

bition of a great number of drawings from nature very creditably testify.

The modeling in the female department was so admirable as to astonish those able to appreciate this most difficult and most charming of artistic efforts. In painting, also, there were among the pictures some more worthy to be exhibited at our Academy than certain more pretentious specimens of so-called professional artists now on exhibition on its walls.

We, of course, fully appreciate the great importance of drawing to the mechanic and artisan, but we fear that the scientific department of the Cooper Union does not keep pace with the artistic. If the institute were conceived solely for a school of design and cognate branches for male and female pupils, it could be said that it is fully on the road to ultimate perfection; but it was founded "for the advancement of science and art," and the time and accommodation devoted to art far outstrip those devoted to science; this will become evident by the following statement, which at the same time will give our readers at a distance some idea of the extent of the building.

The fourth floor contains two lecture rooms, each about sixty feet square; a mineralogical cabinet, laboratory and apparatus room, each sixty by twenty feet; six or eight class rooms for mathematics, and rooms for the professor of natural sciences. On this one floor are taught the evening classes in mathematics, mechanics, natural philosophy, chemistry, elocution and music. The entire fifth story is devoted to the evening drawing classes for young men. The school of design for women occupies the whole third floor during the day, and the third floor contains the free reading room and library.

We must, however, in order to be just, remark that the scientific course requires more preparation than the artistic. A person may successfully follow a course of instruction in drawing, even if he is deficient in the common branches of education, though he cannot, of course, ever become a real artist, as for this a cultivated and well-trained mind is required. In the scientific course, however, a person deficient in arithmetic, for instance, can proceed slowly, if at all. This remark is verified by the statement of the secretary of the institute on the night of graduation, that of 1,200 pupils inscribed on the rolls, only about one third were able to continue the course, two thirds being deficient chiefly in arithmetic, and thus not prepared to follow the mathematical course, which, we are happy to say, is in this institution made the base of all further scientific instruction.

The aim of this institute is to give gratuitously a technical education to all, the instruction beginning at that point where the highest branches of the common school education ends. Several hundreds have availed themselves of the advantages the institute so liberally offers during the nine years of its existence, and thousands more may reap its benefits, as the institute is self-supporting. The institute, as our readers must all know, was a free gift of Mr. Peter Cooper to the city. The original cost was about \$700,000, while its actual value, according to the present valuation of real estate in that locality, is now one and a half million of dollars.

NEW ENGRAVING LATHE.

A very ingenious and effective lathe for engraving upon copper, steel, wood, and other substances is now in operation at 207 Pearl street, New York city, which is worthy the attention of all who are interested in the reproduction of art. The machine is the invention of Messrs. Guerrant and Field, of North Carolina, who have come North seeking for the necessary business talent and pecuniary aid to put their invention into extensive use. To engrave by means of this machine the operator sits with a copy of the drawing, photograph, or whatever design is to be engraved, directly in front of him. A small pointer rests upon the drawing, and the whole operation consists in moving the pointer over the several lines of the copy. The pointer is operated by two small cranks, one of which produces a vertical and the other a lateral movement; the simultaneous operation of both cranks producing a circular, inclined, or any desired irregular motion of the pointer, which is thus made to "follow copy." All the movements of the pointer are imparted by means of a very simple arrangement of levers to a graver which cuts or engraves the design upon the surface of a copper plate or block. Thus in a rapid manner even an unskilled person having a drawing before him, may engrave the same in superior style. The swelled lines as well as hair lines of copper plate writing may be produced with the utmost freedom, and there seems to be no limit to the execution of the finest and most difficult as well as the simplest kinds of work. It makes no difference whether the surface to be engraved is flat, circular, or irregular. We have seen the whole of the Lord's Prayer engraved by this machine upon the interior of an ordinary finger ring, every letter being perfectly formed and legible under a magnifying glass, but too small to be read by the unassisted eye. For jewelry work, the ornamentation of metals, the production of copper, steel, and wood engravings for letter press, and many other purposes, this invention seems to be well adapted.

MAGNIFIED PHOTOGRAPHIC PICTURES.

If it were possible to take a photograph, say of the moon, and then to take a second one of a portion of the first, and of the same size as the first, and to repeat the process as often as required, a picture might at last be obtained that would show the minute details in the structure of that body; and in the same way the minutest details in the structure of other bodies, now beyond the reach of the most powerful microscopes, might be shown and examined at leisure. In the

present state of science it is not possible to accomplish this, for several reasons.

