A NOVEL METHOD OF MAKING RELIEF MAPS.

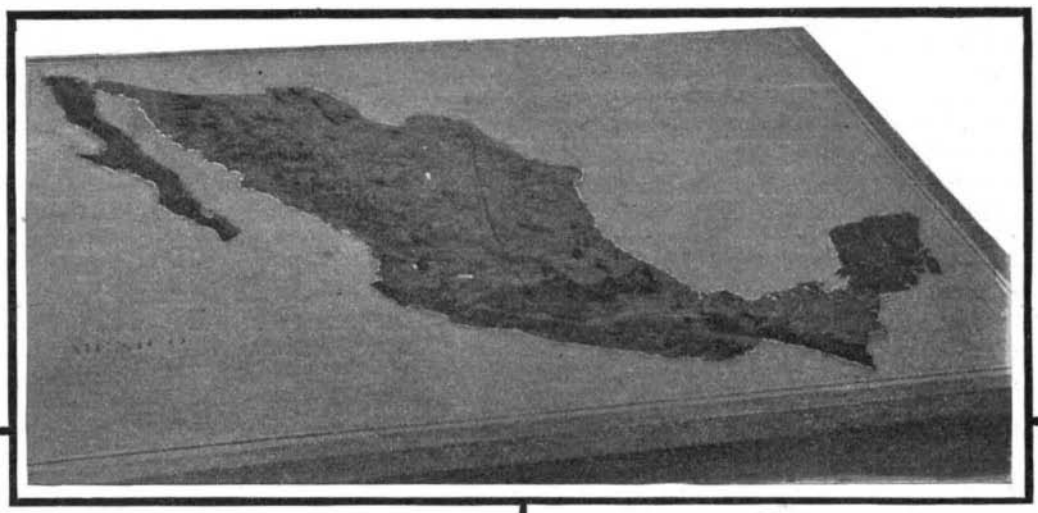
Relief maps are so frequently seen in the museums and expositions, particularly in the government exhibits of all countries, that few people realize the labor, patience, attention to detail, and skill necessary in performing the best work of this character. In the scientific, educational, and war departments of the civilized nations the importance of this branch of the topographer's art is fully recognized, and constant development and improvement are being sought after. The work in this direction that Mr. Matausch is doing at the Museum of Natural History, New York, is not yet generally known.

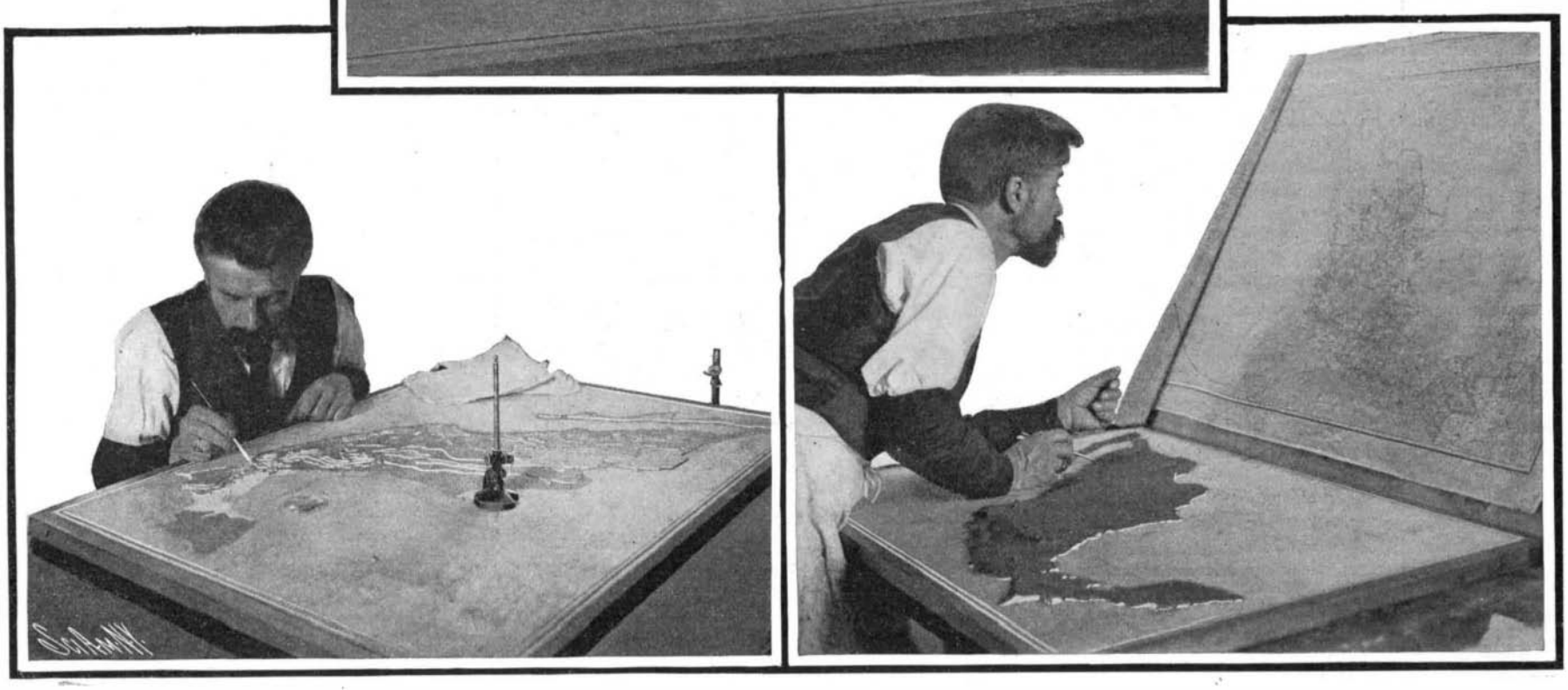
The first difficulty encountered is in the choice of a suitable scale of elevation. This scale must be such that even topographical features of minor importance are plainly discernible, while at the same time there is apparent no unnatural distortion. This scale will probably be different for almost all countries, and the success attending the construction of the map will depend largely upon the skill and judgment of the designer.

