chapter with some very judicious observations, not a word of which is to be changed, even to-day.

"Upon considering this subject under all its relations. I remain persuaded that it would be impossible for any enemy whatever to enter a port in which torpedoes are used without exposing himself to a danger that all the courage possible could neither avoid nor surmount. Prudence and reason would make him abandon such an undertaking. It is even probable that, knowing us to be thus prepared, he would never attempt it, or that, if he did, the catastrophe of one vessel would suffice to guarantee us in the future against new hostilities."

In the following chapter Fulton describes a system of harpoon thrown by means of a small cannon or a blunderbuss, to which the torpedo is attached by a rope of variable length (Fig. 2).

It is unnecessary to say that this system is not utilizable to-day with our vessels all armored with iron; so we shall not dwell upon it. We cannot terminate this short retrospective review without citing the proposition that Fulton made to the government of his country and which figures in his book. We give it in order to show that this ingenious inventor was also a patriot and a man of noble heart:

"Moreover, in proposing this new plan of attack and defense, I do not pretend to abandon to others the care of executing it. If it is adopted in all its extent, with the proper number of men skilled in this maneuver, and if it is judged proper to put these men under my orders, and an enemy then enters our ports, I will satisfy my fellow citizens with the courage necessary to assure the success of the operation.

"But in proposing this, I wish to be well understood, in order that I may not be accused of aiming at a situation or command in a public station.

"My views are constantly directed toward an independence too dear to my feelings to allow me to desire to sacrifice them to ideas of any ambition whatever.

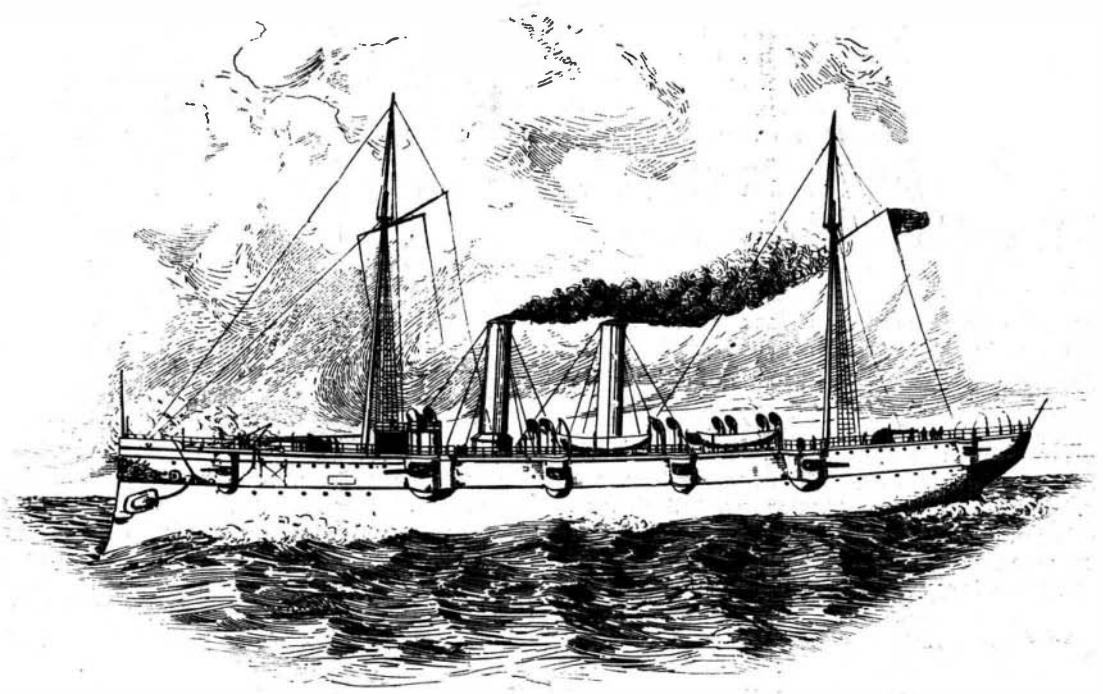
"I see here only a useful and, at the same time, honorable occupation, and it is to me a happiness to think that I can serve my country without any other motive than that of discharging the debt of a good citizen."

At our epoch, when torpedoes are adopted by all navies, it has appeared to us of interest to recall the labors of Fulton.—*La Nature.*

THE NEW UNITED STATES CRUISER MONTGOMERY.

