old tiles that could be found in the country, and by a succession of experiments overcame the obstacles that had retarded the success of his undertaking.

The chief of these obstacles was to discover clays of different colors that could be made to amalgamate in such a way as to contract or shrink equally during the process of drying and firing; and until this object was effected, a perfect tile of several colors could not be produced, sundry unsightly cracks appearing on the inlaid parts of the surface. It will be unnecessary to speak of the present state of perfection to which these beautiful tiles have been brought, further than to observe that they are yearly becoming more appreciated, both on the score of durability and ornament; and there can scarcely be a doubt that, very soon, no ecclesiastical building, having any pretensions to architectural superiority, will be considered to be complete in its decorations without them. Not only are copies of old tiles manufactured, but every variety of design suitable for the character of the building they are intended for are supplied. Almost any pattern can be produced with facility, and in many instances they have been adopted as a substitute for oil cloth in the halls and passages of mansions, being considered far more beautiful, and, from their durability, more economical also, in the long run.

At Minton & Co.'s works the following is the mode of manufacture: The clays of which the tile are made are obtained in the immediate neighborhood—the ordinary marl producing a good buff color when fired; another kind a warm red; black is produced by staining with manganese; blue with cobalt, etc. With the native clays there is a slight admixture of Cornwall stone and clay, and flint from Kent, etc. The whole are subjected to a variety of washings and purifications—the clay intended for the surface especially—and passed through fine lawn sieves in a liquid or "slip" state, as it is technically termed. In this state it is conveyed to the slip kiln, or rather pumped in it, and boiled until it is in a plastic state, and fit for use.

After the modeler has done his part, the pattern is cast in plaster in relief, and is then placed in a metal frame of the size required; but it should be stated that to produce the ordinary six-inch square tile it is modeled 6½ inches, to allow for shrinkage or contraction, which takes place during drying and firing. The maker then commences his operations. A piece of fire clay for the surface is flattened out to about a quarter of an inch thick, somewhat after the manner of preparing a pie crust, and this is thrown upon and pressed upon the plaster pattern, and receives, of course, a correct indentation or outline of the design. The metal frame containing the plaster mould is divided horizontally, and after the surface is put in the upper part of the frame is screwed on, and the maker fills up with clay of a somewhat coarser description, to form the tile of the requisite thickness. The tile is then put under a screw press to impart the proper degree of solidity.

As far as we have gone, the tile is but of one color; next comes the task of giving the different colors required. Suppose a tile be required of three different colors—red, blue, and buff. We will say the surface piece already put in is of a buff color. The maker provides himself with vessels of a suitable kind, containing—the one the blue, the other the red color, in a "slip" state, and these he pours into those parts of the indented surface that the drawing or finished tile before him tells him to be correct. These slips cover the surface entirely, and there is now not the slightest appearance of any pattern or design. After remaining in this state for three days, until the water has evaporated for the most part, the process of scraping or planing the surface commences, which is an operation requiring care, though easily effected by experienced hands. The pattern then makes its appearance, but the colors are scarcely distinguishable the one from the other.

The tile is then finished as far as the maker is concerned; and, after remaining in the drying house from 14 to 21 days, according to circumstances, is conveyed to the oven, where it is exposed to an intense degree of heat for about 60 hours. After being drawn from the oven, the tile is finished, except it be that the parties ordering wish the surface glazed, a rapid and easy process, the dipper merely placing the surface in a tub of glaze.

Plain self-colored tiles, such as black, red, chocolate, buff, etc., and also tesserae, are made of the same material as the encaustic, only that it is dried longer in the kiln, passed through rollers to reduce it to a powder, and is then finely sifted. Presses of great power, made under Prosser's patent, make these tiles. The powdered clay is swept into a recess of the proper size, the screw descends, and by its immense power presses the powder into a solid tile ready for drying and firing. One man can, with ease, make about 500 a day.

Tesserae are now extensively used for mosaic pavements, for which they are admirably adapted. The mosaic pavements of the Romans were formed of small pieces of stone or marble of various colors, bedded one by one in a layer of cement, each of the pieces being leveled with the others as the work proceeded; and on the completion of the work the unavoidable inequalities of surface were corrected by rubbing the whole to a plain surface.

This mode of proceeding was attended with many defects. The irregular shapes of the tesserae caused the cement joints to be of a thickness that greatly injured the effect of the design, while the piecemeal way in which the work was laid rendered it very difficult to produce a level surface.

