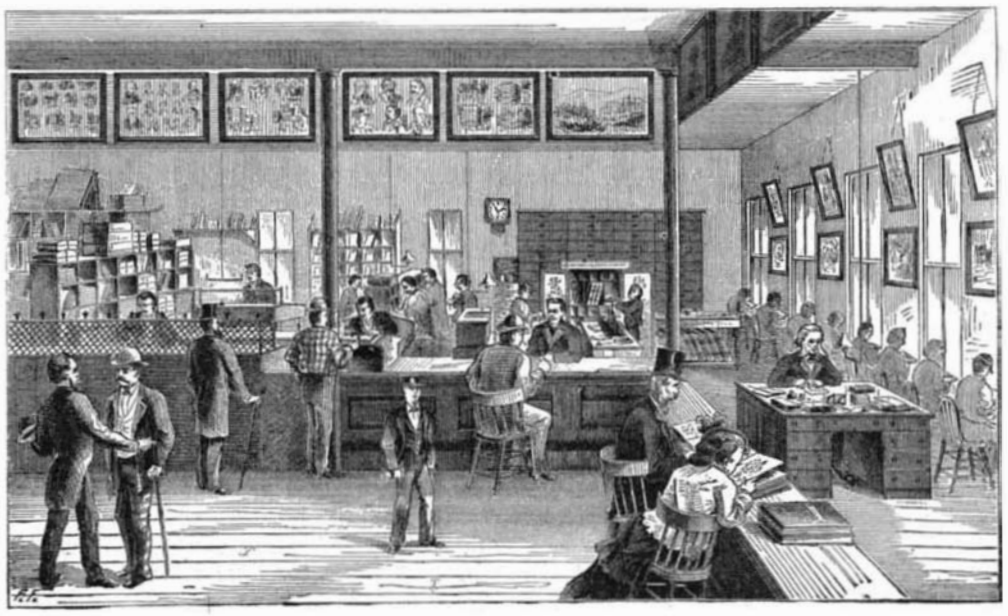
THE PHOTO-ENGRAVING COMPANY OF NEW YORK.

The earliest attempts to produce engraved plates by the aid of light appear to have been made in France about the year 1813, by Nicéphore Niépce. He was prosecuting experiments in lithography, then in its infancy, when he conceived the idea of transferring his drawings on to the lithographic stone by the aid of light. While thus engaged it occurred to him that he might produce engraved plates by the same means, and even render permanent the image shown in the camera obscura. After continuing his experiments for more than fifteen years, he associated himself with Mons. Daguerre, who had also spent several years in similar investigations. In 1833 Niépce died, and a year or two later Daguerre invented his method of developing the latent image impressed by light on an iodized silver plate, by means of the vapor of quicksilver.

