Believing Dr. Dawson to be an honest man, the only inference we can draw from a sentence like the last is that he utterly misapprehends the views of modern evolutionists. Certainly nothing in the writings of Wallace, or Darwin, or Lubbock, or Gray can be found to sustain such an ultra Lamarckian method of development. To be guilty of such a mis-statement of the position of another is to forfeit one's claim to any respect as a scientific critic. Even Agassiz' mantle will fail to cover errors so gross and obtrusive.

THE NEW DEPARTMENT OF AESTHETICS.

Professors of the humanities have ever been inclined to look down upon the pursuits of naturalists as little becoming the refinement and dignity of gentlemen and scholars. They have delighted to picture such as turn their attention to the inferior world as eccentric fellows, chiefly employed, like the unfortunate spouse of Lady Jane in the "Ingoldsby Legends," in bug-chasing and poking into all sorts of dirty places for the ugly things that squirm in filth and darkness, solving the infinite (unlike the Breitmann) as one eternal—evolution!

We fancy that the cultivators of polite literature will therefore be taken somewhat aghast by the address of the retiring President of the American Science Association, especially by that part in which he serenely asserts that the chief requirement of the modern naturalist is an inborn and highly developed æsthetic faculty.

In the physical sciences everything depends on accurate observation, with strict logical consequences derived therefrom. In biology, on the contrary, while the basis of knowledge equally depends on accurate and trained observation, the logic is not formal but perceptive. Consequently the first requisite for excellence in this crown of the sciences is æsthetic perception.

Savages are usually keen observers, but they would not make good biologists: they lack artistic tact. The native Australians furnish an illustration. In them the absence of this faculty is complete. Oldfield relates that when one of them was shown his own portrait he called it a ship, another said it was a kangaroo, not one in a dozen identifying a portrait as having any connection with himself. Professor Le Conte gives a higher illustration of the same incapacity in a well known class of travelers. Having penetrated to the inmost chamber of the temple of Art, even the Hall of the Tribune at Florence, they stand in the presence of the most perfect works of art, and gaze upon them with the same indifference that they would show to the conceptions of the mediocre artists exhibited in our shops. Perhaps they even wonder what one can find to admire in the unrivaled collection there assembled. They may be highly educated, and good and useful members of the social organism; but they lack the æsthetic sense which enables one to enter into spiritual harmony with the great artists whose creations are before them.

Such unæsthetic and unappreciative persons would not delight a Ruskin, as students of Art; nor would a professor of rhetoric be hopeful of making poets of them. Professor Le Conte maintains that they would make no better students of biology. The æsthetic character of natural history makes it for ever beyond them, just as it prevents the results of its cultivation from being worked out with logical precision.

This view of the fundamental difference between biological and physical science claims accord with the views of such masters of biology as Helmholtz and Huxley. To the genius of the artistic interpreter more than the patience of the collector its future progress will be due. A rising giant has invaded the domain of polite literature, and the humanities must make room!

LIGHTNING RODS.

We published, in our last number, a very interesting communication from Mr. George B. Prescott, the electrician of the Western Union Telegraph Company, concerning an alleged electrical phenomenon, observed during a thunderstorm, within a private dwelling, and described by a correspondent in our paper of August 14, 1875.

The phenomenon in question consisted of electrical discharges from the water and gas pipes of the dwelling, which was furnished with a lightning rod. The question was as to the cause of the electrical manifestation. Mr. Prescott believed that it was due to the defective connection of the lightning rod with the earth; but in order to satisfy himself fully in the matter, he took the trouble to send an assistant to the locality, and subject the premises, pipes, and rod to actual electrical tests with the galvanometer.

The result was that the lightning rod was found to be so sadly defective in its ground connection that it could not conduct the electricity into the earth, except feebly; and whenever a thunderstorm occurred, the house became charged with electricity, and the current, being unable to pass down the rod, made its way through the building to the water pipe, and escaped through it into the ground. The details given by Mr. Prescott are quite interesting. He advised the immediate connection of the rod with the water pipe, which would thus to serve as an extensive conducting terminal for the rod, ensure the safety of the building, and put an end to the electrical manifestations among the pipes before mentioned.

This case is a representative one, as the rod was put up in the same defective manner as are the majority of rods, that is, the bottom of the rod was simply stuck down a few feet into the ground or rock, and thus practically insulated.

