allow 13 inches for baseboard, but include doors and windows. Shingles should lay 100 square feet, equal to 10 feet by 10 feet of roof surface.—*Northwestern Lumberman.*

BRACEWELL'S IMPROVED BLEACHING KIER.

We have had from time to time inquiries concerning this improved kier, and as it appears likely to prove of no small value to bleachers, calico printers, paper makers, etc., we proceed to give a short description of the apparatus, along with an illustration.

The peculiarity of the invention lies in the introduction

FIG. 1.

of the "fuse" or "puffer" pipe, of which a sectional view is shown in Fig. 2. This consists of a steam pipe, C, placed within a cast iron pipe, D, with trumpet shaped extremities. Its upper end is covered with a disk, J, called the indicator plate, and the lower end is closed with a dished cover. The lower portion of the fuse pipe, A A, is called the suction nozzle or well, and is so arranged within with steam passages and perforations that the liquor in the bottom of the kier is drawn into this well by the action of the

FIG. 2.

steam which passes down C, and is forced up to the top of D. An automatic pressure is kept up by the rising and falling of the indicator plate, J, at the top of D. The plate, J, is perforated, and slides freely upon C. Above it is fixed the spreader, K, which serves to distribute the liquor over the

goods, which it protects from disturbance by breaking the shock of the liquid. Before the steam is turned on, the liquor is, of course, at the same level inside the fuse pipes and in the kier. On admitting the steam it is driven up the space, D, where it lifts the indicator plate, J, and falls down upon the goods in a thick spray. The indicator, J, falls, more liquor rushes into the fuse at B, to be again forced up and expelled as before, and thus, after steam is once turned on, a constant circulation is maintained without any personal attention, the indicator, J, rising and falling about every second, and by its noise showing that the machine is at work.

The advantages claimed for this invention are, that it is self-acting, that it requires only a very small quantity of steam, that the goods are always submerged and run no risk of being tendered, that the agitation of the cloth or yarn within the vessel is not to be feared, and that each kier may be worked separately. The total result obtained is a better and more uniform bleach at less cost. It must not be forgotten that the "fuse pipe," which is the essential part of the invention, and which is duly protected by letters patent, can be applied to any existing kier with little trouble or cost.—*Chemical Review.*

WOOD STAINS.

To turn oak black so as to cause it to resemble ebony, the wood should be immersed for forty-eight hours in a hot saturated solution of alum, and then brushed over several times with a logwood decoction, prepared as follows: Boil one part of best logwood with ten parts of water, filter through linen, and evaporate at a gentle heat until the volume is reduced one-half. To every quart of this add from ten to fifteen drops of a saturated solution of indigo, completely neutral. After applying this dye to the wood, rub the latter with a saturated and filtered solution of verdigris in hot concentrated acetic acid, and repeat the operation until a black of the desired density is obtained. To imitate rosewood a concentrated solution of hypermanganate of potassa is spread on the surface of the wood, and allowed to act until the desired shade is obtained. Five minutes suffice ordinarily to give a deep color. A few trials will indicate the proper proportions. The hypermanganate of potash is decomposed by the vegetable fibers, with the precipitation of brown peroxide of manganese, which the influence of the potash, at the same time set free, fixes in a durable manner on the fibers. When the action is terminated the wood is carefully washed with water, dried, and then oiled and polished in the usual manner. The effect produced by this process on several woods is remarkable. On the cherry, especially, it gives a beautiful red color.

ON GELATINO-BROMIDE OF SILVER.

By D. VAN MONCKHOVEN.*

I INTEND to give you a practical demonstration of the gelatino-bromide process, which will, ere long, according to my opinion, replace both the wet and dry collodion processes, owing to its extreme sensibility and to the easy manner in which it can be made.

I.—ORGANIZATION OF THE DARK ROOM.

The first thing that a person who intends to work this process must attend to is the best and proper light to be admitted into the developing room. For the wet collodion process it suffices to glaze the window with orange-yellow glass; but the film of silver bromide being sensitive to the yellow rays, the glass must be replaced by deep red-stained panes, for the red is the only color which does not act more or less upon silver bromide.

I have the honor to pass round for your inspection some specimens of the red glass which must be used. It is necessary to employ two pieces of this red-tinted glass superposed one above the other, and it would be well to put a sheet of white paper between the two.

As these panes transmit very little light the surface can be made larger, giving at least a square yard of illuminating surface. The window before which you manipulate ought to be of the height of an ordinary table, so that objects upon it may be easily distinguished.

It is necessary to hang a black curtain before the door of the dark room; for, as the gelatino-bromide plates possess such extreme rapidity, without this precaution you will obtain nothing but fogged proofs. Do not neglect the precaution of stopping up every crack or crevice in the dark room. Paint, if possible, the walls black. Shut yourself up in the dark room for a quarter of an hour, and stop up every crack or opening through which white light can enter. Put a prepared plate in the dark slide, open the shutter half way, and expose the plate thus half uncovered behind, near the red light of your dark room. Leave it a quarter of an hour and then develop it. If a dark line be visible it proves that your red glass is not sufficiently colored; therefore, you must put a third pane against the two others. Examine your dark slide, your cameras, and your lens.

Generally the dark slides let light in at the joints and hinges, and if the precaution to cover the apparatus be neglected fogged plates are the consequence. Landscape photography with gelatino-bromide plates is a real difficulty because of the imperfection of the ordinary photographic apparatus. You are now cautioned, therefore do not neglect the causes of failure which I have pointed out.