These difficulties have been entirely overcome by the use of the patent tesserae, which, being made in steel dies, by the process above described, are perfectly uniform in size, and fit closely together, with an almost imperceptible joint.

The mode in which the tesserae are used is precisely the reverse of the Roman process, and is as follows: A colored design of the intended mosaic having been drawn to a scale, the pattern is set out full size on a cement floor, perfectly smooth and level, and on this floor the tesserae are placed close together, the workmen being guided in the arrangement of the colors by the small drawing. The pieces are then joined together by a layer of cement applied to the upper surface, and in this way they are formed into slabs of convenient size, which, when hard, are ready for use, and can be laid with as much ease as ordinary flagstones. It will at once be understood that the side of the slabs which is next the floor during the process of manufacture forms the upper side of the finished pavement, the pattern appearing reversed during the operation.—*Glasgow Reporter*.

THERE was received recently at the Smithsonian Institute five feet of the butt of a white oak tree, five inches in diameter a foot from the ground, through the center of which a pine board one inch thick and twelve inches wide had been driven several feet by the recent cyclone in Mississippi. Nothing could more forcibly show the terrible effect of the wind.

ISOCHROMATIC PHOTOGRAPHY.

PHOTOGRAPHY, despite the great strides that it has made, has, in a certain respect, remained stationary at the point at which Daguerre left it. Silver salts acted upon by light are very easily reduced by the most refractive rays of the spectrum, while they are scarcely influenced by vibrations of great wave-length; so that the blue violet end has been designated as the chemical region of the solar spectrum, and the red extremity as the calorific region.

The result is that when a photographer wishes to represent blue-colored objects, even very dark, such objects come out white or clear gray. Inversely, objects of an orange or yellow color, even very bright, appear of a very dark tint. Hence a true intervention of shades that causes despair among painters whose pictures are reproduced by the photographer. A lady dressed in a straw-yellow robe, and seated in a blue arm-chair, appears in the photograph in a nearly black robe, and in a nearly white chair.

The same difficulties arise in the presence of nature. A lemon comes out much darker than a greengage plum; the blondest hairs are black; blue eyes are absolutely white; and freckles form black dots.

Photographers have for some years occupied themselves with these changes in color, which necessitate delicate retouchings that can only very rarely and but partially remedy the evil. Waterhouse first, then Cros and Ducos du Hauron, found a means of obtaining a reproduction of the true shades, either by passing the light through colored media, or by impregnating the collodion with eosine. But their results did not appear to be satisfactory enough to interest the photographic craft in them. Moreover, gelatino-bromide processes have now absolutely dethroned collodion.

Two Parisian photographers, Messrs. Attout-Tailfer and Clayton, have succeeded in giving to gelatino-bromide, with eosine, the property that Waterhouse gave to collodion. The plates prepared by them give a reproduction of the shades just as would be done by a draughtsman with his pencil. Yellow comes out bright, blue appears dark, and orange gives an intermediate shade.

The engravings which we reproduce from proofs shown by these gentlemen to the Photographic Society represent stripes that are alternately dark blue and bright yellow, with an orange star. The best commercial gelatino-bromide plates bring out these so different tones in a tint that is

Photographic reproductions of a fabric striped alternately dark blue and bright yellow, and with an orange-colored star. FIG. 1.—By ordinary gelatino bromide plates.

FIG. 2.—By Messrs. Tailfer & Clayton's new plates.

nearly uniform; but, on the contrary, those made by Messrs. Tailfer & Clayton at once clearly set off the differences between them.

It may readily be seen what applications can be made of this valuable process in the reproduction of pictures and of fabrics of different colors, and in the photographing of portraits, animals, flowers, landscapes, and in scientific researches where it is necessary to reproduce red or yellow objects.

We shall not dwell upon the great interest that lies in this improvement. It is only necessary to remark in conclusion that these plates, that the inventors call *isochromatic*, cost the same, can be printed from as quickly, and are used in exactly the same way as ordinary gelatino-bromide ones.—*La Nature*.

SEPARATIONS OF GALLIUM.

By M. LECOQ DE BOISBAUDRAN.

Separation from Tellurium.—The liquid containing tellurium in the state of tellurous acid is mixed in the cold with a sufficiency of hydrochloric acid and saturated in the cold with sulphureted hydrogen. Tellurium sulphide is precipitated, while the gallium is found in the filtrate, which is not, however, always absolutely free from tellurium. In an accurate analysis the clear liquid should therefore be boiled for some minutes, while a current of hydrogen sulphide is passed through it, and the slight traces of tellurium sulphide obtained by this second operation are collected on a filter. When the volume of the filtrate is considerable, it is preferable to begin by concentrating to a small bulk before treating with sulphureted hydrogen in heat.