We have repeatedly advised our readers that a lightning rod, in order to serve as a protection for a building, must have a large conducting terminal in the earth. This terminal may consist of an iron water pipe, as in the present case, or a very considerable extension of the rod itself into wet or damp earth; or a trench, filled with iron ore or charcoal, may be made available.

The aggregate annual losses of life and property in this country, by the striking of buildings by lightning, is immense, but might be almost wholly prevented if properly arranged conductors were generally employed. But it is evident that a more intelligent class of lightning rod men are needed in their erection; and it is probable that electrical instruction must also be given in our common schools before much improvement can be expected.

If a man, employed to put up a tin pipe to conduct the rain water from the roof to the cistern, were to solder up the bottom of the pipe, thus preventing any flow, his work would be rejected, and he would be stigmatized as a fool. But this is substantially what our lightning rod men are doing every day. They put up rods for the alleged purpose of conducting the electric fluid, but seal or insulate the bottoms of the rods so that the fluid cannot flow into the ground; and the majority of employers are so ignorant of the subject that they are unable to detect the fraud.

The known laws that govern the flow of electricity are almost as simple as those relating to water. If a proper connection exists between the rod and the earth, the building will be protected, for electricity will flow through the rod with the same certainty that water will pass through an open leader from roof to ground. But if the bottom of the pipe be sealed, the water cannot run; and if the bottom of a lightning rod be sealed or insulated, the electricity cannot flow.

Tests of lightning rods with the galvanometer, as directed by Mr. Prescott, will always show whether they are safe or not. But it may be taken for granted, without a test, that a rod is unsafe which merely has its bottom stuck down a few feet into dry earth. We repeat, the golden rule for safety is to have the bottom of the rod placed in connection with a large mass of conducting material in the ground.

ANOTHER VIEW OF MR. CROOKES' LAST DISCOVERY.

In a recent issue we gave a summary of Mr. Crookes' recent observations on the behavior of delicately suspended pith balls when acted on by a beam of light. In a vacuum the pith balls, and disks of cork similarly suspended, seemed to be repulsed by the light under conditions which demonstrated, Mr. Crookes asserts, a hitherto unrecognized power of light.

Similar observations with substantially the same apparatus were made fifty years ago, so that the discovery is not new if true; it simply reasserts what was generally believed when the Newtonian theory of light prevailed, namely, that luminous radiations are capable of exerting a direct push upon matter. It is strikingly inconsistent, however, with the now dominant theory of light; and according to some careful observers, it is equally inconsistent with fact. Professor Osborne Reynolds suggests that the action of the pith balls or disks is due to the evaporation of some fluid on the surface of the disks, the recoil of the evaporating particles, as they leave the disk, driving it back.

A better explanation, because better sustained by experimental evidence, is that given by Professor Dewar, of Edinburgh, who claims that the heating of the disks is the efficient cause of the action observed. In his investigation Professor Dewar used substantially the same apparatus that Mr. Crookes employed, simply changing the composition of the disks and interposing certain substances having well known effects upon the radiations.

Placing a candle before the apparatus so as to cause a large deflection, he first interposed a vessel of ordinary glass, and the deflection was diminished. On filling the vessel with water, the disks ceased to be deflected. Now it is well known that water, though transparent to light, is almost opaque to heat.

The experiment was then reversed. A smoked piece of rock salt was interposed, shutting off the light but allowing the heat to pass through. The disk remained deflected: so likewise when a solution of iodine in carbon bisulphide was used, a substance opaque to light but transparent to heat. These experiments show that it is not the luminous radiations which have power to move the pith balls, but the obscure radiations commonly known as heat rays.

The next question was: How do the heat rays produce the motion? To test this, disks of rock salt (transparent to heat) and glass (transparent to light) were substituted for those of pith or cork. When a beam of light was thrown upon the clear salt no motion ensued, the radiations passing through unabsorbed. When the light was received on the glass, part was arrested, the glass was heated, and the disk was deflected. The effect was reversed when the back of the rock salt disk was coated with lampblack. The radiations were absorbed by the lampblack at the surface of contact; the lampblack was heated and, by conduction, heated the salt, and the result was (at first) repulsion. Were the lampblack a good conductor, it would heat through first, and then there would be repulsion from that side, or apparent attraction. This in a vacuum: at ordinary pressure the motion is always forward from the side of the disk most heated.