II.—NATURE OF THE EMULSION.

I begin now with the process itself. Here are two aqueous solutions—one of silver nitrate, the other of bromide of ammonium. If I pour the latter slowly into the former, so as always to have an excess of the silver salt, I obtain a curdy and heavy precipitate which unites easily by shaking at the bottom of the vessel. If I add an acid—say sulphuric acid—to the silver nitrate and pour the ammonium bromide into it, drop by drop, the precipitate is heavy and unites easily. But if I add ammonia instead of an acid I produce a light, white precipitate which remains in suspension in the water.

The experiment which I shall now make before you is strange but true. It is that if I employ a solution of gelatine instead of water the results are completely changed.

Here is a ten per cent. solution of gelatine. I add a few drops of ammonium bromide, and after having well shaken the liquid, I introduce a few drops of silver nitrate. You perceive that this solution remains perfectly transparent, although it contains silver bromide. I now pour it upon a piece of glass, and you see that it is perfectly transparent.

Now, if I allow this solution to remain until to-morrow this transparency will have disappeared. The silver bromide

which exists at this moment in the liquid gelatine in a very finely-divided molecular state will reunite in time and form thicker particles, and then the liquid will become milky. If I add a small quantity of sulphuric acid this will prevent the molecules from approaching, and the transparency will remain much longer; but, if I add ammonia instead, I immediately hasten the union of the particles of silver bromide. Now you see that the liquid has become milky, although I added only a few drops of the alkali. You see now that in gelatine solutions the reactions of alkaline bromides upon silver nitrate are, as regards the physical state of silver bromide produced, exactly the reverse of what is obtained in presence of water.

You all know, without doubt, how emulsions are prepared. A warm solution of gelatine is made, containing ammonium bromide, a solution of silver nitrate is added, and white silver bromide is thus formed in the solution. The more gelatine there is in proportion to the silver bromide the whiter and finer will the latter be found; the more diluted the solutions the finer the particles of silver bromide.

Practice teaches that this solution of gelatine containing silver bromide (which is now known under the name of "emulsion") must remain several days in a warm place, in order to obtain sensitive films. Why is this? and what occurs? The particles of silver bromide become larger and larger, and, at the same time, change from white to green.

Here are two plates covered with a gelatino-bromide emulsion. The first is quite white; it was prepared from the emulsion when newly made. The second is green; it was prepared with the same emulsion after having been cooked several days. In looking at the first through a magnifying glass it is difficult to distinguish the particles; but in the second you can discern them easily, especially upon the edges of the plate where the film is the thinner.

My friend, Dr. Vogel, of Berlin, affirms in his journal that the particles of silver bromide ought not to be seen by the microscope. Truly they are not seen, because in the film they are superposed one above the other, but render the film very thin and they are seen immediately even with a simple eyeglass. This experiment can not only be made with the plates I lay before you, but with those of Swan and all other commercial gelatino-bromide plates.

Experience teaches that the greener the gelatine pellicle is the more rapid is the impression in the camera. Here are two plates—one white and the other green, similar to those I showed you a few minutes ago. I took two similar ones, exposed them in the camera exactly the same number of seconds, and developed them side by side in the same tray. You can see that one is completely developed in all the half-tones, whereas the other shows only the high lights. The lengthy emulsification transforms the silver bromide, which is at first white and finely divided, into a green bromide very much coarser, but exceedingly sensitive to light.

III.—PREPARATION OF THE GELATINO-BROMIDE EMULSION.

I have already indicated my new and favorite method of preparing a gelatino-bromide emulsion. It consists in dissolving carbonate of silver in bromhydric acid, in the sirupy solution of gelatine. This method is extremely economical for those well acquainted with chemical manipulations; but it is extremely difficult for operators little versed in chemistry, and this is generally the case. I believe you will hear with great pleasure that I can indicate another method, very simple in execution, from which I can guarantee a certain and sure result, providing that you will follow to the letter my indications.

Procure some of Nelson's No. 1 photographic gelatine. I insist upon this point, because you will not succeed with German or French gelatines, which are prepared in a different manner from those of Nelson. Weigh up exactly ten grammes of this gelatine and eight grammes of pure and well-dried ammonium bromide. Put these two substances into a bottle and pour upon them 250 grammes of distilled water. In a quarter of an hour the gelatine will have swollen, and you can now put the bottle into a warm-water bath and agitate in order to dissolve the two substances.

Weigh up twelve grammes of silver nitrate and dissolve in fifty grammes of distilled water. Now pour the silver emulsion into the bottle containing the bromide, a little at a time, well shaking it after every addition. When all the silver solution has been added, pour in five centimeters of pure ammonia of a density of 0.910, and shake up well the solution. The ammonia exercises quite a special action here; its effect is to render the emulsion ready to be used in a few minutes, or, if great sensitiveness be required, it can be obtained in a few hours instead of days, and thus decomposition of the gelatine is avoided.

Now pour the solution of gelatine into a porcelain dish, and place it upon cold water and let it set. When set, detach it from the dish, place it in a strong linen sack, and wring it so that the gelatine is expelled in shreds, which are easily washed through a fine sieve. A washing of five hours in water three times changed suffices. Collect the pellicle on a clean linen cloth, and dissolve it at a temperature of 35° Centigrade, and it is fit for use. This process is a combination of those of Mr. Bennett and Messrs. Wratten and Wainwright, with this difference—that I add the ammonia in order to have the emulsion ready to work in a few hours instead of days.