The Montgomery, a sister ship of the Detroit, which we illustrated in our issue of September 2, 1893, succeeded in making 18·85 knots per hour over the entire course, thus demonstrating that she was the finest cruiser of her class. The Montgomery is known as a partially protected cruiser, a class of vessels which are now considered as very important adjuncts to the armored cruisers. After the tidal correction was made the speed was found to be 19 knots, so that the contractors (the Columbian Iron Works) will receive $200,000 in addition to the contract price, which was $612,500. The test was conducted with a steam pressure of 166 pounds, and the average number of revolutions was 180. The engines worked without any mishap, but the steering device was injured, or the speed would have been even greater.

The Montgomery is 257 feet long; 37 feet wide; draught, 14½ feet; displacement, 2,000 tons. Two vertical, three cylinder, triple expansion engines drive the two four-bladed propellers. The indicated horse power is 5,400. A protective deck varying from 0·43 to 0·3 inch thick is provided. The battery is composed of eight 5-inch guns and two 6-inch rapid-fire guns. There are also three torpedo-launching outfits and a secondary battery composed of six 6 pounders, two 1-pounders and two machine guns. For our illustration of the Montgomery we are indebted to *Marine and Railway.*

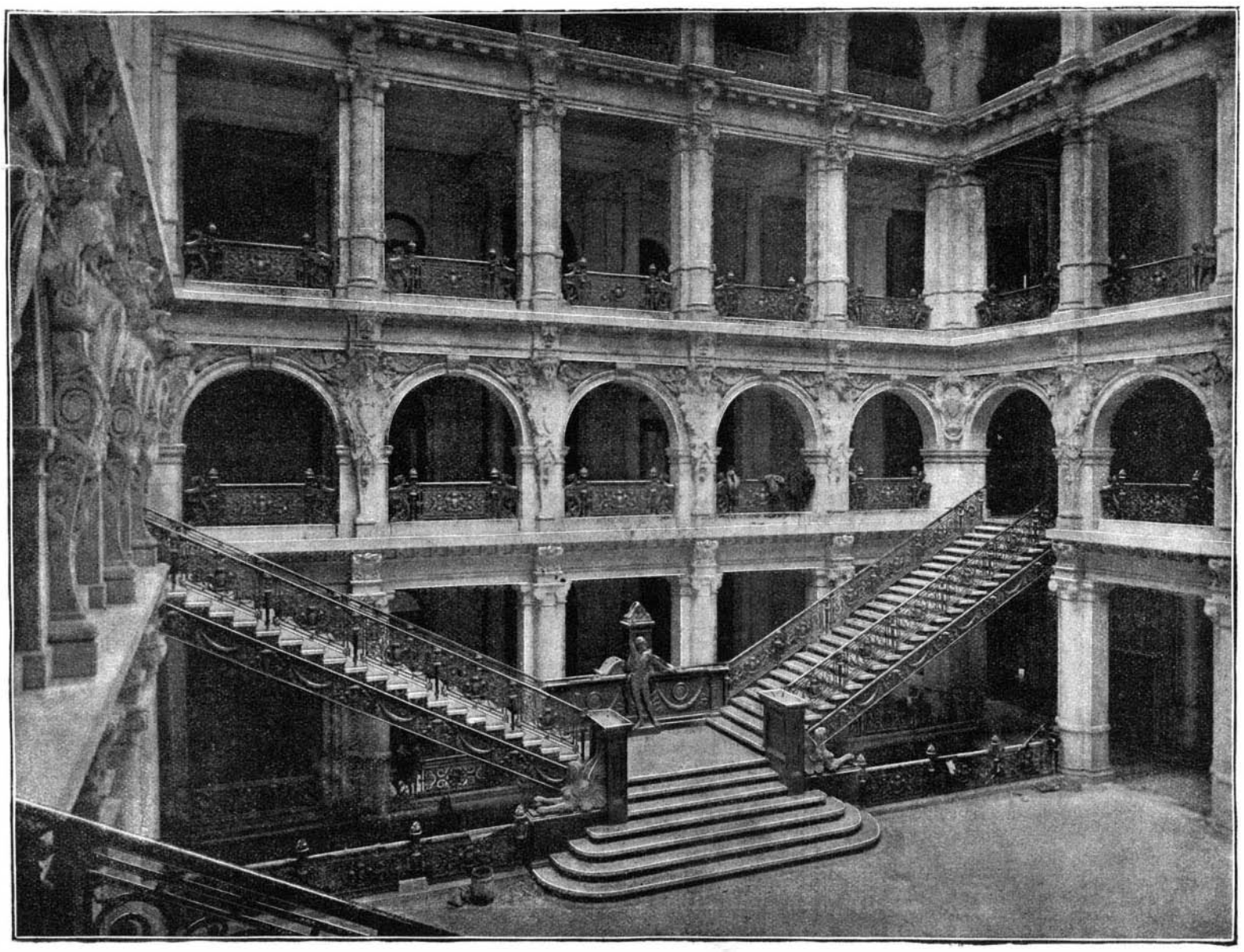


THE NEW UNITED STATES CRUISER MONTGOMERY.