After the scale has been determined upon, a large detailed map of the country in question is smoothly glued to a level wooden surface, and layers or strata of wood or cardboard—the thickness depending upon the scale chosen—placed upon it. These strata correspond to the different elevations shown on the maps. The first or lowest, corresponding to an elevation of a few hundred feet, usually follows the coast line closely. The next is somewhat smaller in area as the elevation increases, and the outline varies with the peculiarities of the country. The following strata become smaller and smaller till the highest elevations are reached, and the mountain peaks are indicated by pegs of the proper height. A layer of clay or wax is now placed upon the strata mentioned above, and the modeling begins. Great care must be exercised in building up the gradual rise from one elevation to another, in forming the mountains and in tracing the water lines and river courses. At this stage everything depends upon the accuracy and skill of the worker alone. Mr. Matausch works from the most detailed maps obtainable, from sketches and descriptions of explorers, and where possible, from photographs. The delicacy of operation and the patience necessary in this work may be understood if we consider that the conformation, peaks, ridges and comparative size of a mountain actually 19,000 or 20,000 feet high must be shown upon a model possibly half an inch in height.

After the modeling is completed the map is varnished, and a plaster impression of it is made. By means of this plaster mold the maps which are intended for exhibition or other purposes are turned out. In making the map of Mexico, shown in the photographs, great difficulty was encountered because there are no accurate or large scale maps available of considerable portions of that country. These difficulties, however, were largely overcome by using the reports, sketches, and photographs of Bandelier and Saville, both of whom led exploring expeditions into the lesser-known parts of Mexico. As soon as the work in hand is completed, Mr. Matausch will begin a large size map of Mont Pelee and its immediate vicinity, working from data and photographs obtained from the various scientific expeditions sent to that ill-fated locality.

Ready for Varnishing and Making the Plaster Impression or Mold.





Smoothing off the Rise from Stratum to Stratum Before Putting on the Layer of Clay on which the Surface Modeling is Done.

Tracing the Watercourses. The Surface Modeling is Practically Completed with This.

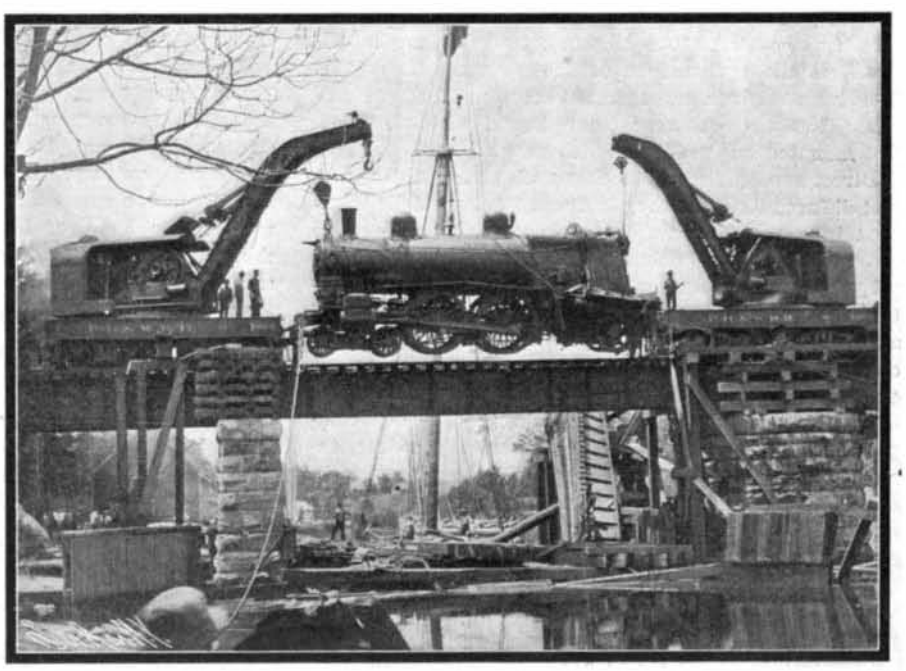
A NOVEL METHOD OF MAKING RELIEF MAPS.

