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[END OF NOTES]

THE
DAGUERREIAN JOURNAL.

VOL. I.

NEW YORK, FEBRUARY 15, 1851.

No. 7.

CHEMICAL CHANGES

PRODUCED BY THE SOLAR RAYS ON SOME PHOTOGRAPHIC PREPARATIONS EXAMINED.

BY ROBERT HUNT.

1. Being desirous of ascertaining, with more correctness than has hitherto been done, the nature of the changes produced by solar radiations upon the various preparations used for photographic purposes, I instituted a short time since, a series of experiments with this object in view. Commencing with the salts of silver most commonly used in this new and beautiful art, it is my intention to proceed with all organic as well as inorganic bodies, which the researches of late years have shown us undergo a chemical change by exposure to sunshine. This inquiry must necessarily extend itself over a considerable period, but by confining myself strictly to the examination of one compound at a time, I hope to be enabled gradually to place the entire subject in a more satisfactory light than it is at present. The results I have already obtained are in the highest degree satisfactory; and as they have reference particularly and solely to the oxide, nitrate and chloride of silver, I see no good reason for withholding their publication. As the examination of the other preparations is completed, I shall, from time to time, forward my results to the editors of the Philosophical Magazine.

2. During the past five or six years, the attention of some of the most eminent philosophers of Europe has been turned to the subject of photography. The result has been the discovery of a great number of most interesting processes; and in some few cases the chemistry of the changes produced by actinic power has been examined and explained. This has, however, so rarely been the case, that I shall offer no apology for proceeding anew over the entire subject; and I hope in every instance, where I do not acknowledge the previous labors of other enquirers, that the omission will be set down to its true cause—my ignorance of those labors—and not attributed to any desire on my part to arrogate to myself the merit of any discovery which is fairly due another.

OXIDES OF SILVER.

3. To a weak solution of nitrate of silver in distilled water, a very dilute solution of pure baryta was added, and the resulting precipitated oxide of silver received upon plates of glass. When the whole of the oxide had fallen down, the fluid was removed very slowly by means of a small glass siphon, so that the powder on the glass plates might not be disturbed. Without being removed from the vessel in which the precipitation was effected, the oxide was dried at a very moderate heat, and there resulted exceedingly thin films of the

oxide of silver on the glass, quite free from all organic matter, every precaution being taken to prevent its presence.

4. These plates were exposed to full sunshine for periods varying from one to twenty-four hours, one-half of them being covered with an opaque body. The brown oxide of silver (protoxide) was gradually darkened, so that after half an hour's exposure, the exposed part was a much deeper brown than that which had been covered. This darkening process was continued until a perfect black was produced, after which, by the prolonged action of sunshine, a very remarkable whitening of the oxide takes place, and proceeds slowly until it is of a very fine olive color.

5. On immersing one of these plates in strong ammonia, all the oxide which had been kept from the solar action was dissolved off, whereas the exposed part did not appear to be acted on. Another plate, immersed in a solution of twenty drops of nitric acid in 300 drops of water, was acted on in precisely the same manner; the oxide being entirely removed from the unexposed portion of the glass plate, whilst the changed or actinized part, appeared to remain untouched. From this we might consequently infer that the oxide of silver had been reduced to the metallic state. Moderately strong nitric acid, dissolving the whole from the glass, seemed to render this in every way probable.

6. Metallic silver, in however fine a state of division it may be, conducts electricity; consequently it was expected that the changed oxide would conduct the current of a voltaic battery. One of the glass plates covered with oxide was made part of the circuit, between a single pair and a galvanometer of great delicacy, but not the slightest indication of any conducting power could be detected.

7. Films of oxide of silver were darkened all over by long exposure to sunshine. One was placed in ammonia, and another in very dilute nitric acid. It was now dis-

covered that the ammonia did dissolve a portion of the actinized oxide; it became a pale brown color, and was found to hold silver in solution. The dilute nitric acid also dissolved off some oxide from the plate, as was shown by its becoming milky on the addition of muriatic acid. On adding some potash to the ammonia, and dissipating the ammonia by heat, a black precipitate was formed. The precipitate from nitric acid was dark brown. The general characters of this oxide, were the same as those of the suboxide of silver examined by M. Wöhler. ✓

8. After having removed as much as possible from the glass plate by solution of ammonia, there was still a film upon the surface of the glass, which, upon drying, became nearly black, appearing of a fine olive-green color when looked through. It was now ascertained that this film conducted an electric current, and on pouring over the plates nitric acid, diluted with an equal quantity of water, the films were dissolved off with the formation of nitric acid fumes.

9. These results prove to us that the influence of the chemical rays (actinism) on the protoxide of silver, converts it into the suboxide and into metal. I have not been able by the longest exposure to sunshine to reduce all the suboxide to the state of metal, unless organic matter was present.

10. Pure protoxide of silver being spread whilst moist upon paper, by means of a camel-hair pencil, and carefully dried, passes in the course of a few hours, if the sun shines strongly, into a perfect black, the whole of which dissolves off in ammonia. The salt precipitated by potash, the ammonia being dissipated by heat, gave, upon reduction, the exact formula of Wöhler's oxide (Ag_2O).

11. By continuing the exposure of the papers for a few days, their colors were changed from black to an olive. Ammonia dissolved nothing, and diluted nitric acid was equally inactive. In modern

strong nitric acid, however, the paper was almost immediately rendered white with the formation of nitrous acid fumes. Any analytical results from preparations on paper are so liable to error, from the inconstant character of the composition of the paper itself, that they are scarcely to be depended upon. But by very carefully drying two weighed pieces of paper until they lost no further weight, and even heating them up to a point but a little below that at which the paper would scorch, placing them both in warm tubes and hermetically sealing them, exposing one to the actinic influence, whilst the other was preserved in the dark, opening the tubes under the same circumstances, burning the papers at the same temperature, and weighing the ashes against each other, I succeeded in reducing the sources of error considerably; and the result was, in several experiments, that the actinized oxide lost in weight exactly (or *very nearly*) the weight of the oxygen of the oxide employed.

12. Several trials were made to ascertain if the films of oxide of silver on the glass plates lost weight upon darkening: but, although some evidence was obtained that they did so, it must be admitted that it was not at all satisfactorily proved to be the case by this means. The films seldom exceeded a grain in weight, and the pieces of glass upon which they were spread, generally weighed 200 grains; it will therefore be easily conceived how difficult a thing it was after an exposure of some hours to sunshine, and under all the varying conditions of temperature and atmospheric moisture, to decide with anything like accuracy, the loss by weight of oxygen of the oxide employed; the more so as evidence was obtained to show that the finely divided metal had the property of condensing water within its pores with some rapidity. I cannot refrain from venturing to express my opinion, that the silver reduced by actinic power is different in many re-

spects from silver brought to an equally fine state of division of mechanical means.

13. The oxide of silver, as is well known, is soluble in ammonia; by exposing such a solution to the action of the atmosphere, a pellicle forms upon its surface, which Faraday considers a peculiar oxide. If this solution is spread over paper and dried, I believe a similar oxide of silver is formed. This paper darkens by exposure to light with some rapidity, as does also the film formed on the surface of the ammonia. After darkening, it will be found that the darkened parts are no longer soluble in ammonia, or in diluted nitric acid, but that moderately strong nitric acid dissolves it with the formation of nitrous acid vapors. In this case, consequently, we may conclude that the oxide is reduced to the metallic state at once by the action of the sun's rays.

14. Perfectly pure silver, as is well known, does not combine with oxygen by exposure to the air; but silver reduced as above by solar action, becomes oxidized by exposure, and after a short time ammonia will dissolve off a considerable portion.

NITRATE OF SILVER.

15. Nitrate of silver does not change by the action of light, unless organic matter is present, for which it is so delicate a test, that Dr. John Davy recommended it as the most useful for ascertaining the presence of minute quantities in a solution. It has been stated that the "nitric acid appears to be the agent which destroys the animal texture, and the black stain is owing to the separation of oxide of silver*," and this opinion has been very generally entertained. I am satisfied, however, that something more than this takes place, and that an actual combination of the organic body with the silver ensues; and I hope to have an opportunity of examining some of the very complicated phenomena which have presented themselves to my notice during investigations which have been made

* Turner's Elements of Chemistry.

incidentally to the present inquiry, into the influence of organic matter upon the salts of silver and gold, during exposure to light and heat.

16. Count Rumford appears to have been the first who noticed that carbon had the property of reducing the salts of gold and silver from their solutions, at a temperature below that of boiling water, in *the dark*; and that the same precipitate of pure metal took place by exposure to the sun's rays. He inferred from this, that the "chemical properties attributed to light," were due alone to the heating powers of the sun's rays. The error of this has long been known, as experiments with the prismatic spectrum have shown that the rays in which the calorific power exists at its maximum have little effect in producing any such reduction. The precipitation of the silver from the nitrate in solution, takes place very speedily under the influence of the solar rays which have been deprived of their heat by being passed through plates of alum or rock-salt, and when the temperature of the solution is kept at 32° F.

17. Nitrate of silver dissolved in distilled water was spread on paper; it was allowed to darken to a chocolate-brown; ammonia now dissolved off the darkened surface, proving it to be in the condition of an oxide. The exposure being continued for some hours during very bright sunshine, a surface of a peculiar russet color, and of a dirty appearance, resulted. Ammonia did not now possess the power of altering the color; it removed some oxide from the paper, which arose from undecomposed nitrate of silver, protected by the superficial film from the action of the rays of the sun. But if the darkened paper was previously soaked in distilled water, until all the free nitrate was dissolved out of it, neither ammonia nor dilute nitric acid separated any oxide, clearly showing that the darkened surface was metallic silver.

18. Some nitrate of silver in distilled

water was boiled with a grain or two of animal gelatine for some hours in the dark; the solution became colored a fine brown, but even after standing for many hours no precipitation took place. Potash precipitated the oxide of a black color, which ammonia dissolved. The solution being of a brown color, I am led to infer this is a suboxide of silver (7).

19. A similar solution of nitrate of silver and gelatine was put into a stoppered bottle and exposed to sunshine; it speedily darkened, and in about two hours, the solution was so opaque that the sun could scarcely be seen through it. Its color was a grayish-green, which it retained during an exposure to a very bright sunshine for five days. It was expected that an increase in the acid reaction of the solution might be detected during the progress of precipitation. Such can hardly be said to have been the case; the solution was repeatedly tested with litmus paper, but the change of color was very nearly as decided at first as after the entire length of the exposure. Does the nitric acid enter in combination with the organic compound, is it itself decomposed by the combined action of the solar rays and the organic matter?