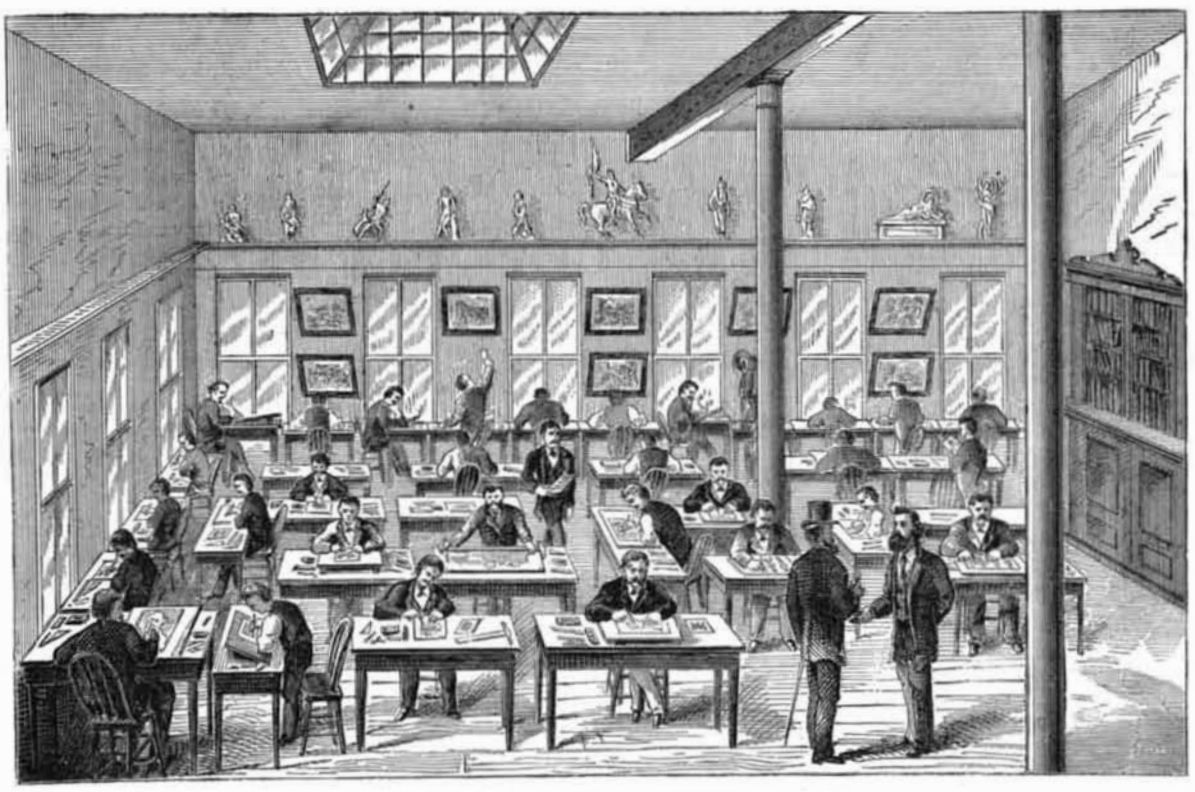
Niépce's method of heliography, as he called it, consisted in coating a metallic plate with a film of asphaltum dissolved in oil of lavender. Over this plate he laid a print or drawing, which had been rendered transparent by the application of oil, and then exposed it to the sun. The dark lines of the drawing protected portions of the asphaltum from the light, while the unprotected parts were acted upon and became insoluble. The plate was then washed with turpentine, which removed the asphaltum where the light had not acted, but left the remainder undisturbed. The bare metal, thus exposed, was then etched with an acid, and an engraving produced. But the results thus obtained were very imperfect and practically useless.

There are quite a number of different processes which may be classed under the general heading of photo mechanical printing, which it is not deemed necessary to review in detail here, as the degree of success attained has been frequently small, especially when the particular system was subjected to the rapid and comparatively careless manipulation incident to the use of the fast newspaper press. It may be stated, however, that nearly all of these processes depend upon the use of bichromate of potash with which is associated gelatin or similar organic matter. Mungo Ponton, in 1839, first discovered the sensitiveness to light of a sheet of paper treated with bichromate; in the following year Becquerel found that the sizing of the paper played an important part in the change, and in 1853 Mr. Fox Talbot discovered and utilized the insolubility of gelatin exposed to light in the presence of bichromate. In 1854 Paul Pretsch discovered and utilized the quality which such exposed gelatin possesses of not swelling in water. On Pretsch's discovery are based the gelatin processes that have attained most notoriety, and that have excited among experimenters the largest expectations of success, as follows: A glass or metallic plate is coated with a mixture of gelatin and bichromate of potash, which is allowed to dry and afterwards is exposed to the sun through a photographic negative. It is then immersed in cold water, when the parts protected from the light by the negative rapidly swell, while the parts not so protected are hardened and do not swell to the same extent. This gelatin surface then becomes the matrix from which, through intermediate steps, the final plate for printing is formed. The main difficulty encountered is that the surface of the matrix is made up of unequally swelled lines, and these, as reproduced, come out without sharpness—uneven and clumsy. Hence when placed upon the press, the plates are found incapable of yielding a clean and bright impression. The other process differs from the foregoing in that instead of swelling the soft parts they are wholly washed out. The difficulty here is that the water affects the insoluble portions, so that the lines are rendered rounded. Broad lines are also likely to become concave and to require subsequent pumicing to level them, a proceeding which is fatal to their delicacy and fineness of definition.