THE CRIMINAL COURT BUILDING OF NEW YORK.

For many years the criminal courts of New York and the Grand Jury have been housed in a miserable fire-trap which should have been condemned long ago as unsanitary. In this rickety old building, ill-lighted, worse ventilated and reeking with sewer gas, other city offices were quartered, so that the space devoted to the criminal courts was totally inadequate, while the District Attorney has been obliged to occupy rented offices. At length the city fathers awoke from their lethargy, and on October 25, 1890, the corner stone was laid of a large and imposing edifice. The site is an historic one, being part of what was known in colonial times as "The Commons." The building occupies the block bounded by Center, Elm, White and Franklin Streets, and is connected with the city prison, usually called the "Tombs," by a bridge, which will probably be known as a "Bridge of Sighs." This bridge, which crosses Franklin Street, will enable accused persons to pass directly from the prison to the courts without being exposed to the gaze of the curious. The new building is 115 feet in height, and measures 188 by 190 feet, and in its plan allowance has been made for the widening of Elm Street.

The style adopted by the architects, Messrs. Thorn, Wilson & Schaarschmidt, is a modernized Renaissance, and the effect of the exterior is imposing. The edifice is constructed of light red pressed brick with trimmings of terra cotta and Belleville stone, and the



THE NEW CRIMINAL COURT BUILDING, NEW YORK.

iron roof is covered with tiles. The basement is devoted to the Street Cleaning Department and the Bureau of Contagious Diseases. On the main floor is the Court of Oyer and Terminer, Court of Special Sessions and a police court. On the first mezzanine story are various offices connected with the court. On the second floor are the rooms for the Court of General Sessions, judges' rooms, etc. On the second mezzanine are the executive offices of the Street Cleaning Department, the Grand Jury room, Coroners' Court, District Attorney's offices, etc. The fourth story is devoted to the Board of Health and the Excise Board. The amount which the city has been paying for rented offices will now be saved. The building is all finished in natural wood and the lighting, heating and ventilation systems are as perfect as money can make them. Six elevators render the various offices easily accessible. Some of the principal court rooms are to be decorated at the expense of the Municipal Art Society by the best American mural painters.

It is customary for all important courts to be approached from an impressive vestibule or ante-room, to emphasize the dignity of the law, as in the *Salle de Pas-Perdus*, in the *Palais de Justice*, at Paris, and the arrangement is preserved here. From a large marble vestibule, the visitor enters the great rotunda, which we illustrate. This rotunda is sixty feet square, and is built of marble, elaborately sculptured in delicate figures and tracery. On each side grand stairways of iron and marble add to the imposing effect. The newel posts will be surmounted by elegant bronze electroliers. This huge rotunda is covered by an ornamental glass roof. The whole rotunda is treated with excellent taste, and it is one of the finest rooms in America, and compares favorably with the grand vestibule of the Paris Opera House, which it somewhat resembles, although, of course, the rotunda lacks much of the fine work which has been lavished on the Opera House. The entire building, with furniture, will have cost about $1,500,000, and the disposal of this money reflects credit alike upon the architect and contractors, and New York may now well be proud of this fine edifice.

Natural History Notes.

Do Scorpions Commit Suicide?—The question as to whether scorpions commit suicide or not by directing their sting against their own body when they are placed within a circle of fire or are tortured in some other manner by this element is one that has given rise to the most animated discussions. The opinion that they do is probably held by many persons at present. But Mr. Bourne's experiments on some Madras species have demonstrated: (1) that the poison has no effect upon the scorpion that receives it, and (2) that these animals are easily and quickly killed by a moderate heat (50° C.) Besides, when they are discommoded by too hot an atmosphere, or, according to Lankester, by the vapor of chloroform, scorpions have the habit of agitating their tail in the air and of darting their sting forward above the head as if to strike some invisible enemy. If, by means of a lens, the solar rays are concentrated upon a scorpion's back the animal is observed to immediately rase its tail and endeavor to remove the cause of excitation therewth. So the true explanation of some, at least, of the alleged cases of suicide among scorpions would appear to be this: The animals have really been killed by the heat to which they were exposed, and the observers have erroneously believed that the strokes of the tail were designed to put an end to the animal's sufferings.