A STRANGE RAILWAY ACCIDENT.

A railroad accident attended by some very curious results recently occurred on a branch of the Philadelphia, Baltimore & Washington division of the Pennsylvania system, extending through the town of Laurel, Del. At this place the railway crosses a navigable stream on a bridge, the track being about 25 feet above the water. The bridge consists of three spans and is of the ordinary steel-girder type, the center one being the draw span. Through a misunderstanding of signals, the engineer of a passenger train ran on to the bridge before he perceived the draw was open. The locomotive fell through the draw, but fortunately the coupling between it and the tender broke under the strain, leaving the balance of the train on the bridge and the embankment forming the approach, although the tender hung over the brink.

The schooner "Golden Gate" was passing through

The Open Draw and the Wreck of the Schooner and Engine.



Two Wrecking Cranes Lifting Up the Locomotive.

A STRANGE RAILWAY ACCIDENT.

just at the time the accident occurred, and was in such a position that a novel head-on collision was the result, the locomotive striking the forward part of the vessel. Such was its momentum forward as well as downward that the front portion partly telescoped the hull, as shown by the illustration, of course sinking the schooner. One of the most difficult problems to solve was the best way of putting the engine again on the rails. Here the advantage of the wrecking crane was strikingly demonstrated, for without it the attempt would have been impracticable without the use of several cumbersome derricks. The weight was in such a position that it could not be dragged ashore, and, further, was partly buried in the hull of the vessel. Cranes were hauled to each end of the track. Two spans were temporarily placed in position to replace those damaged by the accident, the ends being supported on the masonry bridge piers and kept from shifting by false work. The cranes then took a position where the jibs extended over the vessel, and the engine was raised without difficulty, and swung upon the rails. To accomplish the feat, however, it was necessary to lift the weight of 45 tons to a height of 30 feet and swing it laterally about 10 feet.

DIRECT PHOTOGRAPHY IN NATURAL COLORS ON PAPER.

It is not a new idea to found, on the basis which Herschel established in the beginning of the forties, a process which has for its purpose the isolation by the action of light of single colors from a color-mixture. Davanne, Dr. Wiener, and others have written on the subject, and E. Vallot announced in 1895 that he had succeeded in obtaining corresponding colors by allowing sunlight to act for three or four days through colored glass on paper impregnated with the three fundamental colors.

I concluded to experiment in this direction, and especially to strive to obtain the bleaching by light in the shortest possible time by means of additions to the color mixture, writes an unknown author in Photographische Chronik. I found that various ethereal oils heighten the light-sensitiveness of organic coloring matters to a very considerable degree; oil of anise is especially effective, and the principal effect is due to the anethol contained in this oil. I continued these experiments, and arrived at the following process:

Writing paper free from wood is drawn through a bath which consists of a mixture of alcoholic solutions of primrose, Victoria blue, cyanin, curcumin, auramin, and an addition of anethol. The test of the proper constitution of this bath is made by exposing a sensitized strip of paper under a test negative composed of red, yellow, green, and blue strips of glass. If the composition is correct, exposure in sunlight must cause all the colors of the test negative to appear on the strip of paper. The bath must be kept at a temperature of 20 deg. C. (68 deg. F.) The sensitized paper is hung up to drain and allowed to dry at the same temperature.

It is exposed in a printing frame as soon as surface-dry, either under a picture of colored glass, or under a transparency, or under a colored lantern slide. Every delay diminishes the sensitiveness of the paper to light, so much so, indeed, that even an hour after preparation it has become considerably less sensitive. The exposure in perpendicularly-falling, full, clear, sunshine varies according to the transparency of the negative, the strength and anethol content of the bath, and the intensity of the light. Under favorable conditions I have obtained good results in five minutes.

