LANTERN PANTOGRAPHS.

BY GEO. M. HOPKINS.

For the production of off-hand tracings for illustrations, especially during the projection of a series of experiments or pictures, nothing can excel a pantograph adapted to the lantern. Two forms are here shown, both of which produce figures on the prepared glass without exhibiting the arm by which the work is done.

The instrument shown in Fig. 1 is, perhaps, hardly deserving of the name given to it, as it is not strictly designed for accurate copying, on account of distortion, but it may be used in copying when a true figure is not important. It is designed rather for tracing upon the prepared glass while the operator watches the progress of his work as it is projected upon the screen.

The base board is provided with a square central opening, having around it a rabbet for receiving the prepared glass. This board is adapted to the lantern, and furnished with a pair of small buttons for engaging diagonally opposite corners of the prepared glass and holding it in place. The tracing arm consists of a square metallic frame, *a*, containing a glass plate, and having at one edge an arm carrying a tracing point, and provided at the opposite edge with two parallel rods arranged to slide freely through a block, *b*, pivoted to the base board. The center of the glass in the frame, *a*, is perforated to receive a needle, *c*, which is pressed forward toward the prepared glass by a small spiral spring, as shown in the sectional view. The needle thus supported may be moved around upon the prepared glass in any required direction, and it may be readily lifted from the plate by pulling the tracing point away from the base board.

By placing a design upon the board, it may be traced and reproduced upon the screen, and, if the designs are specially made so as to compensate for distortion, correct tracings will be produced.

By means of the pantograph shown in Fig. 2, anything, large or small, may be readily and correctly traced. The levers are arranged relatively, so as to produce upon the prepared glass a tracing one-third of the size of the original. With this pantograph, writing, figures, maps, diagrams, sketches, etc., can be made with great facility.

The base board of this instrument is necessarily somewhat cumbersome, as provision must be made for the supports of the pivot of the pantograph, for the prepared glass, and for the design to be traced or a sheet of paper on which to mark. The base board is adjustable up and down on a slotted standard, and the latter is provided with a foot, which permits of clamping it to the table.

The metallic frame, *a*, which is attached to the arm, *b*, contains a transparent plate of glass, having a central perforation, in which is inserted a stout sewing needle—a small carpet needle, for example. The bar, *b*, is pivoted to one end of the short metallic bar, *c*, and the opposite end of this bar, *c*, is pivoted on a stud projecting from the rock shaft, *d*, which can turn in supports attached to the base board. Upon the same stud is pivoted a bar, *b'*, which extends parallel with the bar, *b*, and both these bars are pivotally connected with the bar, *c'*. The lower end of the bar, *c'*, is provided with a tracing point, *f*, for which a lead pencil may be substituted when an original design is to be made. The paper on which the design is drawn is attached by drawing tacks to the lower part of the base board. The rock shaft, *d*, is provided with a long key, *e*, which extends downward, and is pressed outwardly by a spring underneath it. The key is prolonged above the rock shaft, where it is provided with a screw for limiting the motion of the key and shaft. The arrangement of the shaft and key is shown in the small detail view.

The shorter arms of the levers of the system are 4 in. long, and the longer arms are 12 in. long. That is to say, when the bars are at right angles to each other, the distance between the bars, *b b'*, is 4 in., the distance between the bars, *c c'*, is 12 in., the distance from the tracing needle at the center of the transparent

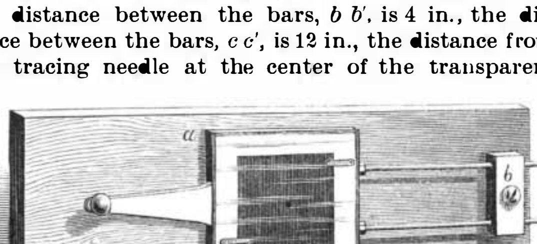


Fig. 1.—SIMPLE TRACER FOR THE LANTERN.

glass to the pivotal connection of the bars, *b c*, is 4 in., and the length of the bar, *c'*, from the pivotal connection of the bar, *b'*, to the tracing point, *f*, is 12 in.

The glass plate on which the tracing is made is preferably coated with collodion colored with aniline. If this is not convenient, the glass may be smoked.

The needle is prevented from touching the prepared glass by pressing upon the key, *e*, thus slightly twisting the entire system. When the point of starting is reached, the key, *e*, is released, when the spring under the key, through the key, rock shaft, and bar, *c*, carries the frame, *a*, forward, and brings the tracing needle into contact with the prepared glass, when the tracing begins. When it is desired to interrupt the line, the key, *e*, is again depressed, when the needle may be moved to a new position without making a mark.

THE TOP OF THE EIFFEL TOWER.

The top or "crown" of the Eiffel tower of 300 meters, or 984 feet, is represented in the engraving on page 150, which, to a considerable extent, explains itself.