20. It was with great difficulty that the precipitated matter could be separated from the solution; this was at length effected by subsidence, and it was found to be entirely soluble in ammonia, giving a reddish-brown solution. The bottle in which the solution had been placed, was coated with a thin film of an olive-colored matter transmitting green light, upon which neither ammonia nor very diluted nitric acid acted. By nitric acid diluted with an equal quantity of water it was very speedily dissolved, the bottle becoming filled with nitrous acid fumes. It is apparent from this experiment, that the first action of light is to liberate the protoxide of silver from its combined acid, then to set free another proportional of oxygen, and that eventually the suboxide is entirely reduced

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to metallic silver. The nitric acid and the organic compound are evidently thrown into some new conditions by the agency of the sun's rays, the examination of which I reserve for the present.

CHLORIDE OF SILVER.

21. Perfectly pure chloride of silver was prepared by dissolving crystalized nitrate of silver in distilled water which had been boiled with a little nitric acid, to ensure the absence of any organic matter; it was then precipitated by pure muriatic acid, well-washed with distilled water, separated by subsidence, and dried on glass in a sand bath. In diffused light this chloride changes color very slowly, and eventually assumes only a light lead color. In bright sunshine it darkens much more rapidly, and becomes brown by about one hour's exposure.

22. Under the influence of the prismatic spectrum, two very decided colors are produced on the pure chloride of silver—a blue or fine rich lead color, by the space between the most refrangible green, and the extreme edge of the violet rays, beyond which for some distance the same color is produced, but gradually lowered, until it becomes a mere tint of a lilac hue, at a distance beyond the visible spectrum, equal to about one-third its length. Now, supposing we divide the visible group of rays into 100 parts, this tinting goes on over a space equal in extent to thirty-four of such parts. Over the space covered by the ordinary and the extreme red rays, a very decided red impression is slowly made. By combining the influence of the red and the blue rays, the chloride with tolerable quickness becomes of a fine brown color. I find it would be quite practicable to arrange a scale of colors with which the actinized chloride of silver might be compared, and thus enable us to ascertain with tolerable correctness the relative quantities of heat and chemical power existing in the solar rays at any time. By means of an arrangement similar to that used by Mr.

Shaw and Dr. Percy, by which the chloride is restored, after darkening, to its original condition by the action of chlorine, a very accurate and interesting series of observations might be made.*

23, As it appeared probable that artificial heat would produce similar effects to those described as the result of exposing chloride of silver to the thermic rays, many experiments were made with this view. In no instance, however, would artificial heat directly applied or reflected from a metallic surface produce any change in the color of the chloride of silver, short of the point at which it is converted into horn silver, and then the color is but very slightly altered; and even if the heat is incautiously allowed to become too great, it only passes into a lead color, this change arising from the reduction of some portions of the chloride to the metallic state. From this we may infer that the solar and terrestrial heat have properties distinct from each other, or perhaps that solar heat has of itself, in its ordinary state, no particular power in producing a change in the chemical condition of bodies, but that it modifies the action of actinic force, in a similar manner to which light has been shown to do so, (see the published experiments of Herschel,† Becquerel,‡ Draper and the author.§)

24. Mr. Fox Talbot, and, following him most other inquirers, have stated that in the preparation of the ordinary chloridated photographic papers, it was necessary, to ensure sensibility to solar action, that the chloride of silver should have some nitrate of silver in mixture with it. It was important to ascertain if possible the cause of this. Three pieces of glass covered with films of chloride of silver by subsidence, in the manner recommended by Sir John Her-

* Philosophical Magazine, vol. xxv. p. 450.

† Philosophical Transactions, 1841.

Annales de Chimie, 1843.

§ Philosophical Magazine for 1840, 1842, 1843, 1844, and 1845,

schel, were selected; one was exposed quite dry, another moistened with distilled water, and the third with a solution of nitrate of silver. The action was most rapid on that wetted with the nitrated solution, the next in order was the moist one. In an hour they were however darkened to as nearly as possible the same shade of color.

25. The glass plate over which the wash of nitrate of silver had been applied, was soaked in distilled water to remove any of that salt that might remain undecomposed. The three pieces of glass with their darkened films, were then boiled separately in nitric acid diluted with double its quantity of water. The colors of the plates were but very slightly changed. The liquids were then examined for silver, and in that alone in which the plate on which the nitrate had been spread was any detected. It was evident that the nitric acid had either dissolved off oxide of silver or oxidized metallic silver and then dissolved it. The films on the other plates were not changed in color by the application of either ammonia or hyposulphite of soda.

26. Three similar plates of glass covered with films of chloride of silver were placed in jars of pure hydrogen and nitrogen gases and in atmospheric air, and then exposed to bright diffused daylight. The object of this was to ascertain if the nitrogen of the acid, or the hydrogen of the water, were likely to assist the change in any way. The chloride in the nitrogen and the atmospheric air darkened equally in equal times. The first action of the hydrogen on the chloride of silver was to reduce it to the state of metal over the surface. But as soon as the chloride began to darken, this bright metallic film was removed and the whole darkened equally, but to a deeper tint than either of the others. These plates, as in the former case, were boiled in diluted acid, from which experiment I ascertained that the hydrogen plate alone gave any evi-

dence of the presence of oxide of silver or revived metal.

27. It may appear that this metal was produced by the hydrogen independent of the actinic power, but I find when chloride of silver is plunged into hydrogen gas in bright sunshine, that no reduction of the chloride due directly to the hydrogen takes place, yet most distinct evidence of the presence of metallic silver after darkening has been obtained. We thus learn that the advantage of the nitrate of silver over the chloride is, that it is more readily reduced to the metallic state (17) than the chloride and that the well-known accelerating power of moisture is due to the decomposition of water, and the influence of the nascent hydrogen, in reducing the argentine salt.

28. The principal point was now to ascertain the condition of the chloride of silver after it had been thoroughly darkened by exposure. Many experiments were tried, in various ways, which need not now be detailed, as they were in varying degrees successful; to one alone, which gave very satisfactory results, I shall at present confine myself. Pure chloride of silver was prepared with great care, as before stated (21), well washed with boiling distilled water, until neither nitrate of silver nor muriatic acid produced any precipitate, and then dried. Five grains of the salt were put into a long test tube full of distilled water, and placed in the sunshine to be darkened, the powder being frequently moved that every part might be acted upon by the sun's rays. It was found, even after an exposure of a few minutes, that the water contained chlorine; it became opaque on the addition of nitrate of silver, and this very gradually increased as the chloride darkened. The darkening was continued for several hours, after which the solution was filtered to free it from chloride of silver and nitrate of silver added to the filtered fluid; chloride of silver was precipitated, which, when collected and dried

weighed 1.4 grain on one occasion, 1 grain on another, and 1.5 grain on a third trial. It is very difficult to ensure the darkening of every portion of the chloride of silver, it adheres in little masses; these are darkened on their outer surface, and the interior is then protected from the solar influence; this was overcome as much as possible, by repeatedly breaking down those small particles with a glass rod. On drying the darkened chloride and weighing, it was found that the loss of weight was scarcely a quarter of a grain. From this it is evident that the chlorine liberated by the sun's rays, must have been partly replaced by some other body; and it becomes highly probable that the darkened chloride is in the state of an oxychloride. No oxide of silver could be detected by digestion in diluted nitric acid.

29. The exposure in the water was in another case continued for many days, but no greater degree of darkening occurred; but a curious fact was now noticed. It was found that during the night nearly all the chlorine which had been liberated during the day was recombined, and that the darkened powder became much lighter. A similar effect to this, but a more striking one, has been noticed by Dr. Percy and Mr. Shaw, when chloride of silver is darkened by light in an atmosphere of chlorine. Some other salts of silver exhibit this curious phenomenon in a striking manner, as will be shown in future communications.

30. Pure chloride of silver was dried on a glass plate, and heated nearly to the point of fusion; it was then placed in an atmosphere of chlorine and darkened in very bright sunshine. No loss of weight could be detected by the most careful manipulation and with a very delicate balance. There is no very satisfactory way of explaining this, except we suppose that the liberated chlorine is retained by cohesive force in connection with the finely divided particles of what we must regard as a subchloride of silver, unless we return to the

old theory of the compound nature of chlorine.

31. In these experiments the presence of organic matter had been carefully avoided. It now became necessary to enquire into the condition of the chloride of silver darkened by the solar rays on paper. Bath post paper highly glazed, was covered with chloride of silver in the usual way, all free nitrate of silver being washed off. The prepared paper was then exposed to light for forty-eight hours, in which time it darkened and became of a fine olive-brown. The paper was now cut in pieces; some parts were immersed in very dilute nitric acid, which produced no change; others in ammonia, which had not the slightest effect upon them; therefore it was evident that no oxide of silver was present. On putting fragments of the paper into nitric acid diluted with equal parts of water, all the darkened portion was rapidly dissolved off, and the paper was left of lilac color. Hence we have very satisfactory proof that metallic silver is eventually formed on the surface of the chloridated photographic papers, and that the under sensitive surface is preserved in the condition of a subchloride of silver by the opacity of the superficial coat.

32. From other experiments which do not properly belong to this paper, I am inclined to believe that the first action of the solar rays (I avoid using the term light, considering these phenomena as the result of a modified principle) is to liberate one-half of the combined chlorine, which is very readily, moisture being present, replaced by oxygen. By the continued action of the exciting cause, the other proportional of the combined gaseous element is in like manner set free and replaced. We have seen (3, 4, 5, &c.) that oxide of silver is in a short time decomposed under actinic power, and hence we have eventually, nearly pure metallic silver in a state of extremely fine division. It will be seen that organic matter plays an equally important

part with the chloride of silver as it does with the nitrate of that metal when under the influence of that mysterious power which appears to emanate from the solar orb.