When the picture appears clearly in all its details of color, the exposure is finished. The print is then washed in pure benzol for an hour and dried at about 30 deg. C. (86 deg. F.) If the odor of anethol can still be detected after this procedure, the benzol bath must be repeated. The slightest trace of anethol diminishes the permanence of the picture. The print is now placed in a concentrated solution of copper sulphate, left there two or three hours, washed, dried, and mounted on cardboard with paste.

Direct sunlight soon bleaches such pictures. In indirect diffused daylight they last some weeks, while when kept in a portfolio and only occasionally exposed to light, they remain unchanged for years.

By the use of less concentrated baths and the addition of a very large quantity of anethol, pictures of artificial flowers can be directly obtained in the camera by the use of lenses of very large aperture. I expose for this purpose about two hours in direct sunlight. The colors appear somewhat weak, but completely recognizable even to the green. Of course, instead of paper one can use glass plates previously coated with collodion or gelatine, for this process. The results, however, are much inferior to those obtained on paper.

This process has one disadvantage, that the shadows which are black in the transparency, appear on the prints not black, but brown. The cause of this is as follows: The colors which are used in the color bath behave differently toward light, that is, they do not bleach in the same time. Yellow fades most quickly, red next, and blue least rapidly. Therefore, in order to isolate all colors in purity after a given time, yellow must predominate and red overbalance blue in the color mixture. For this reason the tone of the color mixture and the paper is not black, but brown. Since the opaque parts of the transparency protect the paper from bleaching, it remains under the black parts in its original color, that is, brown instead of black. In the course of the year 1902 I tried to remedy this disadvantage by first making a platinum print from the negative, then sensitizing this in the color bath, and exposing under the colored negative. These prints appear incomparably more beautiful, with deep black shadows. The experiments have further shown that the light-sensitiveness of the paper depends essentially on the nature of the fibers of which the paper is made. The most suitable are flax fibers without any other admixture, and therefore Whatman papers are to be preferred to all others. Since, however, they possess a much greater capacity of imbibition, it is preferable not to draw such papers through the color solution, but to coat the paper with the solution by means of a stiff brush.

Although the anethol shortens the time of printing very considerably, I was desirous of still further increasing the sensitiveness to light. After numerous experiments with oxidizing and reducing substances, I found that some resinates possessed the property, in the presence of anethol, of still further increasing the light-sensitiveness. These experiments are not yet concluded, and it is to be hoped that with the help of these substances a very considerable sensitiveness, and therefore a wider applicability of the process, may be attained.

Correspondence.

The Black Race and the Sun.

To the Editor of the Scientific American:

In reply to the query of Prof. E. G. Dexter as to why negroes are able to withstand the effect of the sun's rays better than those with white skins, though black absorbs heat far more readily than any of the colors, might it not be well to test the power of the black matter in the negro's skin to resist the passage of the invisible or X-rays of the sun? Possibly we are unfavorably affected by the sun's less-known influences, and the dark races have been provided with just the right kind of shades to protect their bodies from them.

O. R. Washburn.

Pocantico Hills, N. Y., August 20, 1904.

The Two-Headed Eagle.

To the Editor of the Scientific American:

In your issue of June 11 in "Science Notes," speaking of the two-headed eagle, you say: "The symbol of the two-headed eagle is considered by some heralds to be merely the result of the heraldic practice of 'dimidiation' which crept into English heraldry during the reign of Edward I. . . . It robs the two-headed eagle of half its terrors to know that it owes its origin to this sort of child's play."

It happened that at the same time I was reading "The Hittites; The Story of a Forgotten Empire," by Prof. A. H. Sayce, LL.D., D.D., the famous authority on eastern antiquities; and I find that in this book he gives an illustration of the sculpture of a two-headed eagle, with the following remarks: "The same block of stone . . . bears also on the inner side the figure of a double-headed eagle, with an animal which Prof. Perrot believes to be a hare in either talon, and a man standing on its two-fold head. The same double-headed eagle, supporting the figure of a man or a god, is met with at Boghaz Keni, and must be regarded as one of the peculiarities of Hittite symbolism and art. The symbol, whose prototype goes back to primitive Babylonia, was adopted in later days by the Turkoman princes, who had perhaps first seen it on the Hittite monuments of Kappadokia; and the Crusaders brought it to Europe with them in the fourteenth century. Here it became the emblem of the German emperors, who have passed it on to the modern kingdoms of Russia and Austria. It is not the only heirloom of Hittite art which has descended to us of to-day." Perhaps this quotation, showing the immense antiquity of the symbol, may prove of interest and information to some of your readers.