First, the photographic picture is painted by the deposit of metallic silver, which, in a minute state of subdivision, gives a general gray tone to the picture when it is not magnified; but when the entire picture, or a small portion of it, is inspected by means of lenses, the white luster of the silver appears more and more plainly as lenses of higher power are used, and the picture assumes a frosted and crystalline appearance, which obscures the finer details beyond a certain limit. The limit is reached by a lens of quite low power, and photographic pictures when viewed in stereoscopes show more or less of the silvery frosted-looking surface texture. To obviate this difficulty a substance must be discovered as sensitive to light as the salts of silver now in general use for photographic purposes, and that will in its decomposition leave a perfectly amorphous coating upon the paper, where the light acts, and in proportion to the strength of its action from the lightest gray tint to the deepest black.

A second difficulty is the roughness of all surfaces upon which pictures can at present be taken. If we attempt to magnify a photograph, all the roughness of the paper or collodion which is imperceptible to unaided vision becomes apparent, and mingles its own images with that of the finer details, in such a way as to make complete confusion. The remedy is the discovery of new materials capable of receiving a polish so fine as to show a perfectly smooth surface under the highest magnifying powers.

The third and the greatest difficulty is the fact that in enlarging small pictures the amount of light reflected by them is constantly diminished, each picture becoming more indistinct than the one of which it is a copy, until finally the original image is completely extinguished. Formidable as this difficulty appears, it is within the range of possibility that it may be completely overcome. The reinforcement of the galvanic current obviates a similar difficulty which at one time threatened to interfere greatly with telegraphic communication. The reinforcement of a sound can make it audible through a large space where it apparently had totally ceased to exist. It remains to discover a means for the reinforcement of light. We believe that in time to come all the obstacles we have mentioned will be surmounted, and the photographic art will become the means of revealing the yet hidden mysteries of nature's grand laboratory.

Another difficulty, that relating to the imperfection of lenses, we will hereafter discuss.

CONSTRUCTION OF FIRE-PROOF BUILDINGS.

We present on another page several illustrations of experiments made by Messrs. Hoe & Co., of this city, which, with the details of the trials we consider of the greatest importance to builders and others. We accordingly invite the attention of our readers to the subject.

The insecurity of our buildings generally, especially their lack of resistance to the ravages of fire, is well known. The aggregate of the sums of money yearly expended for premiums for policies of insurance, would surprise, if it were known, every person. When real defense against fire is undertaken the cost of the erection of buildings is immensely enhanced. The walls must be of great thickness, of fire-proof materials, and laid with great care. The floors must be of similar materials, arched to sustain their superincumbent weight, and supported at intervals by strong columns. All the passages from one floor to another must be defended and guarded by proper devices. This mode of construction and these appliances are too costly for general use; what is needed is some cheaper mode of construction which shall not be less effective in confining fire to the floor in which it originates, without the necessity of constructing a perfectly fire-proof and costly building in the style now considered necessary. It would seem that this result has been partially, if not fully attained by the satisfactory experiments of the Messrs. Hoe.

In addition to their method of rendering floors fire-proof, a patent was obtained in 1860 by J. B. Cornell, of this city, for the protection of iron columns in case of fire, which, in connection with the plan of Messrs. Hoe, would seem to render increased security to buildings attacked by fire. The plan is to inclose the supporting columns with a casing, the space between which and the column is filled with plaster of Paris or any other non-conducting material. The object is to prevent the disintegration of the metal composing the supporting column by heat.

The subject of erecting fire-proof buildings is of vast and growing importance, and we hope experiments will be made all over the country with a view of improving the mode of their construction.

PHOSPHATE DEPOSITS—The discovery of immense deposits of bone phosphates in South Carolina, which, more than a year ago, was heralded by the press of the country, is again brought before the public. The entire coast and Sea Island regions of the Palmetto State are now supposed to be underlaid by the osseous remains of extinct land and marine creatures of past ages. The statement is also made that human bones as well as stone implements have been recognized. An analysis, made by the State Geologist of Massachusetts, of a sample from the Ashley river, shows in 100 parts of bone; moisture and organic matter, .80; bone phosphate of lime, 81.60; sulphate of lime, .65; salt, .15; sand, etc., 16.80.

FRANCE is well provided with lawyers and judges, governmental statistics showing that there is in the empire at least one man connected with the administration of justice for every 500 of the inhabitants, without counting the agents of external justice and city and rural police forces.

Editorial Summary.