Separation from Silica.—If free sulphuric acid exists in the liquid, it is strongly acidified with hydrochloric acid and evaporated to dryness, at first at 100°; then, when all visible traces of liquid have disappeared, the residue is kept for fifteen to twenty minutes at 120° to 125°.

When cold the mass is moistened with dilute hydrochloric acid and evaporated to dryness a second time in the same manner.

The mixture of silica and the salts of gallium is sprinkled with a little hydrochloric acid, and then heated to 100° for some minutes, in order to dissolve entirely the gallium oxychlorides, which have been formed during desiccation. Care

must be taken that no part of the matter is now dried up. Water is then added, and the liquid is heated to near the boiling-point while being stirred.

The silica is then collected upon a filter and washed for a long time, at first with water acidulated with hydrochloric acid, and then with pure water. The gallium is easily extracted from the filtrate by expelling the greater part of hydrochloric acid by evaporation and precipitating with cupric hydrate.

Whatever care has been taken in washing the silica, it retains almost always slight traces of gallium. In an exact analysis, especially if the quantity of silica is large, it must be redissolved in potassa, supersaturated with hydrochloric acid, and treated again as above.—*Comptes Rendus*.

THE TREATMENT OF SEA-SICKNESS BY THE TRANCE STATE.*

By Prof. EDWARD P. THWING.

THE phenomena of the trance have interested me for more than twenty years. For two years my experiments have confirmed the theory of Dr. Geo. M. Beard, that the concentration of the mind's attention in one direction induces an insensibility to other things, more or less complete. President Porter (*Elements of Intellectual Science*, section 81) says that pure sensation is simply an ideal or imaginary experience, and that, as the perceptive element is made stronger, the sensational is weakened. The intensity of the one is the suppression of the other. Some persons can excite expectancy sooner than others, and so gain control quicker. Some subjects take a consenting attitude more readily than others. One yields instantly, another only after repeated interviews, and some, perhaps, may never yield at all.

Nine cases of sea-sickness, occurring in the Atlantic and in foreign seas, are selected from many, to illustrate the speedy relief, often the complete cure, of this distressing ailment. Some showed little somnolence, while others sank into as complete insensibility as in ordinary anæsthesia by chloroform.

One patient had been unable to retain any nourishment on the stomach after leaving port, two days previous. Manipulations began about the temporal and frontal regions, particularly along the superciliary ridges, and the patient at once exclaimed: "What a heaven to be relieved of pain!"

Food was administered in small quantities, and, two hours after, a dinner of roast mutton was relished and retained. The other cases were treated in a similar manner, without the "passes" of the old-time mesmerizer, or the pretentious and dramatic display seen in stage exhibitions, without even fixing the gaze or standing before the individual. The voice probably did more than the hand, but in one case that, too, seemed superfluous: for the sufferer, a brawny Welshman, not understanding English, while busy casting his bread upon the waters, yielded to a pantomime, was led away from the ship side, and made to recline on the shoulder of the operator. The trance became at once so profound that a pin introduced and left in the skin covering the back of the hand caused no wincing. Surgical operations have also been performed, some of which will be described by Prof. Jarvis of Bellevue College. Four facts may be stated as results:

1. The trance state in many cases relieves sea-sickness by restoring nervous equilibrium, and in surgery is sometimes an adequate substitute for ether. Not every one responds. Not every one is able to awaken that faith, belief, expectancy, which Dr. Beard has already shown before this Academy to be the subjective state out of which all these phenomena are evolved. This persuasion cometh not readily to every willing, yielding soul, still less to a reluctant, incredulous mind. Failures are mostly found in two classes. 1. The querulous, dogged, despairing sort, who, at home or afloat, nurse their pains and "enjoy poor health," as they say. 2. The curious, voluble, and volatile, who wish to listen to and join in conversation. But failures with these at the first or second meeting, are by no means final or decisive. Sequestration and silence on the part of the patient, and perseverance on the part of the operator, often secure success in apparently obstinate cases.
2. Trance states, *i. e.* where control is partial and unconsciousness is incomplete, frequently afford proportionate relief.
3. The sense of subjugation and helplessness that comes over one, when in the grasp of Neptune or the surgeon, is sometimes a helpful accessory. It is analogous to the yielding attitude of the animal under a tamer or trainer, and not unlike the paralyzing influence of a panic.
4. The feeling of certainty on the part of the operator is a

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