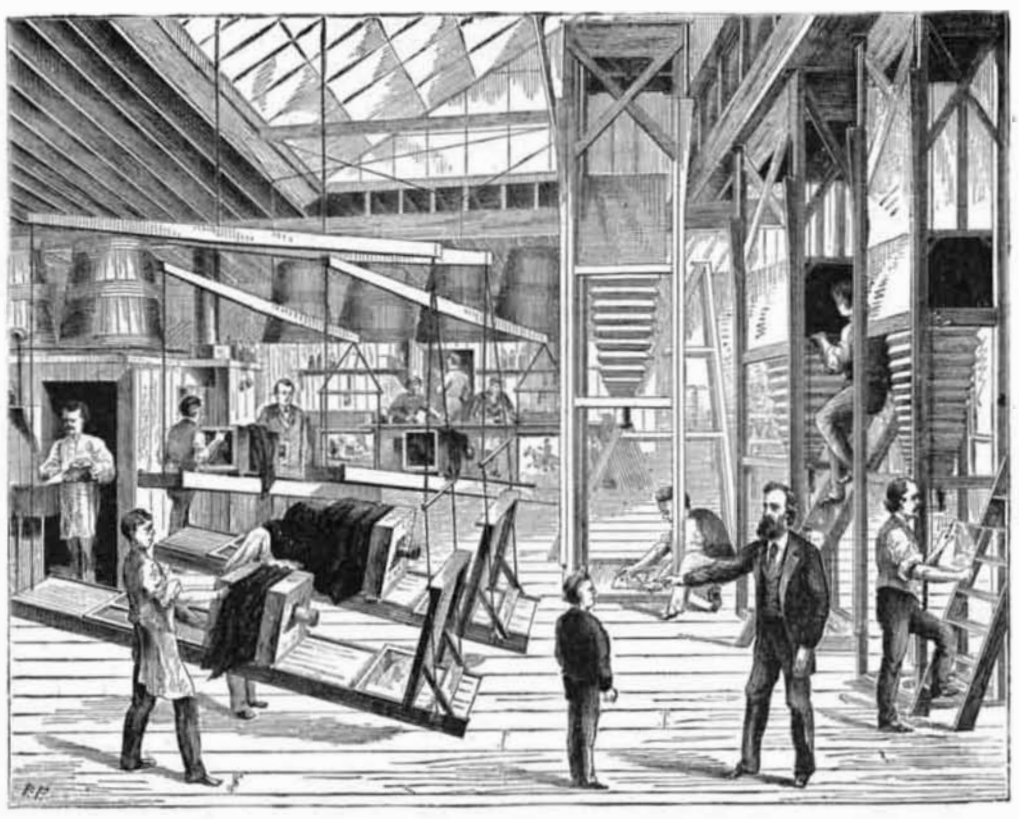
These processes, as already stated, constitute the foundation, but the results they yield are materially affected by the different minor modifications which individual experimenters have introduced and which, as a rule, are kept secret and not patented. The Moss process arose from an effort to avoid the difficulties above referred to. It is a combination of certain elements of other processes, for the purpose of securing completeness and delicacy of detail, in connection with all desirable depth and smoothness of lines. Of the two prominent photo-engravng concerns in this city, one prepares its plates of zinc, and turns them out ready for the press without the further necessity of any hand routing or other tool work; the other produces fine plates in type metal, and finishes by hand. In both cases, however, hand work is involved, as in that first mentioned the necessary sharpening of the lines is done on the negative.



OFFICE OF THE PHOTO-ENGRAVING COMPANY, NEW YORK.—Fig. 1.



ARTISTS' STUDIO OF THE PHOTO-ENGRAVING COMPANY.—Fig. 2.



PHOTOGRAPHIC DEPARTMENT OF THE PHOTO-ENGRAVING COMPANY.—Fig. 3.