Other experiments were made with disks of sulphur, clear and ordinary; and with transparent disks coated on one side with white phosphorus, which is opaque to the ultra-violet rays. In the latter case, when the disks were acted on by light, chemical action ensued with disengagement of heat, resulting in a motion of the disks away from the side heated. The reverse was demonstrated by bringing ether near a disk; and doubtless the same effect would have been produced by a piece of ice. The chilling substances caused a radiation of heat from the side of the disk toward it; the distant side became the heated one, and apparent attraction was the result.

Professor Dewar's explanation of these phenomena is simple, and does not involve any new or inexplicable power in radiations. The apparent attraction of the disks by light under ordinary pressure is caused, he says, by convection currents. The air or gas in front of the disk is heated, and, rising, tends to cause a vacuum; the disk consequently advances, pushed forward by the power that drove the ship of the "Ancient Mariner":

> "The air is cut away before
> And closes from behind!"

In a vacuum the effect is different: the disk is repulsed instead of attracted—repulsed by the recoil of the residual molecules of the gas, which leave the heated side of the disk at an increased velocity after impinging upon it in the course of their travels.

"What takes place is this: The particles of the gas are flying about in all directions, with a velocity which depends on the temperature. When they impinge on the heated disk, they go off with a greater velocity than those which go off from the colder side, and hence there is a recoil of the disk. When the gas is at all dense the particles get a very short way before they are met by another and sent back, and so the velocity gets to be a common velocity before any visible action takes place. When the gas is rare, the particles may get a long way off before they meet others, and so the action becomes perceptible."

The vacua employed by Professor Dewar were formed by the charcoal method, the density of residual gas being reduced to one four-millionth of its density at ordinary pressure. In such a vacuum, the average path between two collisions is about 1 foot against an average of one four millionth of a foot at ordinary pressure. It will be seen, therefore, that the particles may have relatively a very long way to travel after leaving a disk.

For the benefit of those who have dreamed of securing a profitable direct motive power derived from solar radiations, it may be added that the total work done by the radiations in these experiments did not amount to the five-millionth part of the available energy received by the movable surfaces.

EXPLOSIONS IN GUNPOWDER MILLS BY ELECTRICITY.

A correspondent remarked, some time since, that the mysterious explosions of some powder mills may probably be due to an electric spark given off by persons dressed in woolen clothing, who, when the air is dry, may (by friction of their clothing or feet) produce from their finger ends a spark of electricity sufficient to ignite a gas jet. He submitted the question whether it would not be possible that men at work in powder mills may create so much electricity in their bodies that, when their hands come in contact with metallic conductors, it may be, if not sufficient to ignite powder, enough to ignite some inflammable gas generated from the chemicals.

This letter has drawn the attention of the London *Chemical Review*, which states that in England they have often seen in American journals the statement that an electric spark, sufficient to ignite gas, may be given off by the human hand; but the editor says that he never heard of such cases on his side of the water. We know that the air in England and all the countries of Western Europe is very damp, owing to the prevailing west winds and the absence of extensive areas of dry land, blowing over which the wind would become very dry, as are our west winds, coming over our prairies.

It is asked what inflammable gas may be generated in the manufacture of gunpowder? To this, it may be answered that, in the manufacture of fulminates for percussion caps, inflammable vapors, as nitrous ether, etc., are given off, while the dust of gunpowder and even of charcoal, when floating in the air in a proper quantity, may form an explosive mixture. Even the dust from the mineral grahamite, which in its character is very similar to gunpowder charcoal, has repeatedly exploded in the mines in Western Virginia, when mixed with air in the right quantity. It is well known among electricians that a weak electric spark will more easily explode gunpowder than a strong, intense spark; the latter will scatter a heap of gunpowder without igniting it, but, when the spark is weakened by substituting for a part of the conducting metal a less conducting material, such as water or a moistened thread, then ignition will readily take place.

We acknowledge that we have no positive evidence that powder mills have actually been exploded by electricity; but the possibility of such a cause was only suggested in our paper, and it must be admitted that this suggestion is not unworthy of serious attention.

Resignation of Commissioner of Patents.

The daily papers announce the resignation of Mr. J. M. Thacher, the present Commissioner of Patents, to take effect October 1. His successor has not yet been announced by the President, but the name of R. H. Duell, of Courtlandt county, N. Y., is mentioned as the probable appointee. Mr. Duell is reputed to be a lawyer of considerable ability as well as a first class politician. He was formerly a member of Congress.