C. E. Cook.

Cape Town, South Africa, July 21, 1904.

A Comment on Prof. Dexter's Theory.

To the Editor of the Scientific American:

In your issue of August 20 Prof. E. G. Dexter finds what seems to him a contradiction in nature's laws, according to which the heat-absorbing black pigment is placed in the skin of the dwellers in tropical regions, while the light-skinned races dwell in cold climates. He says: "The sensible effect of direct sunlight upon the negro should be more intense, by several degrees, than upon the white man. Why is it?"

May not the explanation be that since it is true, as he states, that black is a better absorber of heat than white, it is therefore also a better radiator, and that the people in the tropics need to lose or radiate away from the body the heat produced in it by the chemical processes of life, while the people in colder regions need to preserve that heat in the body? As the mercury climbs up toward 90 deg. F. the heat becomes oppressive, and we seek the shade and the breeze, and endeavor to cool the body. Heat prostrations begin to take place before the external temperature has reached 98 deg., or the temperature of the body. When the thermometer goes above that, it is only with care that we can exist at all, and continual subjection to such heat, or to the direct tropical rays of the sun, would speedily be fatal. The average temperature, even in the tropics, must be below 98 deg., or life could not continue, but on the approach to it the body must be cooled. Radiation is one method of cooling. Hence the black pigment, that assists this radiation. In cold climates, on the contrary, nature gives white, a poor radiator, to retard the loss of heat by radiation, just as the wool of animals in cold climates retards radiation, while the bare skin of the elephant, in the tropics, assists this cooling process.

E. P. Foster.

Cincinnati, August 22, 1904.

Effect of the Sun Upon the Black Race.

To the Editor of the Scientific American:

I read with much interest the inquiry, at page 126, respecting the black race, and believe to have found a sufficient and simple declaration that the home of the black race is the tropic zone, and of the white the moderate zone, though the black color is a greater absorber of the heat than the white.

For scientific and historical reasons the hypothesis seems to be right that the birth of whole mankind happened at one single place, at the frontier of both zones, supposed in Asia. In the later development of human beings, the different races appeared. Now, the principal reason that the home of the colored men is to be found in the tropic zone seems to me the fact that the normal temperature of blood of man is about 100 deg. Fahrenheit. The white color is protecting the man more from leaving this temperature of blood, far higher than the average temperature of the moderate zone, than the black color. Therefore the black people felt inclined themselves by this natural reason to go to the hotter countries, where the temperature is more adequate to the temperature of the blood. Moreover, the development of their nervous system helped them to stand the tropic heat.

Meanwhile, there is the question, for what reason, the white race or a part of them did not also take their refuge to the tropic part of the earth. But, it is a fact, documented almost by every found from their early times of mankind, that the history of this age consisted in an epoch of continual fights between the single tribes, and especially races. Every people sought his own country, his own pastures, his own hunting grounds, and did not suffer any one in them, like most savages do in our days. In this struggle, the negroes succeeded in securing for themselves the tropic countries, more adequate to them, leaving the moderate zone to the white race, without counteracting their prosperity. The white nations could live in the colder parts of the earth, because the white color protected them against the influence of coldness.

These natural and historical reasons will completely give the answer upon the above inquiry.

Herman Gumpel.

Philadelphia, Pa., August 21.

The Current Supplement.

An article by Emile Guarini, entitled "The Admiralty Pier Cranes at Dover," opens the current Supplement, No. 1496. Its excellent illustrations do much to elucidate the text. Mr. William Metcalf writes on "Alloy Steels," "Porpoise and Black-fish Oils" is the subject which Mr. Charles H. Stevenson, one of the experts of the United States Fish Commission, discusses with authority. A suction gas producer for use with explosive engines, is fully described and illustrated. Mr. W. Ripper concludes his report on the Mosely educational commission. The St. Louis correspondent of the Scientific American writes an instructive article on the historical exhibit at the Electricity Building at the Exposition. Three pictures of historical inventions accompany the text. Other articles from the same pen are entitled "A Fine Exhibit of Welded Steel Plate," and the "Big Twenty-Foot Wooden Pulley in the Machinery Building." Mr. I. Wilbert contributes an article of much value to the history of the rise and development of chemical industries in America. Professor James Dewar discusses in his usual exhaustive way the problems of the atmosphere. An article which contains many a curious bit of information is one which bears the title "Plants as Builders." The similarity between the forms adopted by Nature in her constructive processes and those devised by ours is striking.