The annexed illustrations, representing the various steps in the photo-engraving process, were prepared by the Photo-Engraving Company, of this city, and are excellent examples of the fineness and delicacy of the work done by means of the Moss process. These plates are made of type metal by stereotyping, and are hand finished The first operation is to prepare the drawing which is to be reproduced. To do this successfully it is necessary that the picture should be formed of clean, sharp, and very black lines. Flat tints and washes, or blurred shadows, cannot be photo-engraved unless they are first translated into lines. Where an engraving is to represent a piece of machinery, for example, a photograph of the object is taken, but is not fixed in the gold bath. From this print the artist obtains his outline in black ink, and this done he obliterates the photograph by corrosive sublimate. He has then an accurate outline, which he proceeds to fill in with a shading, etc., of pen lines. It is usual to make the drawing somewhat larger than the engraving is to be, in order that by the reduction the lines of the latter may be rendered finer.

The interior of the artists' room of the Photo-Engraving Company is shown in Fig. 2. Next ensues the photographing, and the apartment in which this is conducted is represented in Fig. 3. Here a negative of the drawing is prepared, from which, by several intermediate steps, a mold is made. The picture during this process is reduced or enlarged as desired, the reduction being only limited by the capability of the resulting block to yield a clear impression under the conditions of printing to which it is to be subjected. Thus a finely reduced engraving would soon fill with ink and produce a disagreeable and blurred impression on a rapid press, while, on a slow book press and on fine smooth paper, the same engraving would give excellent prints.

The reader will notice from this illustration that the cameras used are exceedingly large, thus giving clear and very well defined pictures, while the entire apparatus of both camera and retaining device for the picture to be photographed is suspended from the ceiling of the room by a single rope. The advantage of this last arrangement is that it prevents independent accidental movements of camera and object. Should one or the other move even the merest fraction of an inch—and this might easily be caused by the jarring of the building through the passage of heavy vehicles in the street—it is evident that the accuracy

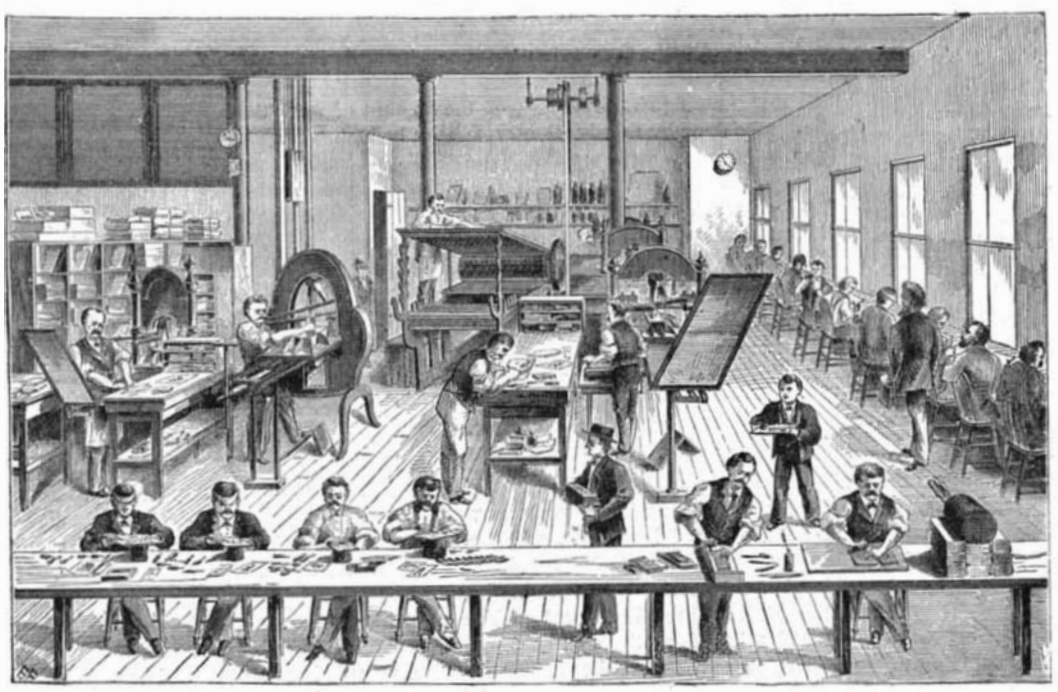
of the photograph would be impaired, but, so long as both camera and object must move together if at all, their relative positions always remain unaltered. It is by such nice relative refinements as this that the clear sharp work, of which the annexed engravings are excellent specimens, is produced by the Photo-Engraving Company.