NEW RUSSIAN GUN.—A great cannon, lately built at the works at Oboukowsky, has cost $65,000, and weighs 40 tons. It is a breech loader, entirely in crucible steel, 20 feet 6 inches long; its largest ring is 57½ inches in diameter, and the tube has thirty-six grooves.

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Continued from first page.

floors and the basements below are occupied by the post office, and the third and fourth floors by the United States courts and offices (the interior of the United States Court is shown in our Fig. 2). There are ten elevators for mail matter, and four for passengers. The building looms up grandly above the structures in the vicinity, and attracts and interests the attention of every beholder. The solid walls of the post office contain half a million cubic feet of granite. Every credit is due to the great ability shown by A. B. Mullett, formerly United States Supervising Architect, in perfecting the plans of the building, and giving to New York an edifice that will be a continual source of pride to it.

The business transacted in the post office in this city is something marvelous, being nearly double that of any other city in the Union. The average number of domestic letters received and distributed daily is 300,000; the number of foreign letters received, 30,000; the number dispatched, 35,000; and the number of local letters received and distributed, 120,000. There are 5,795 lock boxes for letters, and 372 lock boxes for newspapers. At the post office and stations there are about 1,300 employees, and 390 carriers are employed. In the post office proper there are 600 clerks.

Experience has shown that Mondays and Thursdays are generally the heaviest days. To properly manage a business so vast and so complex as that transacted in the New York post office requires the highest order of executive ability, combined with a quick perception of details needed to systematize the work so as to make one harmonious machine.

THE ELEVATORS.

One of the most noticeable features of the interior of the building is the telescopic hydraulic elevator. Eight of these are used for handling the mails, and four for passengers. Of the latter the two principal ones are located in the wells of the grand spiral stairways which occupy the pavilions at either extremity of the north or park front. The elevator cars are of elaborate design and finish. Their most striking peculiarity, however, is their mode of operation. Imagine an iron telescope about 18 inches in diameter and 30 feet long when closed; set the small end up, with a car resting on the eye piece. Now this telescope, being strong enough to resist great internal pressure, has its three polished wrought iron slides working through watertight stuffing boxes; and it is obvious that, when water is forced into it, the slides will be forced out and up, and the car, resting on the upper one, will in consequence be elevated. To lower, the confined water is permitted to escape, when the weight of the car and slides causes a prompt descent. These operations are controlled by a threeway valve, actuated from the car by a guide rope in the usual way; and by its means the speed in either direction can be instantly adjusted to any rate, from an almost imperceptible motion to 100 feet a minute with perfect ease and steadiness.

The engraving, Fig. 3, represents one of the large passenger elevators extended to its full hight. Their range is from the first to the fourth floors, a distance of about 80 feet.

These elevators were built by Messrs. Davidson & Mars, of 36 Courtland street, New York city.

The foregoing engravings are all executed by the new process of the Photo-Engraving Company, No. 62 Courtlandt street, this city, an account of which we give in the subjoined article.