I will pass over a few practical details, which you will find in a future edition of my "*Traité Général de Photographie*." To explain them at present would lengthen enormously this lecture.

IV.—APPLICATION OF THE EMULSION TO GLASS.

Those who desire to prepare plates with emulsions made by themselves or bought from commercial houses must observe the following practical conditions: First of all, the window of the dark room must be of the height of the table on which the preparation is to be done in order that things may be easily seen and found. The table must be covered with a sheet of black marble perfectly leveled. In winter the plates to be prepared must be slightly warmed or the emulsion will not run well. In summer it is not necessary. The emulsion is heated to 40° Centigrade to render it liquid. It is now poured into a glass funnel, in the neck of which a tuft of cotton wool has been placed.* The funnel itself is placed in a double funnel made of metal and filled with warm water. The filtered solution is collected in a porcelain pot of the form of a cream-jug. In order to avoid bubbles the extremity of the funnel must touch the bottom of the jar. The filtration of the emulsion is absolutely indispensable in order to clear it from its mechanical impurities. The plate is placed horizontally upon three pieces of wood, the proper quantity of emulsion is poured upon the center

* A lecture delivered to the members of the Belgian Photographic Association.

* The cotton wool ought to be boiled about a quarter of an hour in caustic soda, one part water to 100 parts. Ordinary cotton will not filter the gelatine, because the fatty nature of the fibers repels the liquid.

(ten cubic cent. for 9x12) is now spread all over the plate by means of a glass spatula. The solution is leveled upon the plate by means of a *tour de main*, well known by all those who have practiced wet collodion.

The excess of emulsion must never be poured into the vessel containing the filtered emulsion, or the films will be filled with air bubbles. The plate covered with emulsion is now laid upon the marble table to set, during which time a second, third, and so forth are covered. The film of the first plate being set, it is put into a drying box, of which I will speak presently. It is necessary to continue the preparation of the plates until the whole of the emulsion has been employed. In summer, if the emulsion be long kept warm, or it has been allowed to cool and set in the bottle and then warmed up again, the gelatine loses its setting qualities, and "frilling" will be the consequence during development.

FIG. 1.

The drying box is easily made, and consists of a box of thick wood, on the top of which is a zinc pipe to connect it with a chimney. At the bottom is another pipe, but with an elbow to prevent light from entering. Horizontal shelves are placed in the interior, so that the current of air obtained by the draught in the chimney goes over each, one after the other. (See Fig. 1.) This box ought to be placed in a warm and very dark room. Without these precautions only fogged plates can be obtained. I again repeat, seeing the extreme sensitiveness of the gelatino-bromide of silver plates, all light not coming through the red glass must be excluded, without which non-success will be the consequence. Among the failures is the permanent production of fog in developing, especially if you employ very sensitive plates.

V.—PRESERVATION OF PREPARED PLATES.

The plates covered with gelatino-bromide emulsion cannot be left in the open air; they must be enveloped in a bag of black paper of the same form as a letter envelope. I generally put four in a bag, and interpose between the edges of the plates a piece of folded Bristol board. (See Fig. 2.)

FIG. 2.—A, Bristol Board. B, Prepared Plates.

I inclose three of these bags in a cardboard box. The plates, if kept in a damp place, soon spoil and produce fogged images. Those kept in a dry place can be preserved several years.

VI.—EXPOSURE IN THE CAMERA.

This operation, so simple with the collodion process, becomes complicated because of the extreme sensibility of the gelatino-bromide preparation. I am certain that I shall not make a great mistake in saying that not one single dark slide of a camera protects the plate as it ought to do. Light enters especially through the shutter which rises to expose the plate. I have frequently proved this in the following manner: I have exposed a plate in the camera without taking the cap off the lens, and in developing the entire plate has been fogged. You must make certain that light does not enter through the holes of the Waterhouse diaphragms, nor round the ring upon which the lens is screwed. I am accustomed in the open air to completely envelop my camera with a large focusing cloth, allowing only the lens to protrude out of it. I even open the dark slide under the cloth. Without these precautions nine times out of ten fogged images are obtained.

VII.—DEVELOPMENT OF THE IMAGE.

The latent image can be developed immediately after exposure in the camera, or, if required, several days after. I believe, nevertheless, that if the development be postponed very long the impression will diffuse itself throughout the film and thus produce a fogged image.

Two methods of development are recommended—the first with a solution of alkaline pyrogalllic acid, the other with oxalate of iron. The greater number of operators prefer the first, asserting that the exposure is shorter and the development more rapid than with the second. My personal experience is entirely opposed to this statement. I find that even with wet collodion the iron solution permits a shorter exposure than pyrogalllic acid. I find also that images developed with pyro are duller and of a color which may deceive the photographer as to their intensity, and thus render the retouching very difficult. On the contrary, as you can judge by the number of negatives now before you, the color of the *cliches* developed by iron do not differ from the very best negatives made by the wet collodion process. I may even add that the pyro dirties the hands and must always be prepared fresh, whereas the iron can be used to develop a great number of negatives, and does not dirty the hands.

A short time ago I received a visit from three English amateurs. They had with them gelatino-bromide plates, prepared by the best commercial houses of England. We made a comparison, these gentlemen developing with pyro, and I with iron. I was able to diminish the exposure one-half, and they freely admitted my negative to be superior. I will now begin by informing you how to prepare the iron developer such as I use every day.

