STUDENTS' DEPARTMENT.

PHOTOGRAPHY IN NATURAL COLORS.

A. AND L. LUMIERE point out that the indirect method of photographing in natural colors has not received a proper practical application, because of the difficulty experienced in selecting the colors, and in preparing and superposing the monochromes. They recommended the use of orange, green and violet screens for preparing three series of negatives presenting a maximum of sensibility to the rays which the respective screens allow to pass. Specimens of photographs so prepared were exhibited before the Paris Academy of Sciences. The printing and superposition of the monochromes have been successfully accomplished by employing birchromated gelatine to which are added substances insoluble under certain conditions. If, for example, five per cent. of ammonium bichromate, and five to ten per cent. of silver bromide in the form of emulsion, be added to a ten per cent. solution of gelatine, and the preparation be spread in a thin layer upon a plate of glass, a surface is obtained which can be exposed under a negative, and will reproduce the picture by the action of light. After exposure, the plate is washed with cold water, and the portion of the film acted upon by light being rendered insoluble, remains and serves to print the image form on the application of suitable colors. The silver bromide, which, by the way, may be replaced by other insoluble precipitates, is easily removed by the action of sodium hyposulphite, and proofs can then be printed from the plate in any color, showing all the graduations of tint present in the negative. Polychrome prints may be obtained by receiving on the same plate monochrome red, yellow, and blue images successfully, by means of three corresponding negatives, and isolating each image from the preceding one by an impervious layer of collodion. By employing dyes of greater or less concentration, or by simple decoloration with water, variation in the relative intensity of the monochromes is readily obtained.

USEFUL HINTS.

A GIVEN number of feet of radiating surface properly placed, will be found more effective than a greater amount located to save floor space or be out of the way.

CHLORIDE of zinc paint, although virtually a water-color, dries quickly and hard, so that it can be washed with soap and water when necessary, and will be found a preservative of wood, rendering it almost incombustible.

WIRE nails for joining dressed boards or barrel heads by being driven into the different edges, will be made by machinery and the price greatly reduced. This will dispense with the use of the brace and bit and wedge-plug for that use.

FOR filling up the pores of the wood before commencing to polish: For white wood, equal proportions of whiting and plaster of Paris, thinned to a paste with turpentine and well into the grain of the wood; for mahogany, add rose pink, or whatever the color of the wood is, and dry color to match up to same.

A NOVEL engineering scheme in the construction of a foundation we have heard of is the one recently used in New York—to freeze a bed of quicksand which impeded the work. A row of 4-inch pipes was sunk to a depth of 40 feet. These pipes were capped at the bottom, and contained inside similar pipes opened at the bottom. From a large condenser cold air was forced through these smaller pipes into the larger, from which it returned to the condenser. The air was cooled to a temperature of about 45 deg., thus freezing the surrounding mud and wet sand, and checking their flow into the excavations.

WE have long had slag paint and pavement, but the latest is a slag brick chimney. According to L'Industrie, this plan was adopted by the Courrieres and Ortricourt companies, and their example is followed by the works of Arbel and Douai. The latter establishment planned a chimney 164 ft. high, and to weigh but 379 gross tons, about half the weight of a brick chimney of the same dimensions. A special cement was to be used which would bind together the blocks composing the chimneys so firmly as to require no chain or iron band for strengthening. This is an interesting application of a cheap industrial by-product, which, should the experiment prove a success, will be appreciated by metallurgists.

THE scientific journals describe a series of tests lately made to determine the loss of heat from steam pipes due to radiation, three distinct conditions being observed in the calculations, namely, bare pipes, pipes covered with 1 inch of composition, and pipes over-laid with 1 nch of composition and three surfaces of hair felt, each ½ an inch in thickness. The steam pressure used was from 45 to 60 pounds, and the result showed that with 1 inch of composition out of a possible loss of 100 per cent., 83½ per cent. was saved, and with the extra felt covering, 8¼ per cent. additional marked the saving. It is marked that if a single pound of coal is required to evaporate 8 pounds of water into steam at 60 pounds pressure, then six and a half hundredweight of coal would be needed every year to make good the loss of heat for every square foot of uncovered steam pipe.