33. Admitting the imperfect character of the results which I have endeavored to record as faithfully as possible, I cannot but regard them as important, and they appear to point to some general law, which is probably applicable to those phenomena which Moser has described, and which are in all probability acting a grand part in the mutations of the universe. The same power which we detect changing the film of chloride of silver on the photographic paper, has been in action for countless ages on the earth's surface; and by pursuing, with due care, the investigation, we may be enabled to proceed, step by step, into the great laboratory of nature, and discover the various causes which have been in operation on the consolidated masses of this globe, and which are producing multifarious chemical changes, to the excitation of which are due the great magnetic phenomena which are exciting so much the attention of philosophers.—*Phil. Mag.*

LITHOGRAPHY.—*The Art of Printing from Stone.*—The process of Lithographing is based upon the fact that printing ink, being largely composed of oil, will not adhere to any surface that is wet with water. Every one knows how utterly impossible it is to mix oil and water. To lithograph, then, all that is necessary is to draw on the surface of a dry slab of stone with a greasy crayon, whatever is desired to be printed. A weak solution of nitric acid, is then rubbed over the stone, which fastens the drawing so that it cannot be rubbed off. After this a solution of gum Arabic is passed over the surface, and then the surface is ready for printing. By means of a sponge, water is now passed over the stone, and while yet wet, the inking roller is applied, the ink of course adheres to the line of the drawing, because

they are oily, but to the wet stone it does not stick. The paper is now laid on, and with the stone passed through the press, the result being a beautiful and exact copy of whatever is drawn.

The stone required for lithography is of a peculiar kind of lime and clay nature, resembling in appearance a smooth yellow hone, yet possessing the quality of absorbing water. It is found chiefly in Bavaria, though there are quarries of it in England. The Bavarian stones, however, are those most usually employed, and their importation is a considerable object to commerce. They are worth, in New York, from five to ten cents per pound.—*Banner of the Union.*

GEOLOGY OF ALABAMA.—The *Montgomery Journal* has commenced the publication of a series of essays on this interesting subject. The third number is devoted to the examination of the calcareous deposits and their value in the useful arts. It states that the annual consumption of lime in the State is one million of bushels, costing 50 cents a bushel, three-fourths of which are imported. He says it can be furnished from the beds of Alabama at 10 cents a bushel. Let the South develop its resources.

The Artesian Well at Charleston, S. C. has now reached the depth of one thousand feet, and they are now putting down the tubes to secure further operations. With the exception of occasional boulders the whole depth of the well has been cut through a bed of marl. The last boring discovered an increase of sand, and water had risen above the surface.

The artists of Boston are about to erect a monument to the late Gilbert Stuart, the renowned portrait painter.

The same apparatus used now in producing Daguerreotypes will, with slight alterations and additions, be required of the Hillotype process.

MERCURIAL VAPORS.

OBSERVATIONS ON CERTAIN MOLECULAR ACTIONS OF CRYSTALLINE PARTICLES, ETC.; AND ON THE CAUSE OF THE FIXATION OF MERCURIAL VAPOR IN THE DAGUERREO-TYPE PROCESS.

BY AUGUSTUS WELLER, M. D.

When a piece of glass is covered with a solution containing the double phosphate of ammonia and magnesia, and traces are made upon it by any hard body, it is known that they become visible shortly afterwards by the salt being precipitated upon them. Berzelius, who mentions this test in his Elements of Chemistry, states that Wollaston proposed to make use of this fact as a test of the presence of magnesia in solution, which has since been frequently adopted. According to Berzelius, "the cause of this property is of a mechanical nature, probably from the glass being covered with microscopic crystals, the facets of which take a different position on the traces, for some reason which is not easily explained." More recently, Prof. Liebig has alluded to this subject in his Vegetable Physiology, § 157. These effects are referred by him to a state of unstable equilibrium of the various particles which compose the liquid, which is destroyed whenever a dynamical action is created sufficiently powerful to overcome the feeble attractions, or the inertia of the molecules in solution. He ascribes to the same cause the sudden solidification of water, which had remained liquid when below the freezing-point, upon being agitated; the precipitation of a mixture of potash and tartaric acid; also the detonation of fulminating powder from the contact of any solid body. Neither of these eminent observers mentions having submitted these traces to microscopic observation, although that is the only manner to test the hypothesis advanced by Berzelius.

On the present occasion it is my intention to describe some observations I have made,

in order to elucidate the influence of molecular action on the precipitation of saline bodies, similar to that observed in the double phosphate, and to show that a similar influence is exerted over bodies in a gaseous state and in a state of vapor, and afterwards to point out some phenomena hitherto unexplained, such as the fixation of the mercurial vapors in the Daguerreotype for instance, which evidently depends upon a like cause.

In order to obtain the double phosphate, I have generally used a solution containing about ten grains of phosphate of soda with about three of carbonate of ammonia in an ounce and a half of water. I have preferred this mixture, because the ingredients are more easily procured, and are less acted upon by the atmosphere than the phosphate of ammonia. The magnesian solution was generally a few grains of sulphate of magnesia to the same quantity of water as above.

A small quantity of the first mixture is poured on a piece of glass, and to this are added a few drops of the magnesia in solution; if it be allowed to remain undisturbed, in a few minutes the surface of the liquid becomes covered with a thin film, and on the glass appear minute shining crystals; but if before these crystals have time to form, any solid substance, as a glass rod or an empty pen, for instance, is passed over the glass through the liquid, the course it follows becomes visible shortly after. The images which are thus formed are double, and may be termed the upper and lower images.

I will first describe the upper images;—They appear on the surface of the liquid itself, when the film would otherwise have been formed. They are seen immediately after the passage of the pen through the liquid, whereas the lower ones only become apparent a few moments after. Being formed on a moveable surface, they are not perfect representations of the traces that

have been made, and are changed and distorted by any movement of the liquid. When the solution of the salt is weak, they frequently disappear in a few moments after their formation and are redissolved in the liquid; when the liquid is more concentrated, they likewise disappear, owing to the formation of the film on the surface. The production of these images appears to be independent of the chemical nature of the body used for tracing. They may be obtained independently of the lower ones, by drawing a thread gently over the surface of the liquid, without its coming in contact with the surface of the glass.

The lower images are formed on the surface of the glass, under the upper ones. A few seconds after the tracing has been made upon the glass, they begin to appear, and gradually become more distinct. The space of time which elapses before their appearance depends upon the strength of the solution. When it is strong they appear quickly, and when weak they take several minutes before they are visible.

To cause the formation of any images, the tracing must always be made after the mixture of the two solutions; under no other circumstances have I been able to create them. Thus, when the tracing is made on a perfectly dry glass, or on one slightly wet, and then immediately covered with the solution, no image will be created. This is likewise the case when we make traces in either the magnesian or the phosphate solution before their mixture together.

The passage of any solid substance in the proper solution on glass will cause the formation of a deposit. Wood, glass, slate, and other similar substances, all have equal power in this respect, but metallic substances are less active. Other polished surfaces may be used instead of the glass plate, and I have formed these images on quartz and agate with the same effect.

The difference of crystalline texture exerts no influence, but the images seem to be

with more difficulty produced on polished silver and copper than on a vitreous surface.

A very slight degree of friction will excite the formation of an image, although a moderate degree of pressure is more favorable.

Electricity exerts no influence in the formation of these images. In one experiment in order to diminish the friction, I adapted two fine wires of a spiral form to a battery sufficiently strong to decompose water freely. These wires were moved through the solution in various directions, and the marks of the passage of the two poles became equally apparent without any difference on either side; and when afterwards disconnected from the battery and used in a similar manner, they produced the same effect.

It is remarkable with what fidelity the traces of lines become visible in this manner. Letters thus formed by a pen, are much more faithfully rendered than when written on paper with ink, and lines may be formed which are scarcely visible to the naked eye. Microscopic inspection shows this extreme exactness to a much greater degree than could have been anticipated for we see a simple line become as it were decomposed into a number of parallel lines which represent the point of contact between the two solids. These lines are composed of very minute and confused crystals, of an irregular appearance and joined together. Their diameter varies from one of a millimetre to about double that size. Between these parallel lines are frequently seen others still more minute. The other crystals which become deposited by the common crystalline powers over the untouched parts of the glass, are much larger than either of these. When the point of intersection of two lines is examined under the microscope, we perceive the appearance represented. While crystalline masses are in process of formation, it is impossible to prevent the deposition of crystals on other parts of the glass; but if while these are fresh they are subjected to a sharp current

of water, the irregular crystals are mostly carried away while the images are left almost intact. It is therefore evident that the same power which causes this deposit, renders them more adherent to the surface of the glass than the other crystals. Another method of demonstrating the difference of their adherence, is by allowing the solution to dry on the glass, when by brushing it slightly with the feather of a pen, most of the irregular crystals are taken off and the images remain.

Other substances capable of forming a like deposit.—Chloride of platinum and nitrate of potash, mixed together, form a double chloride, with which images can be obtained with as much ease as with the double phosphate. The only difference is, that the double chloride precipitates in the shape of octahedrons, &c. Solutions of tartaric acid and nitrate of potash deposit crystals of bitartrate of potash, which are capable of forming upper and lower images with nearly as much facility as the double phosphate. The lower images formed by the bitartrate differ in one respect from those by the phosphate, for shortly after their formation they appear to lose their adhesion to the glass, and the slightest agitation of the liquid causes them to be detached; and if a sentence has been written, the curious appearance is presented of fragments of words and letters floating about in confusion. Under the microscope also they differ, fewer parallel lines are perceived, and the crystals are larger and unequal in size. Liquor potassie added to a solution of tartaric acid will form images exactly similar to those just mentioned. Caustic soda and tartaric acid produce the same result, but the solution must be much more concentrated.

Images formed by gaseous bodies.—These traces are formed in the same manner as those which are crystalline, by passing a solid body over a piece of glass covered with a liquid containing a gas in solution, when they are immediately perceived

by the bubbles which are deposited. On account of the specific gravity of the gas, these images are not very durable, for after a short time the gas which composes them arises to the surface. As a general rule, the ingredients, whose combination causes the formation of the gas, should be added together gently, and so diluted that whatever gas is formed they remain dissolved in the liquid. I have been surprised to find how much gas may be in this way made to remain in solution; and as most of them appear capable of being dissolved in this unstable manner, traces may be obtained from them all; and I have ascertained by experiment, that such is the case with carbonic, acetic and hydrochloric acids.