I employ two cans, similar to those used in our rustic kitchens to boil milk in; they contain each about a quart of liquid. In the first I put 200 grammes of purified iron sulphate, pour upon it half a liter of boiling water, and stir up the liquid with a glass spatula until all the iron is dissolved. I then throw in 100 grammes of oxalic acid, and keep on stirring until I feel no more crystals undissolved. A heavy precipitate of iron oxalate is formed in the hot liquid, which will settle at the bottom of the vessel in about ten minutes. I now decant off the clear liquid, and replace it by hot water and stir up. This I repeat four times in succession, leaving it to deposit each time about ten minutes.

During the time this operation is in hand I weigh up 250 grammes of neutral oxalate of potash (not ordinary but neutral), and put it into the second can. I add three-quarters of a liter of boiling water, and I stir up until all the salt is dissolved. I now pour this liquid upon the iron salt prepared as above (after having naturally decanted all the water off it) and stir up well. I now pour all the solution into a bottle of one liter (1,000 c.c.), and if the bottle be not quite full I fill up the difference with water. Do not leave the yellow powder in the can, all must be put in the bottle.

I now put into the bottle 100 grains of iron wire in pieces of fifteen centimeters in length. In this manner is made the iron developing solution, which can be used as soon as it has become perfectly cool.

To employ this solution I filter three-fourths of it into a vertical tray. "Why a vertical tray?" you may ask. Simply because in a horizontal tray the liquid offers such a large surface to the air, and so oxidizes very rapidly, the liquid thus losing its power of developing in a short time. In the vertical tray, on the contrary—above all, if it be kept closed when not used—the liquid remains good for several hours. Nevertheless the horizontal tray can be used, but as soon as a plate is developed it is necessary to pour the developer back into the bottle which contains the stock solution.

To restore the iron solution to its proper strength it suffices to return it to the bottle containing the iron wire and to shake up the whole. During the night, and even as soon as the daily work is done, the iron solution should be poured back into its stock bottle, which must always be kept full (by adding a saturated solution of neutral oxalate of potash). I advise, moreover, that the bottle be plunged into hot water so as to dissolve the deposit of oxalate crystallized at the bottom of the bottle, and which prevents the developer from retaining its virtues, or, in more exact terms, preventing its deoxidation by contact with the iron wire and the oxalate in the bottle. It is impossible to preserve the iron regenerator in a cold place, as the neutral oxalate will crystallize. I keep it always at a temperature of 15° Centigrade.

In order to understand this theory well you must know that the salt which develops the image is the ferrous oxalate, and that this salt is not very soluble in a cold solution of oxalate of potash; therefore it is indispensable to introduce new ferrous oxalate as soon as the solution becomes weakened. Our stock solution contains a great excess—sufficient, in fact, for the work of a whole week. But if we leave the potash salt to crystallize in the bottle it imprisons the ferrous oxalate, and we have no renewal of the strength of the solution. Hence the variations in the ferrous oxalate developer. It is very easy to obviate this inconvenience. First, to have several quarts of the iron solution in separate bottles; secondly, to put the bottle which has lost its qualities into hot water; thirdly, to prepare every other day a new developer. I hope you understand the importance of these observations. I promise you that if you give the proper attention the gelatino-bromide process will offer you less difficulty than the wet collodion process; that is to say, when you have practiced it a short time.

The formula for the iron developer just given is not complete. You must have a solution of 100 grammes of ammonium bromide in one liter of water, so that ten c.c. contain just one gramme of bromide. From ten to fifty c.c. of this solution must be added to each liter of the developer. This quantity is determined by experience, and we shall see shortly how to do it.

I said a short time ago that the developer was contained in a vertical tray. The plate to be developed is immersed directly in the solution. If the tray be horizontal the liquid is kept in motion; if the tray be vertical the plate is lifted up and down by means of the plate holder. If this precaution be neglected a great number of spots will be observed upon the surface, for the gelatine repulses the developer, and these kinds of fatty spots make so many stains in the image.

When the plate has remained about half a minute in the developer the high lights become visible. In about a minute or a minute and a half the details in the shades are to be seen; in two minutes, or three at the longest, the image is completely developed, which can be ascertained by looking at the back of the glass. The high lights have gone through the film. The plate is now washed and fixed. For this washing it is better to employ rain water.

The development proceeds in this manner only when all goes on well. It is probable that it will act in a different manner with you at the commencement, for we must all pay our tribute to gain experience. Very often at the beginning of the development the high lights come out well, but with the appearance of the half tints a change in the color of the plate comes on; it begins to fog, and, finally, the fog invades all, and the image disappears.

The cause of this fog may be attributed to too much light in the laboratory, by the red glass not being sufficiently stained, or from some white light entering the dark room through the cracks in the partition; or it may be that the dark slide is not light tight—in fact, one of these causes, or, perhaps, the whole of them combined.

If these causes of fog do not exist, still you have fog; but try the following: Take an unexposed plate and plunge it into the iron bath; if it fogs, it is owing to your having prepared or dried your plate in a room in which the obscurity has not been complete. If, after all, however, this is not the true cause, add eleven, twenty, thirty, forty, or even fifty c.c. of your bromide solution to the liter of developer; shake well, and allow it to settle for a quarter of an hour. Plunge another unexposed plate into the developer and see if the plates still fog. If so it is in the drying of your plates or in the red glass you must seek for the cause of your non-success.