After the photo-plate is finished, and this is a work requiring skill and scrupulous care, it is copied in metal, and this copy forms the engraving or block that is used on the printing press. The room in which these metallic plates are made is shown in Fig. 4, and here appear the various devices for melting the metal, running it upon the molds, etc. The next process is the trimming of the plates, and this is done by skilled engravers, who, with the burin, render the lines sharp and clear, and cut away metal in the high lights to intensify the same. This work is of course entirely auxiliary to the photo-engraving process, but it has the advantage of rendering the engravings produced by the Photo-Engraving Company from drawings or other engravings almost as perfect as the originals. Very often it is found necessary to reproduce a picture which is poor, but the only one attainable giving the desired representation. In such case the photo-engraving is an accurate reproduction, faults and all, but the latter are speedily modified by the skill of the finishing engraver.

The plate of metal is now mounted on a block, type high, and no further treatment is necessary to adapt it for the printing press. Sometimes where a large number of impressions are to be taken, the surface is coated with a thin film of copper by electro-metallurgy, or an electrotype is taken from the plate the same as from a wood cut.

STEREOTYPING DEPARTMENT OF THE PHOTO-ENGRAVING COMPANY.—Fig. 4.

Fig. 1 represents the interior of the office of the Photo-Engraving Company, at Nos. 67 and 69 Park Place, this city. Here may be seen a large collection of engravings reproduced by the process we have described. Fine line steel engravings are duplicated with wonderful accuracy, so that instead of paying ten or fifteen dollars for a choice picture, the lover of art may now obtain the same at a tenth the price. The capabilities of the photo-engraving art were never better illustrated than by the splendid portrait of Professor John W. Draper, which occupied our initial page last week. For color, delicacy of line, and general artistic effect, this work of art is universally admitted to equal the best efforts of the wood engraver. The process used by the Photo-Engraving Company is due to the ingenuity of Mr. John C. Moss, who has labored constantly in inventing and improving the same for nearly twenty years. The exact means whereby the excellent results we have noted are obtained are kept secret, but this is of no importance to the public, so long as such high grade work can be uniformly produced at a cost less than that of wood engraving. Several thousand illustrations prepared by the Photo-Engraving Company have appeared in the SCIENTIFIC AMERICAN and SUPPLEMENT during the last few years, side by side with the best productions of hand wood engraving; and in this fact will perhaps be recognized one of the best recommendations as to their excellence, which photo-engraved illustrative plates have received.



PROVING AND FINISHING DEPARTMENT OF THE PHOTO-ENGRAVING COMPANY.—Fig. 5.

Electric Fire Balls.

M. Planté seeks in the foregoing experiments of his an explanation of the *foudre globulaire* or "fire ball." They show that with a sufficient quantity and tension of electricity we can obtain the electric light in a globular form. He therefore thinks that this manifestation of the lightning discharge is due to an abundant flow of electricity in the dynamic state in which great quantity and potential are united. Those particular cases wherein the fire ball is seen to move and to stop are explained by the motion or rest of a column of humid air, strongly electrified and invisible, which serves for an electrode. In order to imitate this effect it suffices to oscillate the platinum electrode in the above experiments, pendulum fashion, over the water, or a metallic surface, when a little fire ball is seen to move over the surface opposed. This explanation of the fire ball has been advanced before by Mr. Cromwell F. Varley.

Prismatic House Signs.

A new contrivance for rendering the numbers of houses visible by night is becoming general in Paris. It consists of a hollow triangular prism about nine inches long, two of whose sides are formed of panes of blue glass, on which the number of the house is picked out in white. This prism-shaped lamp-glass rests against the front of the house, so that the two sides with the numbers on them can be plainly seen by the passers-by. In the interior of the prism is a gas jet, fed by a pipe from the house. Householders on the Avenue de l'Opera have been obliged to supply this mode of numbering at their own expense on the houses they are building; and the municipal authorities have introduced it on some 450 of the municipal establishments, schools, police offices, fire brigade offices, etc.