PROCESS OF GALVANIC BRONZING.—By means of a recent French improvement, the process of galvanic bronzing is said to have been made not only more simple, but capable also of giving every tone, from that of barbedian bronze to antique green, governed by the length of time that the copper is allowed to remain in contact with the liquid; after the piece has been well scoured, it is covered by means of a brush with a mixture composed of twenty parts of castor oil, eighty of alcohol, and forty parts each of soft soap and water. Thus treated, the piece left to itself for a period of twenty-four hours becomes bronzed, and if the duration of contact be prolonged, the tone changes, a very great variety of tones, pleasing in their appearance, being obtainable in this manner. The drying is finally effected with hot sawdust, the only remaining operation being then that of coating the piece with colorless varnish largely diluted with alcohol, thus insuring work of the finest character.

PRESERVING WOOD BY LIME.—On the preservation of wood, a Canadian experimenter writes: "I have for many years been in the habit of preparing home-grown timber of the inferior sort of fit, Scotch spruce and silver, by steeping it in a tank, or a hole dug in clay or peat, which was fairly watertight, in a saturated solution of lime. Its effect on the sapwood is so to harden it and fill up its pores that it perfectly resists the attack of the little wood-boring beetle, and makes it, in fact, equally as durable as the made wood. I had a mill which was lofted with Scotch fir prepared in this way in 1850, and it is in perfect preservation. The timber is packed as closely as it will lie in the tank, water is let in, and unslaked lime is thrown on the top and well stirred about. There is no danger that the solution will not find its way to everything in the tank. I leave the wood in the solution for two or three months, by which time an inch board will be fully permeated by it. Joists and beams would, of course, take a longer time for saturation; but in practice we find that the protection afforded by two or three months' steeping is sufficient, if the scantlings are cut to the sizes at which they are to be used."

WEATHERING OF NAILS.—Mr. Samuel Cabot writes as follows to the American Architect:—When a plain iron nail in any structural woodwork is so placed that water can gradually work between the nail and the wood, a hydrated peroxide of iron is formed by the oxidation of the surface of the nail. This oxide acts rapidly and very destructively upon the fibre of the wood, which in chemical parlance is almost wholly cellulose, the same material which we find in cotton and linen. The action of this hydrate upon the cellulose, seems to be a completely destructive one, resulting finally, in the case of a nail, in its becoming so loose in its place that it can be frequently removed with the fingers, as you draw a pin from a cushion. If the examination is then made, all the adjacent parts of the wood will be found to be deeply tinged with the red-brown color of the hydrate of iron, and to be completely disintegrated and decayed by the oxidizing effect of the hydrated iron oxide. This, of course, tends to gradually diminish the structural strength of the part so effected, and in such cases, for instance, as piazza rails and posts, may result in dangerous fickle support and so in perhaps serious accident. Of course, the means of avoiding these objections are quite obvious: The first is to shun, as far as possible, the exposure of the nail head or point in a position where water can trickle upon it and follow down between the nail and the wood; but a still more radical, though more expensive cure, is the use of galvanized nails, or still better, composition nails, in all such cases, and it is the writer's conviction that such construction would be a great economy in all cases such as above cited. If any of your readers will carefully observe the conditions that obtain in such cases, they will need no better testimony than their own eyes.

CEMENT AS A SAFE MATERIAL.—The Improvement Bulletin gives the following interesting test of the fire-proof and non-heating conducting qualities of cement: A safe constructed of cement, with steel wire netting placed in between, was tested by order of the Reichsbanks, the German Government's banking establishment. The question to be decided was whether it is practical to build vaults of this material for safety against fire. A safe was placed upon a pyre of logs drenched with kerosene, which, after being set on fire, kept the safe for half an hour exposed to a heat of about 1,800 degrees Fahrenheit; that is, a heat in which iron will melt. Two hours after the safe was opened and the contents—silk paper, draft blanks and a maximum thermometer—were found to be absolutely uninjured. The maximum thermometer showed that within the safe the temperature at no time during the test rose above 85 degrees. This seems to prove that cement safes within buglar-proof steel vaults fill all the requirements that can be possibly expected.