You will find the addition of the bromide to the oxalate

of iron developer does not lengthen the time of exposure, but makes the development a more lengthy operation. What is gained is that the clear parts of the negative remain perfectly white by reflection, and after fixing the image will be perfectly clear and free from fog. With emulsions which will fog the only means to get over it is to give a double or even triple exposure in the camera, and to stop the development before the fog begins.

I informed you, when I first commenced, that the difference of sensitiveness in commercial plates was very considerable, but that it was very easy to ascertain their relative sensitiveness by a little practice. The greener and coarser the grain on the edges the more rapid they are. These last require greater care and special precautions in manipulations; more bromide in the developing solution can be employed with them.

When I began my experiments on gelatino-bromide plates I employed those of Mr. Swan, and could obtain nothing but fogged plates. I wrote to the maker, and he informed me that the cause of my non-success was owing to my red glass or the state of my dark slide. I then went to work and stopped up every crack in my dark room; reglazed my window with proper red glass; examined my dark slides, which in truth, were all in a bad state (although made by Dallmeyer). As soon as I took these precautions I had no more trouble with fog. You will pass through the same ordeal, and you will succeed like me in the end.

VIII.—PYRO DEVELOPMENT.

M. Obernetter, of Munich, who cultivates with great success the gelatino-bromide process, prefers the pyrogalllic acid development to that of the oxalate of iron. Here is his system:

The following solutions are prepared beforehand:

1. Water..... 10 parts.
Potassium bromide..... 1 part.
2. Alcohol..... 10 parts.
Acid pyro..... 1 part.

These two solutions are kept in bottles having a dropping tube attached, containing ten c.c. Another dropping bottle is required, containing pure and concentrated ammonia.

To develop the plate is laid flat in a tray (it is not necessary to plunge the plate into water) containing the following solution:

Water.....	250 cubic centimeters.
Acid pyro.....	4 "
Bromide.....	2 "
Ammonia.....	10 drops.

This mixture must be made when about to be used and in the order given. In half a minute the high lights ought to come up; if they appear sooner five to ten c.c. of the bromide solution is added. If they do not show in half a minute five to ten drops of ammonia are employed—not put upon the image, but dropped into one of the corners of the tray where the greater quantity of the solution has been brought. Thus an under and over exposed plate can be corrected. The regenerator is allowed to act until sufficient density is obtained, which can be seen by lifting the plate out of the liquid and looking through it. It must be taken into consideration that the density will diminish during the fixing. The negative is now well washed and fixed.

IX.—FIXING THE IMAGE.

The image should be fixed in the dark room. Hyposulphite of soda is used for that purpose; strength 15°. The fixing is slow, and so much slower in proportion as the film is greener and coarser in grain. Fixing with hypo is not so easy and simple as with wet collodion. The fixing solution colors easily, takes a dirty yellow tint from the oxalate of iron left in the film, and it communicates this tinge to the gelatine film; therefore a certain quantity must be prepared beforehand to replace the one employed for fixing as soon as the latter has been colored by the iron salt. You must not, in order to fix rapidly, employ a concentrated solution of hypo. Frilling and blisters in the film will be the consequence.

The film should be well washed after development, but even more so after the fixing. I wash, first of all, the plate under a tap for about thirty seconds, then I place it upright in a water bath for about a quarter of an hour, and finish up by a rinse under the tap for a few seconds. Without this precaution the image bleaches under the action of the intensifier, or, if it be not necessary to intensify, the film will leave the glass after having been varnished.

If the film blister or frill during development, or after or before fixing, the following excellent preventive, due to Mr. Mawdsley, must be tried: Before developing plunge the plate into a solution of ten grammes of chrome alum per liter of water; wash for a few seconds, and then put it into the developing solution.

X.—INTENSIFYING THE IMAGE.

Pyrogalllic acid mixed with silver nitrate intensifies the gelatino-bromide negative; but it forms at the same time a red veil, because the silver combines with the gelatine. Mr. Swan has recommended as an intensifier potassium iodide dissolved in bichloride of mercury; but the negatives after a short time turn of a chrome yellow color. I have succeeded in discovering that an alkaline solution of silver could be employed instead of an acid solution, as is generally used; but indirect means must be employed to gain this end.

I will now operate under your eyes, as I have already done for the other experiments. This bottle contains—

Distilled water.....	1 liter.
Bichloride of mercury.....	20 grammes.
Bromide of potassium.....	20 "

This other bottle holds—

Distilled water ..	1 liter.
Nitrate of silver.....	20 grammes.
Cyanide of potassium, pure and crystallized.....	20 "

In order to make the first solution put the bichloride of mercury into a mortar, and grind up with the water until all is dissolved, and then add the bromide of potassium. To prepare the second solution dissolve the nitrate of silver in half a liter of water, then the cyanide in the other half liter, and mix the two solutions. A slight precipitate of cyanide of silver will be seen at the bottom of the bottle, and must remain. I wish to insist upon the necessity of employing pure and crystallized cyanide of potassium; ordinary cyanide will not answer the purpose.

* Cyanide of potassium attacks the image without pure and crystallized cyanide be used, and that at two or three per cent. strength.

The negative can be intensified either immediately after the washing which followed the fixing, or it can be employed upon a negative which has been dried. In the latter case the negative must be steeped for a minute or two in a water bath.

Plunge the negative into the bichloride of mercury solution,* and leave it a longer or a shorter space of time according to the intensity required. The extreme limit is attained when the image has become white. Wash well under the tap. Now immerse the negative in the second solution. It must remain only a few seconds if its stay was but short in the bichloride of mercury. If it had been a long time in that solution it can remain also pretty long in the cyanide solution without danger. At all events, it is necessary that the white produced on the negative by the mercury bath disappear in the second solution. This can be seen by examining the negative from the back. The negative must not remain too long in the cyanide of silver bath, because the latter reacts on the blacks of the image and takes away a part of their intensity.