My own experiments, says Mr. R. I. Pocock, are wholly in favor of this conclusion. Upon placing a speciment of *Euscorpius* in a corked test tube and holding the latter over a slow fire, I have found that as soon as the temperature of the air in the tube begins to rise the animal gives signs of great distress and beats the space for some seconds in brandishing its tail, and afterward falls into a state of insensibility. At this moment the glass of the tube was, nevertheless, but slightly warm to the hand. Taken from the tube and placed near an open window, the animal rapidly revived; but, upon a repetition of the experiment for a third time it died. It never tried to sting itself.

I have made also some experiments upon *Euscorpius* and *Parabuthus* in concentrating the solar rays upon them by means of lenses and in putting mustard upon the membrane between the plates of the back. In both genera, I have witnessed tentatives made to remove the cause of irritation by scratching the place affected with the point of the tail, but great precautions were always taken not to sting themselves.

It appears, however, that scorpions have been seen to sting themselves under similar circumstances. One observer mentions, even, in the case of a scorpion of the Indies, that blood issued from the wound made by the sting—a detail that strengthens the probability of the accuracy of the observation. But, *a priori*, it is not probable that the scorpion intended to kill itself. It is not impossible that a blow directed at hazard against an invisible enemy accidentally reached its author, or that, in the case of localized irritation, as happens with the use of a lens or the application of acids, whisky, or mustard, the scorpion, not succeeding in ridding itself of the annoyance by ordinary means, directs its sting upon the point affected with the intention, not of killing itself, but rather of destroying the cause of its pain.

Finally, it may be conceived that the cerebral faculties are deranged by the torture and the approach of death, and that the scorpion, no longer recognizing its own body by the sense of touch, stings it as he would sting any other object within its reach. A blow thus directed in one way or another may chance to pierce the brain or seriously lacerate the great dorsal blood vessel and thus cause death independently of the action of fire.

So then, although it is admitted that scorpions sometimes kill themselves, our verdict should be, it seems, accidental suicide, or suicide through lesion of the brain.

Inheritance of Acquired Characters.—Owing to their coiling, the shells of Ammonoidea and Nautiloidea have furnished biologists with much evidence bearing on theories of evolution, and now Professor A. Hyatt has discovered yet another point, which, he claims, proves that acquired characters have been inherited. Coiled Nautiloidea have, as every one admits, been gradually derived from straight forms, such as Orthoceras. The cross section of an Orthoceran, or even of a slightly curved Cyrtoceran, or loosely coiled form, is circular or elliptical, but the section of a close-coiled form, like Nautilus, shows an impression of that part which comes in contact with the preceding whorl, so that there is a re-entrant curve. In old age, however, when the shells again uncoil, this impressed zone disappears, and the section becomes circular again—a fact which seems to show that the feature is directly due to pressure, and is, therefore, an acquired character. As such it is not found in the early, uncoiled stages of those Nautiloidea that are close coiled in the adult; at least it is not so found in any of the Silurian or Devonian species. But at last, in the Carboniferous, Professor Hyatt has found a species that seems to prove his point; for, in *Coloceras globatum*, which is in many respects a highly specialized species, seven specimens examined have shown this impressed zone existing while the shell was still in the partly curved or cyrtoceran stage. The same early appearance of the impressed zone is likewise seen in numerous Jurassic, Cretaceous, and Tertiary species, including the living *Natilus pompilius*. This, then, seems due to the inheritance of a character in successively earlier stages of individual development, according to a well known law; while the character so inherited is believed to be an acquired one.

The Respiration of Plants.—Mr. Anton Amm gives in Pringsheim's *Jahrbucher* (vol xxv., p. 1) an account of some investigations on the intra-molecular respiration of plants. With regard to the relations between the amount of carbonic acid produced in this function and the degree of temperature to which the plants were exposed, it was found that the minimum temperature, as in the case of normal respiration, was below freezing point, since at 0° C. a significant amount of the gas was given off. As the temperature rose, intra-molecular respiration also gradually increased; but this increase was not proportional to the rise of temperature. In both wheat and lupine seedlings the optimum was reached at 40° C., which coincides with the optimum for the normal process. On the other hand, while there is, doubtless, a maximum temperature for the latter function, in the case of the wheat plant and *Lupinus luteus* somewhere about 45° C., there can, properly speaking, be no such point in the intra-molecular process, since, in absence of oxygen, seedlings cannot stand temperatures between 40° and 45° C. without prejudice to their vitality, and the rapid fall in the respiration curve when the optimum temperature is passed is due to the commencement of death.

The author finds the relation between the amounts of carbonic acid formed in the normal and intra-molecular processes to vary with the temperature.