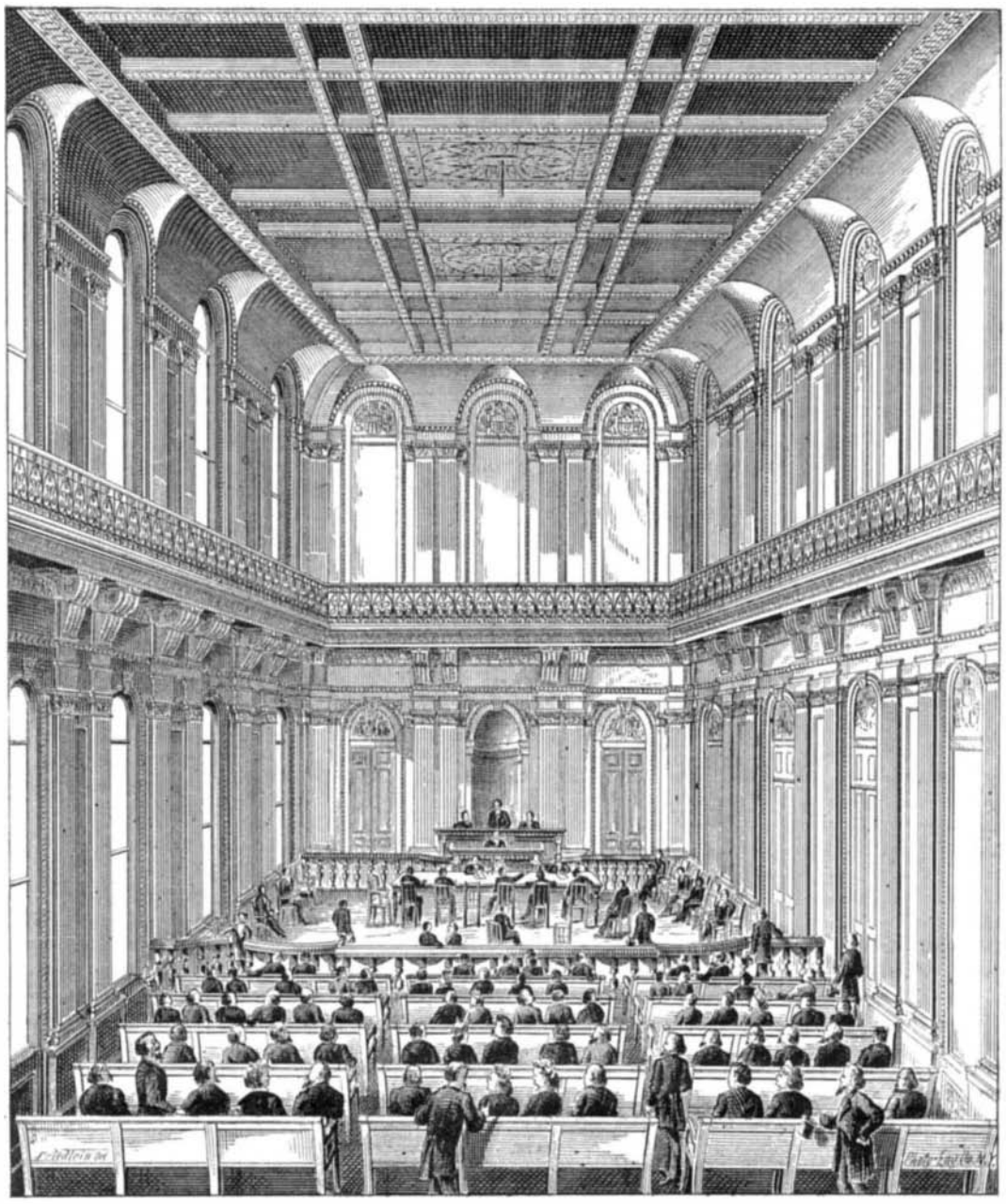
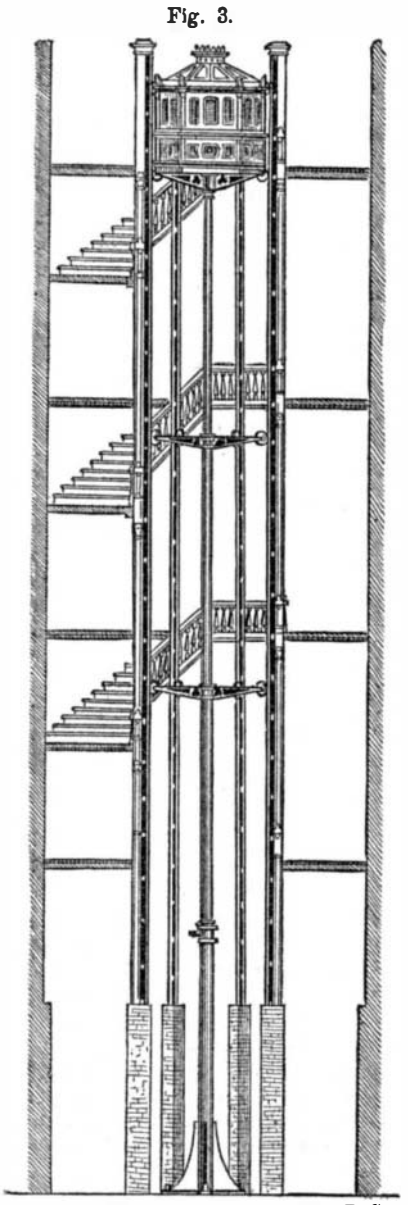


Fig. 2.—THE UNITED STATES COURT, POST OFFICE BUILDING, NEW YORK CITY.