The negative is now thoroughly washed and dried without going into the hypo solution again, as the solution would destroy all the intensity obtained. The successive action of the cyanide of silver and the bichloride of mercury has for its object to produce a violet chloride of mercury in the blacks of the image. This salt does not change by the action of light. The result of this intensifier is superb; one would think that the negatives were produced by wet collodion. Everyday practice confirms the value of this process. Time alone will show its usefulness.

XL.—RETOUCHING AND VARNISHING.

Some photographers retouch their negatives before varnishing, because the matt surface of the gelatino-bromide plates offers every convenience to retouch either with the lead pencil or with the *estoupe* (drawing stump). Others retouch after the application of the varnish. As to varnishing, the operation is the same as for collodion, only great care must be paid to drive out from the gelatine film all moisture by applying a gentle heat to the negative before you attempt to varnish.

The gelatino-bromide process is the process of the future. Twenty times more rapidly can be obtained than by the wet collodion, and the plates can be prepared beforehand. These two advantages alone are immense. So great are they that I am certain wet collodion has seen its best days. For this reason I did not hesitate one instant to make gelatino-bromide the object of my exclusive studies. I shall indeed be happy if the few indications that I have given will be of service to you.

HELIOTYPIC PRINTING PLATES.

TAKE of glue (Koelber leim) 1 kilogramme, allow it to swell for 24 hours in some cold water, and then liquefy the pieces at a temperature of 25° R., adding 20 grammes of potassium bichromate. Pour this solution over a suitable square of plate glass, previously coated with ox gall and provided with a rim of putty, and allow to dry in a dark place. After the lapse of two days the glue tablet can be readily detached. Now place on the smooth surface the transparent negative drawn in bold lines and strong contrast of lights and shades, or made of perforated cardboard, and expose to the sunlight for from one to three hours. After the exposure glue the tablet with its back side to a smooth wood block, moisten the face with water, and finally remove by means of a soft moist cloth all glue not hardened under the influence of light, when the *cliche* will show the drawing in perfect relief with a smooth printing surface. After completely hardening the *cliche* in the light, it is ready to be used in the printing press. Galvano-plastic copies of this plate may also be taken in the usual manner.—*Indust. Bl.*

A NEW QUANTITATIVE ANALYTICAL METHOD OF EXTENSIVE APPLICABILITY.

PROF. A. CLASSEN has extended his method of separating zinc from manganese, ferric oxide, and alumina from manganese, and of determining cobalt and nickel, so that it is now applicable, not merely to the estimation of single constituents of complex bodies, but of all the ingredients present. The following summary of his process is taken from the *Zeitschrift für Analytische Chemie*:

The determination of magnesium and its separation from the alkalies is effected by adding to the aqueous solution, whose volume should be about 25 c.c., a hot saturated solution of ammonium oxalate, or by dissolving in it solid ammonium oxalate with the aid of heat; boiling, adding an equal volume of acetic acid at 80 per cent., maintaining the mixture at a boil for some minutes with constant stirring, allowing to stand for six hours at 50°, filtering, and washing the precipitate with a mixture of equal volumes acetic acid, alcohol, and water. The precipitate and filter, still moist, are heated to dryness in a covered crucible, at first very gently, and then with access of air, but with a small flame till the carbon is consumed, and finally strongly ignited, when the magnesium is weighed. The latter is dense and heavy, and no loss is to be apprehended on ignition. In order to separate magnesium from the alkalies the oxalate must be precipitated from more dilute solutions, otherwise a double oxalate of magnesium and potassium is formed and is not decomposed by the subsequent treatment, whence the magnesium is contaminated with potassium carbonate. The liquid, about 50 c.c., is therefore mixed with a cold saturated solution of ammonium oxalate (1:24), and $\frac{1}{2}$ vol. of alcohol is added. The magnesia thus prepared contains no potassium, or mere spectroscopic traces, and the precipitation of the magnesium is complete. The process is applicable whether the alkalies are present, as chlorides, sulphates, or nitrates.

For the complete precipitation of manganese oxalate, Classen adds zinc chloride; in cases where the presence of zinc would be inconvenient he uses magnesium chloride, in such quantity that for each mol. of manganic oxide at least 1 mol. magnesia must be present, otherwise the residue, after ignition, is a mixture of manganic and manganosomanganic oxides. For determining the zinc oxide the solutions are freed from all uncombined acid by evaporation in the water bath, and, in case of sulphuric acid, by subsequent heating in the sand bath; the residue is moistened with a few drops of dilute nitric acid, or digested for a short time with about 10 c.c. bromine water. A sufficient quantity of neutral potassium oxalate (1:3), about seven times the weight of the oxide, is added, the mixture is heated in the water bath, and the ferric oxide is dissolved by the addition

of acetic acid in drops. The whole is then heated to a boil, an equal volume at least of acetic acid is added, and, after standing for six hours, it is filtered while still warm, washed with the mixture of acetic acid and alcohol, and the zinc oxalate is ignited. Nickel and cobalt are determined in a similar manner; the washed oxalates are ignited, washed again, and re-ignited. The oxalate of nickel is precipitated in a crystalline state only when in small quantity, wherefore it is prudent to take only small quantities of the substance for analysis. Cobalt oxide is reduced in a current of hydrogen and weighed as metal.