To obtain carbonic acid, I have generally used subcarbonate of soda and tartaric acid. Acetate of ammonia was employed to liberate acetic acid, and hydrochloric acid was obtained from common salt and sulphuric acid. A mixture capable of forming traces has the property of disengaging its gas in bubbles, whenever it is brought in contact with any dry surface; as for instance, when a mixture of this sort formed on a slip of glass is caused to spread over a part of the surface which has not previously been wetted, bubbles of gas are immediately evolved on that spot, although none are perceived elsewhere. This effect is also produced with champagne, seltzer and other effervescing waters, which however have not the property of forming gaseous traces. Any surface, whether metallic or non-metallic, will be found to effect the separation of the gas from the liquid; and I have not perceived that there was any difference from the surface being perfectly polished or rough.

The immersion of a piece of bread in champagne to renew the effervescence, is merely an example of the contact of a fresh surface with the gas; in a short time it ceases to have this effect, but if a fresh piece is used, the effervescence is renewed as before. The difference of effect between this and a piece of metal arises from the superior

extent of surface presented by the cavities of the bread. The disengagement of steam from boiling water by platinum foil or any other solid substance, is likewise of the same nature. After a very short time this effect ceases, unless renewed by a fresh surface. The most natural explanation of these phenomena, is to refer them to some molecular action of the solid on the gas, probably of a mechanical nature, which lasts a very short time, when the solid acquires a "droit de domicile" in the liquid, and becomes perfectly inert. M. Legrand, who has made some correct experiments on the point of ebullition of saline solutions, remarks, that platinum possesses no power in equalizing ebullition after a few moments, when, according to him, all the air has been expelled from its surface; but on the contrary, zinc and iron will act as long as they are present in the liquid, which he attributes to their power of decomposing water.

Previously to showing the existence of the same action in bodies in a state of vapor or fume, I will make a short digression with respect to the constitution of vapors in general.

The term vapor is commonly applied to bodies in three different conditions,—1st, that of temporary gas diffused in the atmosphere; 2nd, that of liquid particles mechanically suspended there; 3rd, that of solid particles suspended in like manner. To the two latter, to speak more correctly, may be applied the term of fumes. The first correspond to solution in a liquid, and the other two to that of suspension in the same. As examples of the first, we have the vapor of water while in an invisible state, and those of bromine, &c. Of the second, water as in mists, fogs, &c.; and of the third, the vapors of arsenic and of corrosive sublimate. Bodies in either of these conditions possess the faculty of assuming a definite crystalline form on becoming solid. The properties of the gaseous vapors are so well known, that it is unnecessary to dwell upon them here.

The second class, or the liquid globular

vapors or fumes, which, as we have said, causes those accumulations known under the name of fogs, clouds, or mists, are those which I intend at present to examine, as they comprehend the theory of fixation of the mercurial vapors in the Daguerreotype. It was formerly believed that vapor or mist was composed of minute spherules or globules of liquid water, and in Newton's works we find evidence that such was his opinion. According to another view, first advanced I believe by De Saussure, these vapors were composed of vesicles or very minute bubbles, exactly resembling, on a small scale, the common soap-bubble. This opinion has received the ascent of Fresnel and Berzelius, and at present obtains general credence. The proofs on which it is considered to be founded, are principally the observations of De Saussure, who asserts that on high mountains, or in the clouds, he has been able to detect these air-vesicles with the naked eye, and has seen them burst as they came in contact with each other. Berzelius recommends the examination of the vapor of water over a dark surface, such as that of ink, with a lens of a short focus. He says, that vesicles may be detected in this manner, varying in size from $\frac{1}{500}$ to $\frac{1}{2730}$ th of an inch, which occasionally burst as they touch each other. The suspensiveness of clouds is also used as an argument in favor of the vesicular theory, as it is contended that liquid spherules would descend to the ground by their specific gravity in such situations. Fresnel indeed compares the globules to small balloons, which dilate or contract, according to the temperature of the air they contain.

A few days' stay at the convent of St. Bernard gave me an opportunity of repeating the observations on the clouds, as mentioned by De Saussure, which may be also made in this season on our London fogs. Globules of various sizes in these circumstances are frequently discerned by the naked eye floating in all directions. I have endeavored to ascertain their vesicular structure,

ture, but have been unable to do so from direct observations. It is frequently a most difficult point, in microscopic investigation, to decide upon the existence of a thin transparent membrane. It is still more so to pronounce upon the vesicular or spherular structure of globules in constant agitation; and I believe that if minute spherules and vesicles could be mixed together, we do not possess any means at present of distinguishing them.

I have never been able to detect that appearance of bursting of the globules mentioned by De Saussure, but sometimes, when the agitation of the air is slight, two of the larger globules may be seen floating towards each other, and afterwards disappear suddenly, which may be explained, if we admit that it is caused by the union of the two spherules into one, which is too heavy to remain any longer in suspension, and whose rapid deposition conceals it from the sight.

There may be urged as objections to the vesicular theory, that if the pellicle become extremely thin, the vesicle would no longer be perceived any more than the apex of an air-bubble before bursting, or the central black spot of a system of Newton's colored rings. It will be seen below that the globules of vapor possesses the power of depositing themselves in a crystalline form, which requires a tranquil deposition of particles, such as could scarcely be deemed possible, if the air contained in each had to escape at the moment of its crystallization.

I have endeavored to fix the globules of water on glass and other substances, so as to be enabled to submit them to microscopic inspection, but from their volatile nature and other causes have not succeeded. However, it is easy to do so with almost any other volatile substance; and I have examined several in this way without detecting the slightest appearance of a vesicular structure. Mercury is deposited under the form of globular particles, with a metallic lustre whose diameter is $\frac{1}{500}$ th of a millimetre, in which

I have never detected any internal cavity by the most careful examination.* Flour of sulphur is found to consist of solid globules, several of which adhere together; when acted upon by a gentle solvent, their external portion is dissolved, and there remains a regular octahedron. An interesting experiment may be made on the fumes of sal-ammoniac, which appear whenever muriatic acid and ammonia are brought together. Two small phials, each containing one of these substances, are covered by an inverted tumbler: above the surface of the acid are seen at a short distance the fumes of the salt, which at the end of a few hours are found to have condensed into a thin snowy pellicle,

* In order that others who may wish to verify these results may operate in the same condition as myself, it is proper to state that the mercurial vapors were disengaged in a box, such as used in the Daguerreotype process; and after the mercury had been raised to a temperature of about 90° centigrade, it was allowed to cool. Three experiments were made in this manner: in the two first the glass plate was placed four inches above the mercury, in the other it was eight inches distant. The appearance of the globules was the same in each case; if any difference existed in their size, those of the last experiment were rather larger. In another experiment, where a common Daguerreotype plate was substituted for one of glass, the appearance of the globules was in all respects the same. From the manner in which they are deposited, they appear to exert an influence over each other, as they are frequently found in groups of three or four, or more. Mr. Ross, has stated on the part of Mr. Sally (Microscopical Society, December 1843), that these globules are deposited in hexagonal groups; but with preconceived ideas no doubt it would be very easy to form such shapes, as it would be to form triangles or any other simple geometrical figure, particularly when the allusions inseparable from catoptric microscopy are added to those of physiology. This tendency of the mind, of which a good account has been given by Muller in his elements of Physiology, is so strong, that where groups of globules are concerned, I would always advise their being mapped down under the microscopic camera lucida, and put by for some time for future inspection. I shall have occasion to advert to this subject more fully hereafter.

completely obturating the mouth of the bottle. This partition is so delicate, that the slightest agitation will cause it to fall into the liquid.

In all these cases it is found that the fumes possess the power of remaining suspended a much greater length of time than would be expected from the difference of their specific gravity with that of air, which is also the case with the fumes of other substances, and smoke in particular. This can only be accounted for by the continual state of agitation of the air, even within an enclosed space, and by the elasticity of the solid and liquid particles. In the case of solid particles this can be readily admitted, but with regard to liquid globules, there is probably some action similar to that which takes place on the impinging of solid elastic balls, which after becoming flattened rebound in virtue of their tendency to recover their original shape.

The causes which act in fixing different vapors and fumes are the same as those which determine the precipitation of solid particles in solution, such as for instance, sharp points of any kind, minute filaments, and more especially the existence of a crystalline particle to act as a nucleus. Non-conducting substances, as woollen cloth, the nap of a hat, the web of the spider, &c., are covered with aqueous globules when no rain has fallen, and when polished surfaces near present no such deposition.

Having now shown the existence of a crystalline power in vapors, we shall proceed to prove the influence of a force which disturbs this equilibrium in the same manner as in the saline solutions above mentioned. The friction of a solid body on glass will leave traces which are invisible until breathed upon.

Many bodies possess this property, but the mineral steatite or soap-stone, produces the effect better than any other I know. A considerable degree of friction may be used over the traces thus produced by steatite, without

affecting the appearance of the traces when breathed upon repeatedly. The glass may even be heated considerably without affecting them. By examining with the microscope the parts that have been traced upon the steatite, we are unable any more than with the naked eye, to detect any material cause for the deposition of vapors in these places as it probably depends upon the transparency of the mineral, which being so attenuated is unable to affect the rays of light. When the traces have been brought out by breathing upon them, they must be covered with another piece of glass, which impedes the evaporation of the water and allows them to be submitted to the microscope. The parts untouched by the steatite present the appearances that have been already mentioned. On the lines created by the mineral, the drops of water are differently disposed, their long diameters being parallel to the direction of the lines. These minute drops very much resemble the globules of gas deposited from a liquid, the only difference between the two consisting in the deposition from the globular form in the liquid traces, which evidently arises from the power which the water possesses of wetting glass.

It is evident, therefore, that the secondary cause of these images is a difference in the position of the minute drops of water, reflecting the light differently from the other drops, which are irregularly disposed to the other parts of the glass.

There exists another method of fixing vapors, which has been long known, and to which I believe attention was first directed by Prof. Draper. It consists in merely placing a body on a plain surface, such as that of a metallic speculum, or even of glass; after a short time it is found that simple contact, such as this, has caused some molecular action, as the spot occupied by the object will become apparent by breathing on it in the same way as with the images of steatite. This observation is the more interesting, as it serves as a connecting link

between the effects of mechanical power and those caused by other agents.

The experiments of Mr. Hunt have shown the influence of heat in causing the fixation of vapors.