A NEW PYROMETER of English make, designed by Mr. Wood of the Tees Iron Works, consists of a metallic tube connected at one of its extremities to a pillar of porcelain, and at the other with an index on a dial, upon which the degrees of heat are measured. When used, the instrument is held over the aperture of a blast furnace, and the heated air passing through expands the tube longitudinally, and the difference in length as compared with the porcelain standard is indicated on the dial. In a recent experiment, the temperature was registered from 66° to 1,200° Fah. in less than a minute.

PHYSIOLOGICAL experiment has arrived at a close approximation to the average diurnal gain and loss in a man of one hundred and forty pounds weight. The daily gain is as follows:—

Oxygen.....	lbs. 2.192	Inorganic gain,
Water.....	lbs. 4.104	
Dry vegetable food.....	lbs. 1.687	Organic gain,
Dry animal food.....	lbs. .563	

Total daily gain..... 8.551

The total daily loss in a healthy body will be exactly equal to the gain.

A LARGE collection of fossils from the green sand beds of the Squankum Marl Company, near Farmingdale, N. J., has been presented to the Peabody Museum of Yale College, by O. B. Kinne, of New York. This important acquisition consists of several thousand specimens, many of them new to science. Among the new vertebrate fossils, which will soon be described by Professor Marsh, are the remains of a huge swine-like animal, larger than a rhinoceros, and several others not previously discovered in this part of America.

IN AN important paper communicated to the Academy of Science, by M. A. Mallet, he stated that between 200° and 400° Fah., and in presence of steam, protochloride of copper absorbs oxygen from the air almost instantaneously to form an oxychloride, which parts with its one atom of chlorine at a higher temperature. So that oxygen gas, or chlorine gas, can be prepared at will, and in as large proportions as we wish, the same protochloride of copper serving over and over again.

BORAX AS A DETERGENT.—As a means of cleansing the hair, nothing is better than a solution of borax in water. It leaves the scalp in a most cleanly condition, and the hair just sufficiently stiffened to retain its place. This stiffness, however, can be readily removed, if objectionable, by washing with water. Borax is also an excellent dentifrice. Dissolved in water, it is one of the best of tooth washes.

THE use of raw meat in the treatment of debility and consumption is in the ascendant in France; but that it may be served in a style the least objectionable to the patient's delicate sensibilities, it is prepared under the name of musciline tablets, and is made of raw fillets of beef covered with fruit jelly and candied sugar.

A CANDIDATE for death honors proposes to shoot Niagara Falls in an india-rubber boat, oblong in shape, and with a mean diameter of eight feet, and six inches thick at the top and sides and three feet thickness at the bottom.

THE wire of a telegraph line just put up between Dover, N. H., and Lake Winnipiseogee is made of a steel core surrounded by copper. By this construction, it is claimed, the following advantages are secured: superior conducting power with less weight of metal, durability, and a less number of poles on the line.

OUT of the thirty-one days of the month of May, the residents of this latitude enjoyed twenty-three rainy days, amounting in the aggregate to a steady shower of 150 hours and 18 minutes, or 6 days, 6 hours, and 18 minutes duration. The depth of water that fell during that time, as measured by the hydrometer, was 6.98 inches, against 5.791 inches which fell during May of last year.

IN the town of Arkwright, N. Y., is a little lake which has no apparent inlet, but two outlets; through the one its waters flow into the Conewango river, thence through the Alleghany, Ohio, and Mississippi rivers to the Gulf of Mexico; the other outlet forms a branch of Silver Creek, which empties into Lake Erie, and its waters thus find their way into the ocean through the St. Lawrence.

NEARLY two acres of land on a farm in Hamilton county, Fla., lately disappeared from mortal view, the pasture land now being occupied by a lake of at least fifty feet in depth. This sink is said to be the largest and deepest ever known in the State.

AN INTERESTING ELECTRICAL EXPERIMENT.—M. Becquerel, in making some researches into the subject of the dialysis of the electrical currents, lately found that in passing discharges from an induction coil, between the upper surface of a saline solution, contained in a glass tube, and the extremity of a platinum wire fixed at a short distance, the spark was surrounded with a cloud colored, according to the sort of salt used in the experiment.

HERSCHEL AND ARAGO found that the greater the number of spots on the sun during any year, the higher was the cost of breadstuffs. For the reason that the existence of these spots on the solar disk reduces the heat of the sun very materially. The experiments which led to this assertion were continued during a period of twenty-five years.