Copper oxalate, if precipitated in the manner described for zinc and manganese, falls in a state of very fine division and settles badly. The determination is accurate and convenient if a sufficient quantity of potassium oxalate is added to the neutral concentrated solution. After a time the greater part of the copper separates in fine blue acicular crystals, as cupro-potassic oxalate, and, on adding an equal volume of acetic acid and allowing the liquid to stand, the residue of the copper is completely precipitated. The precipitate, after washing, is gently ignited, lixiviated, and re-ignited till the weight becomes constant, or, as Classen prefers, dissolved in dilute sulphuric acid, and the copper determined electrolytically by means of a thermo-battery or two Bunsen elements. In presence of antimony and arsenic chloride along with iron, as in the analysis of fahl-ores, the copper is not completely separated by the process above described, not even on the addition of zinc or magnesium chlorides. If but little antimony is present the substance is dissolved in nitric acid, the solution evaporated to dryness, the residue mixed with potassium oxalate in excess, filtered while hot, washed with a little water containing potassium oxalate, and the filtrate concentrated to 50 c.c. In presence of larger proportions of antimony the substance, finely pulverized and mixed with 4 four parts ammonium chloride, is very gently ignited in a covered crucible, and thus almost all the arsenic and antimony, together with the greater part of the iron, are driven off as chlorides. The copper is then determined as above.

The separation of phosphoric acid from such oxides as form with potassium oxalate soluble double salts, capable of being decomposed by acetic acid, e.g., lime, is effected by the separation of the oxalate, as described above. Ferric oxide and alumina, whose oxalates form with potassium oxalate double salts not decomposable by acetic acid, are completely eliminated by means of alcohol. The phosphate is dissolved in hydrochloric acid, evaporated to dryness, mixed with potassium oxalate six times the weight of the oxides, and digested for a short time in the water bath, the ferric oxide dissolved by acetic acid, and the same acid in excess and alcohol at 95 per cent. are added as long as a precipitate is formed. After standing for six hours the precipitate is filtered, washed with alcohol, the filtrate in the beaker concentrated on the sand bath to expel acetic acid and alcohol, the residue, almost dry, is diluted with water, any silica which separates is filtered off, and the phosphoric acid precipitated by means of ammonia and magnesia mixture. The process is suitable for the determination of phosphorus in crude iron. Arsenic acid behaves like phosphoric acid. Salts of cobalt, nickel, and zinc do not retain arsenic.—*Chemical News.*

TURKEY-RED OIL.

By G. STEIN.

THE author's method is to weigh 10 grammes of the sample into a porcelain capsule holding about 125 c.c., adding 75 c.c. cold saturated solution of common salt and 25 grammes of dry wax. The whole is then heated on a water bath. As turkey-red oil is insoluble in brine, it rises in an anhydrous condition to the surface and combines with the melted wax. The cake of wax, when cold, is freed from brine by means of filter paper, dried over sulphuric acid and weighed. On deducting the known weight of the wax the residue is the real oil.

DETERMINING SULPHUR.

By ALBERT COLSON.

THE author proposes to burn pyrites in a current of oxygen, and to titrate the products of combustion. The operation is carried on in a tube of green glass, placed in a furnace for organic analysis. One end of the tube is sealed, and to the other is fitted a stopper with two holes. One of these serves for the escape of the gaseous products of combustion which are received in a Liebig's bulb apparatus containing standard caustic soda. Through the other hole passes a long, narrow tube, which conveys oxygen, free from water and carbonic acid, to a small platinum boat placed near the closed end of the combustion tube, and containing half a gramme of the pyrites, spread out in a thin layer. A plug of asbestos is placed about the middle of the tube to avoid projections. Heat is first applied toward the open end of the tube, and as it approaches redness it is gradually extended toward the closed end. The current of oxygen is regulated so as to be always in excess. The disappearance of the white vapors formed in the bulb tube during the operation is a sign that the sulphurous acid is expelled from the combustion tube. The open end of the tube and the stopper are then washed, and the washings are added to the liquid in the bulb tube, the sulphurous acid in which is then determined in the usual manner. If the pyrites contain carbonates, standard solutions cannot be used. It is then necessary to oxidize the sulphurous acid and determine the sulphuric acid formed.

COMPOUND NATURE OF PHOSPHORUS.

Letter from MR. N. LOCKYER to M. DUMAS.

PHOSPHORUS heated in a tube with copper gives a very brilliant hydrogen spectrum. Phosphorus alone heated in a tube where a vacuum has been formed by Sprengel's apparatus, gives nothing. Phosphorus, at the negative pole in a similar tube, gives very abundantly a gas which shows the spectrum of hydrogen, but which is not hydrogen phosphide.

SPONGY SILVER.

PREPARE silver tartrate by double decomposition of silver nitrate and potassium and sodium tartrate, washing the white precipitate, and drying under exclusion of light. When this impalpable powder, perfectly dry, is heated on a thin sheet of copper or brass, over a Bunsen burner or an ordinary spirit flame, it will be seen to puff up into a voluminous shining mass of pure spongy silver.—*Boettger.*

FAST SCARLET WITHOUT COCHINEAL.