An image of this sort formed on glass by the breath, when examined under the microscope, presents exactly the same appearance as those formed by steatite. The same difficulty is experienced in bringing out, by mercurial vapors, the thermographic images on glass, as is found with the traces of steatite, which possess but in a very slight degree the power of fixing mercurial vapors. It appears therefore that the power which water has of wetting glass, causes it to have a greater tendency to deposit than mercury, which does not wet glass. The cause of the production of thermographic images is evidently similar to that which causes the deposition of a solid body from a solution.

The fixation of the mercurial vapors in the Daguerreotype process, which has excited so much interest, and for which so many theories have been advanced, is but another example of the force which causes the deposition of solid and gaseous particles from a liquid, and which produces so many other effects. In this case the chemical rays of light act in the same manner as mechanical action and caloric in causing a certain molecular disturbance. By the discoveries of Meser, it is shown that these rays possess the power of acting upon almost any body, in such a manner as to render it capable of fixing the particles of various vapors. Thus simple minerals, glass, &c. may be made to fix the mercurial vapor.

It appears, however, that silver, gold, copper, &c., which form amalgams, or in other words, are capable of being wetted by mercury, possess this property in a greater degree than any other bodies which are incapable of being wetted by it; in the same way as we have seen that glass has the greatest power to fix the vapor of water. Admitting the truth of this theory of the

Daguerreotype process, we are naturally led to inquire whether the same agent may not likewise cause the fixation of particles in a state of solution or of vapor, in the same manner as by simple mechanical action. After several unsatisfactory attempts I finally succeeded in clearly proving this fact. The solution which shows the influence of light the most evidently, is that of the neutral chloride of gold. A few grains of this salt dissolved in an ounce of water, when exposed to the light, deposits minute crystals of a metallic appearance on that side of the glass nearest the light.

The action of light in causing the deposition of gaseous vapors may be shown by placing some iodine in a bottle closed with a glass stopper. After being exposed to the sunshine for several hours, minute black crystals will appear on the side nearest the light, which will change their position according to the side of the glass exposed. Another substance which shows this action still better, is camphor, a piece of which, merely covered with a glass shade, will give rise to a crystalline deposit, after an hour or two of exposure to light, and which presents the same phenomena as that of iodine. By a prolonged exposure these crystals become very abundant, and are very beautiful*. I have applied this property to the construction of an instrument for measuring the chemical rays of light. As the details respecting this would be foreign to our present subject, I will defer them to another occasion, and confine myself now to prove that these phenomena are independent of the deposits caused by radiation.

1st. The crystals are formed on the side exposed to the action of direct or diffused light.

CONTINUED ON PAGE 213.

* I am informed by a friend, that this action of camphor was mentioned twenty years since by Dr. Hope in his lectures, but I am not aware of anything having been published upon the subject

FERROCYANIDES OF POTASSIUM.

On the Decomposition of the Yellow and Red Ferrocyanides of Potassium, by Solar Light.—A solution of the yellow prussiate of potash, kept in the dark, does not change its color; but when exposed to the action of solar light it becomes of a deeper yellow. So to render that change very perceptible, a week, *i. e.*, nearly colorless solution must be used, in which case the liquid will assume a yellow color, after having been acted upon by a strong sunlight only for a few minutes. If the bottle containing the solutions be closed and not quite filled with the liquid, an odor of prussic acid is perceptible; and at the same time a reddish yellow sediment subsides, which seems to be the peroxide of iron.

The decomposition of the cyanide takes place much more rapidly when strips of filtering paper or linen are immersed in a solution of the salt, and exposed to the action of solar light. In a very short time that part of the strip turned towards the sun, becomes yellow, whilst the opposite side remains colorless or nearly so. If strips of paper moistened with the solution of the common prussiate of potash, are closed up in a glass bottle containing air, they also turn yellow by exposure to the sun, and a strong smell of prussic acid is perceptible in the vessels after a short time. In the shade no such action takes place.

A large piece of linen cloth drenched with a solution of the yellow salt, after having been exposed in the open air to the action of solar light for thirty-six hours, had turned deeply yellow, and yielded, when treated with distilled water, a deep yellow solution, which on being filtered and heated to boiling became turbid, and deposited flakes of peroxide of iron. The same solution exhibited a stronger alkaline reaction than the solution of the common prussiate does. From the facts stated, it appears that the yellow ferro-cyanide is decomposed by light into prussic acid, oxide of iron, and

potash, and a compound formed, yielding with water a yellow solution. Is that compound carbonate of potash and peroxide of iron; and do the constituent gases of the atmosphere take part in the decomposition besides the solar light? Further experiments must answer those questions. A limpid solution of the red cyanide also becomes turbid when exposed to the action of solar light, prussic acid being evolved and peroxide of iron thrown down.

APPELLES.

APELLES, one of the most celebrated painters of antiquity, was born in the Isle of Cox, and flourished in the time of Alexander the Great. He was in high favor with that prince, who made a law that no other person should draw his picture but Apelles; he accordingly drew him holding a thunderbolt in his hand, the piece was finished with so much skill and dexterity, that it used to be said, there were two Alexanders, one invincible, the son of Philip, the other inimitable, the production of Apelles. One of his chief excellencies was, the making his pictures so exactly resemble the persons represented, that the physiognomists were able to form a judgment as readily from his portraits, as if they had seen the originals.

TO TIN IRON.—Cleanse the surface of the iron well, by scouring with weak sulphuric acid, to remove oxide, then immerse the iron in a bath composed by digesting in $17\frac{1}{2}$ pints of soft water, $10\frac{1}{2}$ ounces of bitartrate of potash or soda (tartaric acid, or acidulated tartaric of potash, or soda cream of tartar,) and then adding an aqueous solution of three quarters of an ounce of protochloride, or other soluble salt of tin.

BROMINE.—American Bromine is fully equal, and we believe it superior to the German, in forming Quicks.

NOTICE.

In order that our subscribers may have complete sets of the Daguerreian Journal and to prevent difficulty in supplying deficiencies hereafter, we have made it a rule, which we will adhere to during the next three months, to forward along with the current number all the numbers of the Journal previously published.

 The Daguerreian Journal.

NEW YORK, FEBRUARY 15, 1851.

 NEW AND VALUABLE
DISCOVERY.

HILLOTYPES.

We are now called upon to notice the greatest and most valuable discovery that has been presented to the public since the announcement of the Daguerreotype by Daguerre, and the Telegraph by Morse. With these names we now add another of one whose great perseverance and energy has ranked him with the first discoverers in the world. This gentleman, like Daguerre, has given much time and manifested much skill in conducting his experiments, and is entitled to great credit.

L. L. HILL, of Westkill, this State, has discovered a process of producing impressions upon metallic plates with all the "Colors of Nature;" and as the process is "essentially different from Daguerre's," and wholly unlike all others we will (as it has been left with us to "Christen") name it "HILLOTYPES."

We are led to believe that the Hillotypes will supercede the Daguerreotypes, as the former will be altogether preferable. The discoverer has produced copies of colored engravings "true to the tint." Each particular shade is presented with all the softness in nature or art, and marked with a delicacy and brilliancy which no pen can

describe and no imagination picture. They are unlike a Daguerreotype as they can be seen in any light, and possess beauty that no artist can paint, while at the same time they present Nature as she is.

We feel convinced of the durability of the Hillotypes, from the fact that two impressions have been for four months past, exposed to the direct rays from the sun on an average of about six hours per day, these pictures have undergone no perceptible change; and from this we conclude that they are equally durable with the Daguerreotype. In the practice of Mr. Hill's discovery there will be required similar care and skill to that required in that of Daguerre's. Mr. Hill in one of his communications to us says: "My process involves the use of at least one substance *entirely new*—which though it is my own discovery, I cannot name; and is unlike any thing ever named by chemists." We are led to believe that the world will be *as much* astonished at the means employed as at the beauty of the results. This gentleman is desirous of perfecting his process so far that in a few hours a skillful Daguerreotypist may gain a full knowledge and be enabled to operate successfully; and he has strong hopes that in a few weeks he will be enabled to work with certainty, and produce "*instantaneous* impressions." This last will be a great advantage, as, then we will be enabled to produce a faithful counterpart of children, which will, in this particular, prove an invaluable discovery. We predict that the Hillotypes will not be confined to the taking of likenesses, but extend to the production of *views* from nature in a form more extensive than has heretofore been dreamed of. Think but for a moment of a view 5 feet square what must be the value of such a picture, in which all the "colors of nature," are faithfully represented, and it is out of the reach of art to copy. We conclude for the present, and look forward with interest to that hour, when Mr. Hill shall have made

the proper arrangements, and secured to himself the right and reward to which he is so justly entitled. *Let this be distinctly understood, that this process will not be monopolized*; but be placed within the reach of all worthy Daguerreotypists and Artists.

At a recent interview with Mr. Hill, he expressed a wish that he might be freed from the many and increasing communications *requiring answers*, that are now received by him, on the receipt of every mail. It is to be hoped that our Daguerreotypists and others, although they may feel greatly rejoiced at the discovery, will bear in mind that just at the present moment, it is for the interest of all that Mr. H. has the command of all his time, in perfecting his valuable discovery.

We should say that some little difficulty has been experienced in producing one color, (the yellow), but now it has in a measure been obviated, and not a particle of doubt remains; but that all colors *have been and can be again produced* by the HILLOTYPED process. The following communication will be received with interest.

For the Daguerreian Journal.

THE NATURAL COLORS.

Mr. Editor:—In answer to your request that I should furnish a communication for your valuable journal, I would express a few thoughts under the above caption. It has been pretty widely circulated, that I had discovered a process for Photographing in colors. The facts are these:—Some two years ago, I took to experimenting, with a view to this great desideratum, but with little faith. In one of my experiments, a phenomenon presenting itself which greatly surprised me, and, in the nature of the case, compelled me to believe the thing practicable. One color, the *red*, in a figured dress, was developed as bright as a ruby. I then repeated the experiment, and

failed; but, from that hour until a few months ago, I continued to repeat it in every form I could think of—always failing, but never despairing—for I had reasons for believing in the correctness of my theory, that, *under certain circumstances*, there is on the impressed plate a *latent-colored image*. I at length commenced experimenting on the *developing power* of the vapors of different metals, and found that a large number of them, such as arsenic, padmium, zinc, selenium, bismuth, potassium and sodium, would, when properly vaporized, bring out the latent image in light and shade. The same result followed the use of several gases. The impressions differed so little from Daguerreotypes, that I was on the point of abandoning the pursuit, when I one day unexpectedly, formed a singular compound, and, without much hope of success, applied it to my purpose.