Proposed Diversions of the Nile.

It is well known that the main stream of the Nile is supplied by the great equatorial lakes of Africa, and that the annual inundations are caused by the inrush of torrent water laden with soil from the fertile slopes of the Abyssinian plateau in July, August, and September. This silt is now for the most part being deposited in the bed of the Mediterranean, where it is gradually forming a new delta similar to the delta already formed at the river's mouth. Sir Samuel Baker has written to the *Times* suggesting a plan by which not only the water of the Nile but the mud, which it now deposits wastefully in the sea, may be turned to good account as a fertilizer of the deserts of Nubia, Libya, and the Soudan. He proposes by suitable engineering works to divert a portion of the Nile flood water into these deserts, where it can deposit its rich sediment on the sands, and also irrigate them so as to transform them from a desert into "cotton fields that would render England independent of America." This could be effected by having suitable dams and sluices at different points of the Nile, say at the Cataracts. These dams and sluices, by enabling craft to pass the Cataracts, would also render the Nile navigable from the Mediterranean to Gondokoro, a space of 29° of latitude.

New Oil Wells—Pennsylvania.

A correspondent of the *Petroleum Reporter* says the Clarion oil region is just now experiencing livelier times in the way of operations and new developments than it has ever done heretofore. The number of wells going down is simply enormous, and the statistics total for November will far exceed that of any previous month. The principal field of production, and that wherein lies the most excitement at present, is the Eastern belt, or what is known by that title in the district. A large number of "wild-cats," or test wells, have gone down off the eastern edge of the defined line, but with very few exceptions they have proved dusters. The venturesome operators have succeeded in widening the belt but little, although a great deal of money has been spent for that purpose the present summer. The most prolific territory appears to be in the vicinity of Slam Bang City, a new town on the Twenty-two degree line, and situated between the Stone Church and Shippenville. The Davis well, struck at this place, about three months ago, started off at 400 barrels a day, and has averaged about 125 barrels ever since the "head" was pumped off. Several other wells have been struck in the same vicinity, the largest being that of Cram & Co., on the Wood farm. This one made 750 barrels the first twenty-four hours, and is yet doing over 100 barrels a day.

A good deal of operating has also been done on what is known as the Middle belt, but the territory is all old and developed, and no big strikes have been effected. The Western belt came into existence in May last. Three wells which had been sunk previous to that time proved dusters, and the first oil was found in that month. The next well down on this belt was the great Howe gusher, which did 400 barrels the first day. After that strike operators went crazy, and scores of holes have been put down since. About one half of them are dry, while the others are gradually and fast decreasing in production. The sand is very tight and thin, and the pumping wells decrease after the style of the Bullion gushers.

Some New Lecture Experiments.

H. Kämmerer proposes to show the combustibility of nitrogen, in other words, that nitrogen will unite with oxygen at a sufficiently high temperature to form nitric tetra-oxide, NO_2, a reddish colored gas. He takes a half gallon glass cylinder full of air, and burns in it some 12 or 15 inches of magnesium ribbon. The heat produced is sufficient to produce some of the red gas, which can be easily recognized by its color and intense odor. To prove its presence to an audience, he puts in the jar an acetic acid solution of iodide of potassium and a little starch solution, which is blued by the iodine which has been liberated by the nitric tetra oxide.

Gramp exhibits the green flame of burning zinc, and the cloud of white oxide (philosophers' wool) formed, by making a little brush of zinc turnings 1½ inches long and ¾ inch thick, and fastening it to the end of an iron rod, which he holds in the flame obliquely over an iron plate. To show the combustion of cadmium and the cloud of brown oxide he heats the metal in a small porcelain crucible over the blast lamp. Cadmium can be obtained in beautiful brilliant crystals by distillation in hydrogen gas current.—*B. d. D. Ch. Ges.*

MAGNETIC PROPERTIES OF NICKEL AND COBALT.—M. Hankel finds that with feeble currents the magnetic power of nickel is equal to that of soft iron; but with strong currents it is comparatively feeble. The magnetic power of cobalt with both strong and feeble currents is much less than that of nickel and soft iron.

AQUA FORTIS, applied to steel, produces a black spot.