Fig. 3.



THE HYDRAULIC ELEVATORS, NEW YORK POST OFFICE

Photo-Engraving.

The production of metallic plates engraved by the aid of light, for use in printing, was attempted as early as 1813, by Niepce, about twenty-five years before the art known as photography was invented. Since then, many attempts at photo-engraving have been made, and numerous specimens of more or less merit have been exhibited; but it is only within the last few years that this art has been brought to such a degree of perfection as to serve a useful purpose.

Among the various inventors in this field, John C. Moss, superintendent of the Photo-Engraving Company, of this city, seems to have achieved the highest success. Being both a practical photographer and a printer, his experience gave him great advantage in his endeavors to prepare plates, by means of photography, to be used on the ordinary type press. He commenced his experiments with great enthusiasm, in the spring of 1858; but it was not till ten years later that he had so far succeeded as to get his process into practical working; and then the want of means compelled him to carry on his operations in the same apartments where he lived, in Jersey City.

After prosecuting his work for a year or more under these embarrassing circumstances, and subsequently, for a few months, in a loft on Cedar street, in this city, his plates had attracted so much attention that he was induced to unite with others in the organization of a company for the purpose of carrying on the work upon a large scale. Accordingly the Actinic Engraving Company was formed. But this did not prove a financial success; and after a year and a half it was abandoned.

There are some inventions which, though of great value, are slow in winning their way to public favor. This proved to be one of them. There existed in the minds of many publishers a strong prejudice against process engraving, due to the fact that several processes had been introduced, of which they had made trial with very unsatisfactory results. Time was required to prove that Moss' process was not like the others.

Another and perhaps greater obstacle was met in the reluctance of artists to adapt their style of drawing to the requirements of this new art. They had been accustomed to make their drawings with pencil and brush, often hastily, leaving the work to be perfected and finished by the slow and tedious toil of the wood engraver. Now they were asked to furnish pen and ink drawings, executed with the care and exactness necessary to secure the desired result. Their first attempts were generally failures, increasing the indisposition to change.

But Mr. Moss had pursued his invention too long to be disheartened by these obstacles and delays. A new organization—the Photo Engraving Company—was formed, something more than three years ago. Expensive apparatus and machinery have been introduced, important parts of which have been invented and constructed expressly for this use; workmen have been carefully trained to perform their respective parts; a corps of artists, patiently instructed, have become skillful in the style of drawing required by this method of engraving; and the process itself has, in several respects, been essentially changed and improved.

One of the methods devised by Mr. Moss to save labor in the production of pen drawings is this: The copy from which a drawing is to be made is photographed double the size of the plate required, on arrowroot paper, and then fixed and well washed, but not toned. Directly upon this print the drawing is made with a pen and india ink. When the outlines and all the important parts of the drawing are complete, a saturated solution of corrosive sublimate in alcohol is flowed over the drawing, which bleaches away the photographic color without at all injuring the lines in ink. The finishing touches are then added, when the drawing is ready to be reduced and engraved. Thus the tedious operations of sketching and tracing are obviated, and a degree of accuracy is secured which it would be difficult to obtain by any other means.

It should be observed here, however, that drawings are not required for all the engraving done by this company, since a large part of their work consists in the direct reproduction of woodcut, lithographic, and steel plate prints, either of the same size as the originals, or of reduced or enlarged sizes.

Up to the present time this company has engraved over 50,000 relief plates, measuring over 500,000 square inches; and it is estimated that, with about 60 employees, they are annually performing an amount of work that would require for its accomplishment at least 1,000 skillful wood engravers.

The view of the New York Post Office Building, on our first page, was engraved by this process from a pen drawing made by one of their draftsmen.

The English Polar Expedition.

News has been received in England from the polar expedition, which sailed early in the summer. Both ships had arrived at Disco, Greenland, after a pleasant voyage, and preparations for pushing further north were in active progress. During next spring six sledges will start for the pole. One sledge will leave the party and return every week or so, transferring its surplus provisions to the others. When the exploring party is thus reduced to one sledge, that will push on alone and reach the pole by itself. If this is done satisfactorily, and all the surveys are completed, the expedition will be able to return to England during the autumn of 1876.

MR. PROCTOR, the celebrated English astronomer, who lectured in this country two years ago with so much success, is about to come again. He is an able and interesting speaker.

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