My surprise and joy were unbounded when I found on my plate a true Hillotype. The same process, with some variations, have followed since, always with good results. I now have forty-five specimens, all of which present the several colors, true to a tint, and with a degree of brilliancy never seen in the richest Daguerreotype, and this is true also of the whites and blacks. The pictures have much the appearance of *enamelling*, and I believe are equally durable for it is very difficult to efface them by scouring; and as far as I can judge, they are not acted upon by light. My process bears a resemblance to Becquerels, and is essentially different from Daguerre's.

My success in *quickenning the plates* has

* We substituted the word Hillotype in place of the one inserted by Mr. Hill.—ED. D. J.

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been equally gratifying, and I have but little doubt of being able to operate in diffusing light *instantaneously*, having already reduced the time of sitting to much less than that required for Daguerreotyping. I shall continue experimenting until I have perfected the discovery as far as I can, when I shall secure my right, if possible, by a *special patent*, and offer the process for sale on reasonable terms, to all worthy Daguerreotypists. Several eminent artists from Philadelphia and other cities, who have visited or corresponded with me, advise me to this course. I have been offered \$20,000 for an interest of one-half; but whatever disposition I may make of it, it *shall not be monopolized*. I am told by those well qualified to judge, that my discovery will completely supersede Daguerreotyping; but it may be well to state that very few of the appliances, or manipulations of the Daguerreian room, will have to be dispensed with.

With best wishes for your success,

I remain fraternally yours,

L. L. HILL.

WESTKILL, GREEN CO., N. Y.,

Jan. 17th, 1851.

Those Subscribers, whose names are on our list for four months, will please take notice, that they will receive one number—*viz.*, No. 8, which will be the last, until their Subscription shall have been renewed.

REMOVAL.—The office of the Daguerreian Journal has been removed to No. 262 Broadway, over the bookstore of C. S. Francis & Co.—where we are now arranging a light in connection with our laboratory. We invite all Daguerreotypists to call on us as we shall be free and happy to receive a visit from those who may feel an interest in the promotion of the Photographic arts.

TO THE PRESS.

WE know of no better way to return our thanks to those who have so kindly noticed us, than to say at once, *we thank you all!* We find our experiment has proved successful beyond our most sanguine expectations; and for this success, we attribute much to those of our friends who have evinced an interest in our enterprise, by placing us before the public through their journals. Our exchange list is already large, and we are continually receiving papers with "please exchange," this we have done and shall continue. We have found that a number of our exchanges are required to pay postage on our journal, this we regret exceedingly, and have taken the necessary steps to prevent, but *Law is slow*. We receive our exchanges *free*. Editors noticing this number, and sending a copy of their paper containing said notice, will continue to receive this journal in exchange.

Our Daguerreotypes.

CLARK AND BROTHERS of this city are about to publish a picture 26 by 30 inches lithographed in the best style, and containing correct likenesses of nearly fifty grand officers and distinguished invited guests in their appropriate regalia, as they appeared at the recent great *Masonic Union Celebration* at Tripler Hall, on Friday, December 27th, 1850. This picture will exhibit the interior of Tripler Hall as it appeared at the time.

March 6th.

The present number of the Daguerreian Journal has been delayed in order to publish a contemplated arrangement for the disposition of the Hiltotype process. We hope to have it in our next, or at any rate it will be published in this journal as soon as the proper time arrives, and all "worthy Daguerreotypists will have a chance; there will be no monopoly."

Messrs. Roots, have shown us several Daguerreotypes taken by a microscopic arrangement, in connection with the lenses. This is a new and highly interesting feature in Daguerreotyping and of invaluable importance to the Naturalist. One of these impressions is of a *Flea*, and is a faithful and well developed image. One of a *Fly's* foot and one of a *Fly's* wing; these impressions are well defined, greatly magnified, and are certainly curiosities in the Daguerreian Art.

C. C. HARRISON has sent a number of *Cameras* to London, for exhibition at the World's Fair; we noticed a Mammoth Camera tube with a specimen picture taken by it and also several of the various sizes. These will no doubt be in competition with the far-famed "*Voigtlander and Shon's*" of Vienna—German Cameras.

MEADE AND BROTHER have exhibited for a few days twenty-four Daguerreotypes which are intended for exhibition at the great Fair in London. We noticed twelve wholes, and twelve halves, and they are certainly a superior collection of specimens, and will add much to the collection from America.

We have seen some fine specimens intended for exhibition at the World's Fair in London. These Daguerreotypes were executed at Mr. LAWRENCE'S establishment in this city. Mr. L. has three double whole plates, one representing the Present, Past and Future, which is a gem. He has also six whole plates and sixteen halves all neatly arranged in three matched frames and do credit to the art.

C. C. HARRISON has invented and patented a new wheel for polishing plates. We will represent it in our next by a cut.

W. & W. H. LEWIS have a new iron head rest, which will be illustrated in our next. Also a polishing wheel.

We have received from SCOVILL Manufacturing Co., a number of new plates which for finish and softness of silver, are superior to any we have seen; they are made by an entire new process and require but little labor to render them equally sensitive with the best French plates. We are pleased to find that our manufacturers and dealers are endeavoring to introduce American apparatus and stock, which will fully equal if not surpass all foreign.—The day is not far distant when Photographic stock will become articles of exports rather than imports.

ELECTRICITY.

ELECTRICITY — NEW APPLICATIONS.—A late number of the London Philosophical Magazine describes a new electrical machine, in which gutta percha, owing to its highly electrical properties, affords the means of producing in a very ample manner, an amount of electricity as great as that of the common electrical machine. The machine, an improved, consists of a wooden frame some eighteen inches high which carries two wooden rollers of equal diameter; to the axle of one of which a handle is attached by which it can be rotated. Around the rollers, and fitting them tightly is passed a band of gutta percha about four inches in width—the rubbers are four brushes of bristles, and are placed on one side the band and opposite the axis of each roller. A double conductor connected by a brass rod and passing over the top of the machine is applied, similar in form to the conductor of the plate-glass machine. When the handle of the machine is turned causing the gutta percha band to move at a moderate velocity, an abundant supply of electricity is excited. The electricity given off appears to be of higher intensity, and under favorable states of the weather, nearly as much in quantity as that of an ordinary plate glass machine.

CONTINUED FROM PAGE 207.

2nd. They are not formed during the night, when the radiation from the earth is sufficient to cause the deposition of water.

3rd. Green glass, which retards photographic action, likewise impedes this deposit.

In an experiment which is now going on, a bottle of pale green common glass, is exposed to the north, while another of white glass is placed in a southern aspect. The first became covered with minute crystals, the size averaging about a millimetre, which have remained stationary for a week; the second is covered with arborescent ramifications, which are daily increasing.

Several familiar, but hitherto unexplained phenomena, may in my opinion be easily accounted for by these molecular actions.

The formation of hail I consider to be an instance of an action precisely similar to that which causes the deposition of the solids of gaseous and liquid particles. If we admit the influence of this force on the globular vapors of water, it is not at all improbable that certain conditions may arise in nature when these vapors may be much more liable to this influence than we find them in our imperfect experiments. We have seen that a solution of sulphate of soda or water in a pure state may be brought by the abstraction of caloric to such a condition of unstable equilibrium, that the slightest perturbing cause will immediately reduce them to a solid form.

If we admit that the globules which form the clouds are capable of being placed in a similar condition, we have sufficient data to explain all the phenomena that occur in the production of hail. Any nucleus formed within a cloud in this state, would create around it a deposition of all the neighboring particles; and the size of the hail-stones would be dependent upon the thickness of the cloud it had to traverse. In the storm at Ordenburgh, in 1825, mentioned by Dr. Eversman, pyrites was found in the centre, and had acted like a nucleus around which the crystallization had taken

place. Where the centre is not formed by a foreign body of this sort, it has frequently been mentioned that it consisted of an opaque nucleus of a spongy nature, like congealed snow, which may be easily accounted for. The succession of concentric layers would be caused by the passage of the particles through strata of liquid globules not all at the same temperature; and the radiated structure indicates a gradual increase of crystalline action proceeding from the centre. The temperature of the hail-stones, which has generally been found below the freezing-point, is a further corroboration of this view.

The formation of butter is likewise in all probability another instance of molecular action of the same nature. It is well known that after the cream has been agitated for a certain length of time, the globules suddenly coalesce, and by their union butter is produced. The sudden appearance of this product is the more remarkable, as it takes place at different temperatures, although more quickly at some than others, and not gradually, as might have been expected, which precludes the idea of its being owing to any caloric developed by friction. The most minute observations have been unable to show any material alteration in the appearance of the fatty globules at the moment before the butter is formed. Little doubt can be entertained of its being caused by some molecular action, or engendered in the globules by the continued agitation they have undergone.

Some of the most permanent gases likewise exhibit phenomena closely allied to the above, by their action on platinum and other metals. According to Dulong and Thenard, platinum foil newly beaten has the property of acting at the common temperature, on a mixture of hydrogen and oxygen; but after a few minutes' exposure to the air, it entirely loses that power, which may however be restored to it in a stronger degree than before by heating it in a covered crucible. If it be kept in a

covered vessel, so as to exclude the air, it will retain the power without decrease for four-and-twenty hours.

Platinum filings, made with an ordinary sized file, have the same property immediately after their formation, and which they retain for above an hour. It has also been observed, that a hollow ball of platinum has the power of condensing and absorbing different gases, which are generally disengaged at a temperature below the boiling-point (Pouillet, *Elémens de Physique*, § 131). The action of the gases on platinum in all the above cases greatly resembles that of carbonic acid on glass, except that not merely simple lines, but the whole surface of the metal exerts its influence, and that the gases themselves are invisible.—*Phil. Mag.* S. 3 Vol. 28. No. 185. Feb. 1846.

AGRICULTURAL GEOLOGY.

Bones are phosphate of lime; so is a beautiful crystal called appetite. This crystal is found in granite rocks, is of a green color, hexedral shape, and resembles the beryl and emerald. The phosphate of lime constitutes a part of marble beds, and greatly increases the fertilizing power of that powerful fertilizer. It is also one ingredient of milk. In these various relations it exists in no small abundance, and performs no unimportant agency, either in animate or inanimate creation. It surely ought to be known at least by every farmer, and of course taught to every farmer's son, and daughter too.