For 66 lb. woolen yarn add to a boiling water 1 lb. $\frac{1}{2}$ oz. of starch and $8\frac{1}{2}$ ounce measure of tin solution. Skim carefully, add $22\frac{1}{2}$ oz. crystallized tartar, enter the wetted yarns, and turn for 15 minutes. Add the clear solution of $15\frac{1}{2}$ oz. "naphthaline ponceau R" (Meister, Lucius, and Brüning, of Hochot), in two portions, turn for 15 minutes without boiling, add $16\frac{1}{2}$ ounce measure of the tin solution, and boil gently for half an hour. The tin solution is prepared by dissolving 560 parts of pure tin (granulated) in a mixture of 2,000 parts muriatic acid, 667 aqua fortis, and 667 parts water, the parts by weight.—*Deutsche Färber Zeitung.*

CURIOUS CASE OF LOSS OF PERSONAL IDENTITY.

DR. A. H. HEWETER, of St. Clairsville, Ohio, writes as follows to the New York *Hospital Gazette*: I have had under my care as physician for our county infirmary a very interesting case. There is no discoverable bodily disease, but a very peculiar mental state. The patient has lost all knowledge of his personal identity; does not know who he is, where he came from, or whither he was going. He became an inmate of our infirmary about nine months since. The following in his history since taken in charge by our county officials. All previous to that is a blank to himself and entirely unknown to us:

About the time referred to, nine months since, he found himself standing upon the depot in Bellaire city with a little money in his pocket and a small traveling bag in his hand. This bag contained a change of linen, pair of scissors, and some blank paper like that used by editors. His clothes were quite genteel, and the underwear in his valise was neat and clean. His entire appearance was that of a well-cared-for gentleman ready for business.

There was no name on any property about him indicating who he was: entirely nameless, except on some part of his effects was the name Ralph. This is what he is called in the infirmary.

After thinking and thinking while at the depot he at last went to the nearest hotel and gave the landlord a candid statement of his very strange condition. He asked for a bed, said he had a little money, that he would be no trouble, and that he felt sure this strange mental sickness would soon pass off. The landlord became interested in his case.

The same day a gentleman came to Bellaire to lecture on temperance. Stopping at the same hotel, he soon made the acquaintance of Ralph and invited him to attend the lecture. While attentively listening some impulse came over him which he could not resist, and he found himself out in the street smashing the saloon windows with a big club. The roughs ran out, beat and abused him badly, breaking the neck of the humerus and beating one side all black and blue. This brought him into the hands of the police. But the lecturer, the doctor, the landlord, and mayor all became interested in finding out who he was. They made every effort, but utterly failed.

He certainly is a man of more than the average ability; has had quite an extensive knowledge of business, and is very expert with the pen. Some think that he must have been connected with the press; others, a clerk in some calling in which the use of the pen and figuring was the daily habit. In this way alone can they explain his great expertness.

His knowledge is entirely correct upon all matters disconnected with the question of identity. He has the use of his mental powers in all other directions.

I made him, after having the best evidence of his fitness, my assistant. He has put up all the medicine, etc. I procured him Parrish's Pharmacy, and in a remarkably short time he was able to fill any prescription I required, and in many other ways to assist me.

So great is his general knowledge, and so correct all his recollections of general events, and all special duties imposed upon him, that many were skeptical and believed him to be feigning. But, after nine months close observation, we are all forced to believe that he is what he says he is—a man with no knowledge of his personal identity.

He is about fifty years of age; rather spare; has dark hair, well sprinkled with gray, and is quite a gentleman in appearance. He has made himself so useful, agreeable, and so anxious to return all he can for the benefits he has received, that he was presented with a new suit of clothes and directed to eat at the superintendent's table.

I report the case both on account of its psychological interest, and that possibly it may lead to his identity.

He has been published in our newspapers pretty thoroughly, but these have a much more limited circulation than a medical journal like yours.

THE EUCALYPTUS AND THE PINE CONSIDERED IN RELATION TO THEIR SANITARY PROPERTIES.*

By C. T. KINGZETT, F.C.S., F.I.C.

As is widely known, both the eucalyptus and the pine have long enjoyed a popular reputation as health agents. In particular the eucalyptus has acquired the character of the "fever-destroying tree," and has been largely cultivated in various parts of the world with the view of rendering habitable large districts previously devastated and depopulated by malaria, etc. In this paper the author, referring to the old theory of the action of the eucalyptus, which attributes its sanitary powers to its drainage properties, shows that this hypothesis always lacked evidence, and at its best was of a negative character. In the first place, the eucalyptus is only superior to other trees as a means of drainage in the proportion in which its rate of growth exceeds that of other trees, and this is not sufficiently notable to account for its extraordinary fever-destroying properties. Then, again, other trees, even if planted in malarial districts, do not free them from the disease, so that the action of the eucalyptus is of a positive type, and like the pine tree, its properties are of a healthful nature, upon whatever soil or in whatever climate it may grow, whether in deep valleys or upon the sides of mountains. Others have maintained that just as pine forests are supposed to exert their beneficial influence upon persons suffering from pulmonary and other affections, by virtue of the volatile emanations arising from them, so the eucalyptus produces its well-known effects by the oil which is evaporated from its leaves. Mr. Kingzett then examines this hypothesis in detail, and shows the relative oil-yielding power of the different species of eucalyptus. The genus embraces over 130 species, and of these *Eucalyptus amygdalina* is the most abundant oil-giving tree, 100 lb. of the leaves giving from 3 to 6 lb. of the oil.

* Abstract of a paper read before the Health Section of the Social Science Congress, Manchester.

* If the negative be covered with a white veil it proves that the hypo has not been properly eliminated.