The relation between the amounts of carbonic acid gas formed in the two processes varies in different stages of development of one and the same plant, the fraction increasing with increasing development. The present investigations have also supplied fresh confirmation of the fact that, by the withdrawal of oxygen, production of carbonic acid at once sinks in amount, but remains constant for a long time at the lower level, and immediately rises again to the original amount when oxygen is again supplied.

Finally, the results show that the different organs of a plant, *e. g.*, flowers and leaves, give an almost identical relation between the normal and intra-molecular respiration, while the organs of different species show quite a different relation.

Effect of Temperature on the Coloring of Lepidoptera.—By careful and long continued temperature experiments in pedigree moth breeding, Mr. Merrifield has demonstrated the possibility of producing artificially from a single brood of a moth, subject to seasonal dimorphism, four distinct "temperature" varieties, viz.: summer markings with summer coloring, summer markings with an approach to spring coloring, spring markings with summer coloring, and spring markings with spring coloring. The conclusions reached as a result of this series of experiments are that the coloring and markings of the moth are affected by the temperature to which the pupa is exposed, the marking being chiefly produced by long continued exposure; that the coloring is effected chiefly during the stage before the coloring of the perfect insect begins to show that a low temperature during this stage causes darkening, a high temperature producing the opposite effect, a difference between 80° and 57° being sufficient to produce the extreme variation in darkness caused by temperature; a further lowering of temperature having no further effect; that nearly the full effect in coloring may be produced by a range of temperature of from 76° or 80° to 65° in *autmnaria*, and from 73° to 60° in *illustraria*; that dryness or moisture during the entire pupal period has no appreciable effect on the coloring of the adult.

A general conclusion which the author ventures to suggest (provided we accept the theory of Professor Weismann, that existing forms of North American and European Lepidoptera have come down from a glacial period) is that "icing" the pupa causes the insect to revert to its earlier form, and that experiments of the nature here recorded might be of materal assistance in tracing the evolution of the markings on the wings of the most highly developed forms.

Mr. Merrifield states that it is possible to cause either the summer or winter form to take on the coloring of the other, and produce from moths from the summer pupa specimens that resemble those from the winter pupa, but not *vice versa*.

Mars.

The following questions and answers are from a recent number of *Popular Astronomy*:

Why do astronomers think that the white spots about the poles of the planet Mars are snow or ice?

G. B. D.

Answer.—In connection with this question it was noted by the querist that the telescope shows a change in size of these white patches during the seasons of winter and summer on the planet Mars. This is the main reason why it is thought that the patches consist of ice and snow. It might be added that some good observers have seen indications on the surface of the planet that might be explained by supposing that a fall of snow had covered a considerable area. No astronomer would feel himself justified from his observations or what he knows of the surface of the planet, in assigning snow or ice as the cause of these white spots. Other plausible reasons could be assigned. Some observers have intimated that clouds in the planet's atmosphere might produce the appearance observed. This explanation does not seem as satisfactory as the former one.

From appearance in observation the atmosphere on Mars contains less clouds than that of the earth. If capacity for heat depends on the vapor in the atmosphere, how is it that the temperature of the planet's surface seems so high compared to that of the earth, notwithstanding its greater distance from the sun?

G. B. D.

Answer.—We are not aware that observers are agreed, or generally think, that clouds are less in the atmosphere of Mars than in our own. That would be an impossible thing to determine by observation at the distance of Mars, if we remember that our clouds do not run probably much above two miles in height on the average, except, as it might be inferred, that certain changes in color of surface markings are due to the presence of clouds. It is probable that the density of the atmosphere of Mars is less than that of the earth; the spectroscope also indicates that there is watery vapor in the atmosphere of Mars. From all that is known, or may be fairly inferred by analogy, we would say the temperature of Mars ought to be much lower than that of earth. But if appearances are not misleading, water on its surface does not freeze except in the region of the poles. If earth were viewed from Mars, it is plain that the polar white caps would be much larger than those of Mars are.

Astronomers do not give any reason for this unexpected difference in surface temperature on the planets. There is no known explanation.

A New Test Paper.

A very sensitive test paper may be easily prepared from mallow flowers (*alva*). The violet petals only are used, rejecting the green part of the flower. Fifty petals being infused in 100 c. c. of cold water, a faint violet solution is obtained. This liquid becomes

Ponceau red	on addition of	mineral acid.
Wine red	"	"	organic acid.
Violet red	"	"	acid salts.
Greenish blue	"	"	alkaline salts.
Green	"	"	alkaline carbonates.
Green (yellowish)	"	"	soaps.
Yellow	"	"	potash, soda or ammonia.

The alkalinity of a soap may be nicely gauged by this test.