Derbyshire spar is the fluat of lime. It receives a beautiful polish and is much used for urns and other mantel ornaments. It also appears in beautiful crystals, both in regular tubes and octahedrons, eight-sided crystals, precisely the same of alum crystals, easily formed by dissolving alum in hot water, leaving the mass, while cooling to arrange its particles around wire put in the form of a card basket, or any other fancy article preferred. Nitrate of lime is another calcereous formation, less abundant

and less useful than either of the ates before mentioned.

Each of the lime formations now given is composed of three elements, or ultimate principles. Two of these elements are the same in all—oxygen and calcium, or the oxyde of calcium. The other elements entering severally into the compounds are carbon, sulphur, phosphorus, flourine and nitrogen; which after being acidified by the agency of oxygen, combining in each case with the same oxide, form the carbonate, sulphate, phosphate, fluat, and nitrate of lime.

All these lime formations, except the nitrate, frequently appear in beautiful crystals. Some of the carbonate crystals are rhombic spar, pearl spar, dogtooth spar, tubular spar, satin spar, arragonite, and others, amounting in the whole to two or three hundred distinct crystalline forms of the carbonate of lime. Some of the crystals of the sulphate of lime are selenite (moon stone,) fibrous gypsum, &c. The principal, perhaps the only crystal of the phosphate of lime is appetite, already named in the form of a six-sided prism, not often more than an inch or two in diameter. The phosphate of iron sometimes presents interesting crystalline forms.

Some of the most beautiful and interesting exhibitions of the wonderful science of crystallography are in the fluat of lime. The two principal crystals are also already named—the cube and octahedron—viz. six and eight-sided figures. By cleavage these crystals can be changed from one to the other—the cube into the octahedron, or the octahedron into the cube. Both the crystals, and the process of transformation were beautifully exhibited by specimens formed of pasteboard with great skill and taste, as the richest possible amusement of some girls in a school in Washington for the Scholars' Fair in New York. They were much admired and loudly commented upon by the crowd of visitors.—*Banner of the Union.*

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ELECTRICITY.

ELECTRICITY.—This is found to be a property of all bodies, manifested as a force much in the same manner as gravity or any other property possessed by matter. It is believed to be of the same nature as heat, light, magnetism, gravity, chemical and vital action. Each of these properties of matter if distinct may be called natural forces, inherent in everything animate and inanimate, and may, by using proper appliances, be elicited in either form. For example, electricity may be elicited by friction, or chemical action, the two most usual modes, when desired to employ its force in any peculiar operation; but heat will also elicit it, and so will magnetism. In short, this natural force may be called into action in any way we please, and can be made to exhibit itself in form. These forces were long considered distinct, and are still so considered by many, although each can be converted into the other at pleasure without addition and without subtraction, consequently must be one and the same. They have been called fluids, of extreme tenuity, it is true, but it is more than doubtful if they have any corporeal existence whatever, apart from other matter. Certain phenomena presented by matter in general, are classed as electrical, others as magnetic, others as heat, &c., &c.; it is only by this division into classes, that a knowledge of either manifestation can be satisfactorily explained or understood. When one body is rubbed by another, one or other of them is more heated than the other, one has acquired more electricity than the other, and so of the other modifications of this force.

There cannot be two electricities any more than two lights, positive and negative indicate either an excess or deficiency of the electric force, although no one uses the terms positive or negative light. The reason of this is that we have a word which represents negative light, which is darkness; and so with gravity, weight signifies the possession of that quality, while levity sig-

nifies the reverse; but positive and negative are used as applied to electric phenomena by those who are aware of the absurdity, because we have no term which expresses the total or partial want of electrical excitement. Electricity when elicited by mechanical means is termed mechanical or frictional electricity; that by chemical means is termed galvanism, or voltaic electricity; by heat, thermo-electricity; or by magnetism, magneto-electricity; while that emanating from animals is termed animal electricity, and is exemplified in the ray, the torpedo, and gnotus, perhaps, in a greater degree than in any other animals.

There are other terms applied to different states of the electric force, which it would be well to understand: *quantity* and *intensity*. These terms are extremely difficult to explain, but perhaps some idea of their meaning may be given by comparing the force itself to a stream of water. The term *quantity* may be easily understood if we suppose that a pint of water can only dissolve a given weight of salt, no matter how slow it moves, or how fast; by increasing the quantity of water a greater weight of salt is dissolved in the same time, which quantity is not increased by any increase of velocity the water may have, though the velocity may be so much increased as to wash much more away than it dissolves. Now the term *quantity* is applied to the electricity to indicate its working power as in the case of dissolving the salt, while the term *intensity* is applied to the increased force it gets which enables it to wash away the salt without dissolving it. A small quantity of water can dissolve only a small weight of salt, but its force may be so increased by the declivity of its channel, that it can wash a large quantity away, while it has no power to dissolve more of it than while its motion was slow: so a given quantity of electricity will decompose a given weight of salt by an electrolysis, while no increase in its intensity will cause

any further decomposition while the quantity remains the same.

Electricity produced by mechanical means possesses such great intensity that it bursts all bounds and is exceedingly difficult to insulate; while that produced by chemical means is great in quantity and of such exceeding low tension as to be easily insulated. The *intensity* of force can be increased to any desired extent by adding the requisite No. of battery cells in series, i. e. connecting the elements of the one kind in each additional cell with the contrary element in the next cell. The quantity can be increased by increasing the number of cells, and so connecting them together as that all the elements of the same kind in each cell are connected together, and all the elements of the other kind connected together. They then act as a single cell, and this is called the quantity arrangement; while the former with the alternate connexion is called the intensity arrangement.

ELECTRO-MAGNETISM.—Is magnetism produced by electric induction, which it produces without any diminution of its own original force.

THERMO-ELECTRICITY is produced through a closed circuit of two metals, when heat is applied at their junction without the intervention of any fluid compound whatever.

ELECTRODES.—The general term used when speaking of the anode and cathode together. These terms were first given by Farady, than whom no one had a better right to apply them, as none had so closely and thoroughly investigated their action. The electric force passes from the anode through the liquid, which it decomposes to the cathode on which the metal is deposited as the electricity passes over it on its way to the zinc of the battery cell. The term *electrode* has been substituted for the former ill-adapted word *pole*, which has been and now is entirely applied to the ends of a magnet. The positive pole is now the *anode*

and what was the negative pole is now the *cathode*.

ELECTROLYSIS.—This term has been applied by Farady to the decomposition which is caused by the passage of the electric force through a compound liquid consisting of metal and a metalloid, or an acid—as cyanide of potassium, sulphate of copper, iodide of potassium, &c., by which the compound is decomposed into its proximate, but not ultimate elements. The passage of a current can only take place through a compound fluid, for a fluid containing only one element arrests the passage as effectually as a separation of the electrodes in dry air. Chemical decomposition and decomposition must take place, or no passage can be effected. Whether the one or the other is the first cause is not well understood, but it goes on simultaneously if at all. No electrolysis can take place unless the body be a conductor, though when it begins to melt the water permits a passage, for the decomposed, and by proper means the oxygen and hydrogen of which it is composed may be collected and examined. Sulphate of copper is decomposed into sulphuric acid and metallic copper, the oxygen of the sulphate combining with the anode and dissolving, while the metal is deposited on the cathode. Cyanide of silver is decomposed in the same way, the cyanide combining with the silver anode, while the silver from the solution is deposited in the metallic state on the cathode. It is said the bi-chlorides or dichlorides cannot form electrolytes, at least they are not acted upon by any means which have been hitherto applied to them with this view.

The action on the battery cell is precisely similar to that in the electrolytic cell, the solution acting on and eroding the zinc at the anode, while the metal is deposited on the cathode if solid at the temperature of the battery like copper or liberated as gas at its surface, if volatile at the temperature like hydrogen.

ELECTROLYTE.—The fluid body in the electrolytic cell, as cyanide of silver, or sulphate of copper, which it is desired to decompose by means of the battery. See *Electrolysis*."

ELECTROTYPE.—The term at first applied in Britain to copying metals, types, &c., by dipping from a solution of sulphate of copper, since the principles on which the process depended have been investigated and extended to other metals, and to other purposes, it is now electrometallurgy.

ELECTROMETALLURGY.—The art of depositing metals in their reguline or pure state from any solution of either of their salts, and extended recently so far as to include purifying iron and copper in a state of solution, from their impurities. For the daguerreotypist it is useful for silvering his plate, copying his pictures on copper, etching them, gilding them in Beard's manner.

ELECTRO-ETCHING.—This is the reverse of electro-silvering, the plate to be etched being attached to the battery as an anode, and placed in the electrolytic cell, when it will be eroded or etched, but the process must not be long continued or else the plate will be spoiled.—*American Artizan*.

KEROSENE GAS.

KEROSENE GAS.—We hear that this new gas invented and patented by Dr. Gesner, is now being brought into use in Halifax, and that in color and brilliancy it is greatly superior to the gas made from coals, besides being less offensive, and furnished at a very small cost. The drug store of Mr. Morton and the book store of Mr. Gossip, next door to each other, are both lighted from a small gasometer and apparatus set up on the premises of Mr. Morton, the whole expense of which was only six pounds. The Dartmouth Ferry Company are putting up a gasometer on their premises at Dartmouth, to light their wharves and premises at night, and the houses in the vicinity of the ferry; the gasometer and apparatus in this case are to

cost only thirty pounds; the gas can be made by any person of ordinary intelligence at intervals as required. The gas, as its name implies, is of a greenish tinge, and very grateful to the eye. Since its introduction into Halifax, the Gas Company have reduced the price of their gas to two shillings per thousand feet; but a farther large reduction must take place or the Kerosene gas will completely supersede them. The great gas monopoly which has so long existed in London has at length been broken up, and the citizens of London now get their gas at five shillings per thousand feet, instead of sixteen shillings as formerly. We presume a similar reduction will soon take place in Halifax and elsewhere. The Kerosene gas is now made in Halifax from the Trinidad asphaltum, which, however, is not so pure as that from the Petticoediac in this province. The vein of twelve feet recently opened in Albert, is now being vigorously worked, but we have heard that orders are coming in from the United States faster than they can be supplied, and additional workings are being commenced. Dr. Gesner, through the good offices of Earl Dunderdall, has obtained a patent for his gas from the Spanish government and is now on his way to Havana to light that city with his gas under contract. Asphaltum similar to that found in Trinidad, exists in great abundance in Cuba, in the immediate vicinity of Havana. One great advantage of the Kerosene gas is, that it can be had in country houses and detached residences, without reference to gas works at all, and being made "at home," it furnishes the best of light, on terms ridiculously cheap as compared with the present price of coal gas.—*St. John N. B. Courier*.

DAGUERREOTYPING BY ARTIFICIAL LIGHT.

We understand that an establishment is about to be opened by a couple of enterpris-

ing artists, in this city, one grand and worthy object of which, is to take Daguerreotypes by artificial light; success to them, it can be done. The following we find in Hill's Treatise. Mr. H. has probably been as successful in producing these pictures as any one in this country.

"ARTIFICIAL LIGHT.—It has been made a serious question of late, whether Daguerreotypes may not be taken by means of artificial light. We have frequently, for experiment, produced impressions of engravings, etc., by the light of two candles. It requires about half an hour, and the proof has the dull appearance characteristic of pictures taken in a very dull afternoon. By covering the engraving with a light blue glass, the time was reduced to ten minutes, and the proof much sharper.

"THE DRUMMOND LIGHT, we have no doubt, may yet be rendered available; but it cannot, owing to its effect on the eyes of the sitter, be used without being mellowed by means of screens. We have succeeded in taking good strong likenesses by the following simple process. The sitter was stationed in our usual place, which was completely enclosed on every side with white muslin, save that we used our ordinary back-ground. The Drummond was suspended about three feet forward of the sitter, a little above his head, and the light was shaded by means of a globe of book-muslin, tinged blue. The time required ranged from 45 to 80 seconds. We pursued the experiment several evenings, and always with good results. Some of the impressions were not a whit behind old Sol himself. In making the Drummond light we used a small iron retort, containing 2 or 3 ounces of peroxyde of manganese. The retort was kept at a red heat, in a small charcoal furnace, and was furnished with an iron pipe which conveyed the gas (oxygen) into a gasometer, from whence it was carried by another pipe to the place specified, where a jet of it was passed into the blaze of a spirit lamp. A small globe

of lime, about one eighth of an inch in diameter, held by a strip of platina foil, was played upon by the blaze, and became intensely luminous. The spirit lamp, it will be observed, was used in place of hydrogen gas. With our three-second sensitive we took *burnt* impressions in ten minutes.

FAILURES ARE UNNECESSARY.—They are always the result of some neglect. Let operators bear in mind that Daguerreotyping is a *very delicate* business, requiring the utmost care and skill, and act accordingly, and, our word for it, their difficulties and failures will vanish.—*Hill's Treatise.*

THE REMINGTON BRIDGE DESTROYED.—The Amsterdam Intelligencer states that the bridge built the last season, and recently finished, across the Mohawk, at Tribe Hill, on the Remington plan, went down last week, being unable to sustain its weight from its immense length. We understand the loss to the company so far, in erecting this and another bridge that fell down last year, is about \$12,000.—*Albany Argus.*

We see by our Albany exchanges that the Daguerreotypists of that city are doing quite sharp. Keep cool—remember "plates" are "plates," and without gold "chloride of gold" it is impossible to produce good pictures.—Hold up—steer—no "humbugs!"

ANSWERS TO CORRESPONDENTS.

S. B., Md.—Mr. B. writes—"In burning plates I have in several instances driven off the silver from the surface, and laid bare the copper; what is the best method for restoring the silver surface?"

Mr. B. labors under a mistake; the silver is not "driven off by heat" at a temperature sufficient to make the silver disappear from the plate. Copper, is not heat enough to drive it off. At this heat it only sinks into the pores of the

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er, and the full body of silver is yet preserved. At this point the plate be well cleaned with sulphuric acid, it will present one uniform surface of copper; immerse the plate in a solution of musate of zine, the exterior surface of copper will be removed, and the silver surface will be again exposed, and be equally sensitive to the operation of the light: yet it would be preferable to galvanize the plate than to restore them by the foregoing process. It is well known to every Daguerrotypist that the principle disappearance of the silver is from its having been rubbed off by polishing the plates, as very few subject the plates to a heat sufficient to cause the silver surface to disappear.

G. P. H. Tenn.—Mr. H. writes "What test, if any, can I make to ascertain when there is an excess of sulphur in my hyposulphite of soda, as I am not convinced it is this that makes the numberless black spots on my impressions, as you have stated in your valuable journal, that this excess does make said spots, you must have some reason for it."

If H. will put a very little sulphur in water, and then pour it in a plate, apply the lamp as in gilding, he will find similar spots, and of exactly the same character as when this may be in the gilding, containing hyposulphite with an excess of sulphur, or add a little of the latter to the gilding solution, and the number of black spots will be increased.

T. F. W. Vt.—We can send you a whole size instrument you can depend upon as being equal to any in market.

E. C., Mass.—You cannot get the arrangement of the lenses with the "microscopic attachment" without great expense, we think the common arrangement will answer your purpose.

E. D. S., Ohio.—Write to Peter Smith of Cincinnati, and you will find the article you wish, and thus save expense and risk of transportation. Send the Communication.

M. F., N. Y.—The Rouge has been forwarded, and we warrant it the best, and in fact the only pure article in market—it has been subjected to chemical test in our Laboratory.

W. T. R., Ala.—You should have a Furnace called *Universal Furnace*, one to answer your purpose is 14 inches high, 7 inches diameter, accompanied by two sand baths, set of concentric rings to reduce the size of the top to 3 inches, in good order and complete, price \$20.

M. W., Me.—Mr. W. writes—"Should the plate be coated the same for taking views as for taking portraits?"

It may be coated the same and produce good views, yet it is more generally advisable to coat heavy over the iodine, and even a less proportion of bromine, as this gives more body to the impression, and adds much to the tone, affording a far more pleasing effect.

NEW PUBLICATION.

A TREATISE ON DAGUERREOTYPE: the whole art made easy, and all the recent improvements revealed, embracing a full account of apparatus, Plates, Chemicals, etc., and a complete, scientific, and simple expose of the most favorite modes of operating with the recipes for making all the chemicals.

CONTAINING ALSO, the process for galvanizing plates, and the whole art of Electrotype; the reproduction of Daguerres' images by Titonotype; Directions for preparing Calotype Paper; and a description of all the known methods of producing Photogenic pictures, &c., &c. By L. L. Hill. Price \$2.

It is bound in paper and can be forwarded by Mail to any part of the world.

This "Treatise" contains 181 pages and is filled with matter of interest and should be in the hands of every Daguerrotypist who would be posted up in the art. Much reliable information is found in this volume, and it is from the hands of the man who published the first work of the kind in America. We have perused with pleasure and profit its pages, and feel highly gratified in finding that the author has taken great care and commanded excellent judgment in selecting such interesting matter as makes it of the utmost value to the Daguerreotype world.

The author has treated largely in his "Treatise" on the "Daguerreian Chemistry," "Iodine," its discovery, "Natural History," process of obtaining it. "Its properties, Test starch is a very delicate test of iodine. It forms with a solution of iodine, the *iodine of starch*, which is of a deep blue color. A liquid containing 1-450,000 part of its weight of iodine, receives a blue tinge from a solution of starch, Iodine is frequently adulterated with plumbago. This may be detected by dissolving a small portion in alcohol; the plumbago will remain undissolved, or, heat a small quantity on an old plate, by means of a spirit lamp. The iodine will be driven off while the plumbago, being very infusible, will remain." "Uses" of iodine, "Iodide of silver this substance is found native in Mexico, Chloride of Iodine, Bromide of Iodine." The author gives many interesting "experiments." "Bring iodine and phosphorous in contact in open air, and

the latter will be inflamed." Damp vapors in your box will cause the plate to be coated with the *hydro-iodide*, instead of the iodide of silver, this will cause *blue* pictures. To make this evident, cover the plate with watery vapor the moment before coating, by means of the breath, by holding a plate over the steam of water, we have succeeded in producing impressions in which all the lights were as blue as indigo.

"*Bromine*".—Its history, compounds, and a number of valuable experiments. We find many "Receipes" for various chemicals giving their various proportions, compounds and appropriations.

We trust no Daguerreotypist will be found without this companion.

ADVERTISEMENTS.

HILL'S TREATISE ON DAGUERREOTYPE.

TWO VOLS. IN ONE.

The whole Art made easy, and all the recent improvements revealed. Containing also—The Process for Galvanizing Plates, and the whole Art of Electrotype; the Reproduction of Daguerre's Images by Tithonotype; an account of Calotype Paper, and other methods of Photogenic Drawing, &c. By L. L. HILL, Westkill, Greene Co., N. Y.

CONTENTS.

History of Photography; Theory of the Process; Description of Apparatus; Account of Stock, such as Plates, Cases, Chemicals, and other articles to be purchased forming a complete Daguerreian Directory; Recipes, a large number; Polishing Plates; Coating the Plate; Camera; Mercury; Gilding; Coloring; Calotype, Tithonotype, &c..

The above is but a partial outline of the subjects treated in this work. Nothing is omitted which is necessary to render any person of the requisite judgment and taste "a workman that need not be ashamed." The *Receipes* have cost the author more than \$500, and no pains or expense have been spared to render the work a complete Manual of Daguerreotype.

TESTIMONIALS.

The following extracts from a large number of highly flattering Testimonials from distinguished Artists and others:

M. A. Root, an eminent Daguerreian, Philadelphia says, "I can freely say yours is, in my opinion, a most valuable Treatise on the Art of Daguerreotype."

From the *Albany Express*: We would recommend this useful work to all practising the Art."

E. JACOBS, a celebrated Operator, New Orleans, says, "I have perused the work with much gratification as being much needed in the Art. I can sell a large number to pupils."

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\$5 REWARD.

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NEW YORK, November 1, 1850.

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- Burges, Nathan G., No. 187 Broadway, New York.
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- Brown, H. S., Milwaukee, Wis.
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- Bradlee, J. E., Boston, Mass.
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- Bowman, J. A., Berlin, Waterloo County, Canada West.
- Bisbee, A., Dayton, Ohio.
- Bowen, N. O., Norwich, Conn.
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- Cooley, O. H., Springfield, Mass.
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- Chase, G. L., Boston, Mass.
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