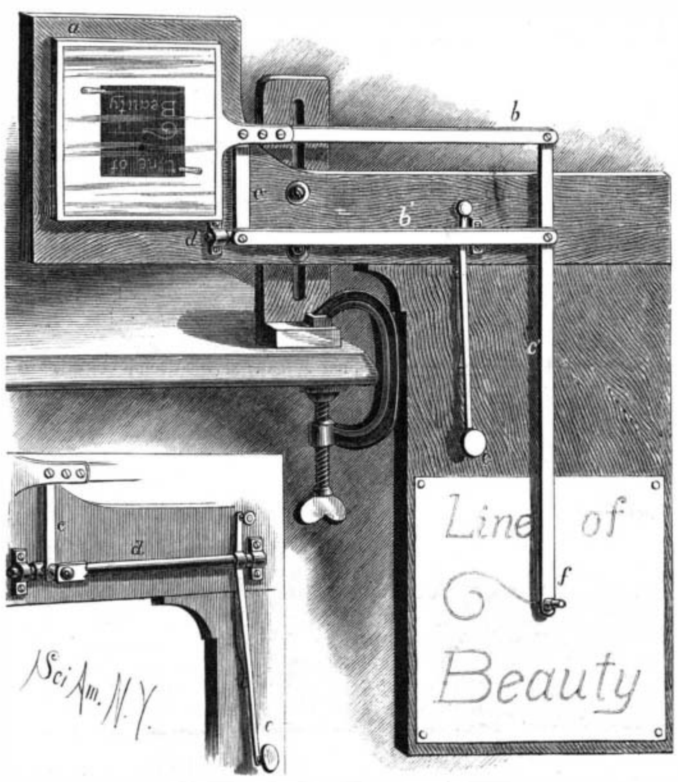


Fig. 2.—LANTERN PANTOGRAPH.

The lowest platform therein represented is the third one from the surface of the ground, and is 276·13 meters above the bottom of the four feet of the tower. This platform includes the balcony of square form, measuring 17·50 meters on each side. The outside promenade will be of glass plates in movable frames. In the center of the platform, on a surface 10·50 meters square, will be a kind of cabin, divided into laboratories for experiments and places for observation. Above this set of cabinets will be another set divided into little apartments.

The highest platform of the tower, which will be 293 meters above the ground, is accessible by a little spiral staircase, with an iron-plated newel. The diameter of this platform is 5·5 meters. It has four trellis supports of curved form situated at the diagonals of the rectangles formed by the main supports of the tower.

The summit of the tower consists of a lantern 7 meters high, which will contain an optical system the same as that of a lighthouse of the first class. The diameter of the lantern will be 3·5 meters, with a path round it. The light will be a fixed one, but means will be provided to enable it to project rays of blue, red, and other colors. In addition, two optical projectors will be provided, giving the power of illuminating at will the principal monuments of Paris or points of interest in the neighborhood of the city.

The question of the possible use of the Eiffel tower for scientific purposes has been often raised, and as yet we have seen no authoritative document on that head signed by any scientific man or indorsed by any learned society, but scientific utility is possibly a secondary object in its construction. The tower will be such a curiosity in itself as to powerfully help to draw many visitors to Paris during the exhibition. On the first of January a book on the Eiffel tower, by M. Max de Nansouty, engineer, was published in Paris, and the author gives the names of several leading French men of science who have expressed "approbation;" but approbation of what, is not quite distinctly stated. The author then suggests that the tower may prove useful for strategical observations in case of war, as the movements of the enemy can be watched when sixty kilometers or more away, as far as the most powerful forts for the defense of Paris. If Paris should be surrounded, signals could be flashed from the top of the tower to friends outside the lines of the enemy, and secret messages given to them optically by a cryptographic method. Possibly, says our author, the enemy might fire howitzers at the tower, although he would have difficulty in bringing them to bear, despite the progress of modern artillery; but then each projectile would have no more effect on the tower than a little grain of lead thrown against the web of a spider—some bars of iron will be broken and quickly repaired, and that will be all.

The foregoing cheerful ideas of M. De Nansouty are suggestive of an anecdote about the Duke of Wellington. The latter was said to hate being pestered by inventors, but, nevertheless, one wormed his way into the Duke's presence, while he was busy writing, and said that he had invented and brought with him a suit of armor which was ball proof. "Put it on," said the Duke, as he resumed his writing. When the inventor had donned his armor the Duke instructed an officer in the room to order a file of soldiers into the courtyard, and, said he, "Tell them to load with ball." He once more resumed his writing, and when he looked up again the inventor had disappeared, armor and all. If ever an enemy should be firing with heavy guns at the Eiffel tower, it is to be hoped that M. Max de Nansouty will be placed in charge of the signaling department at the top of the edifice.

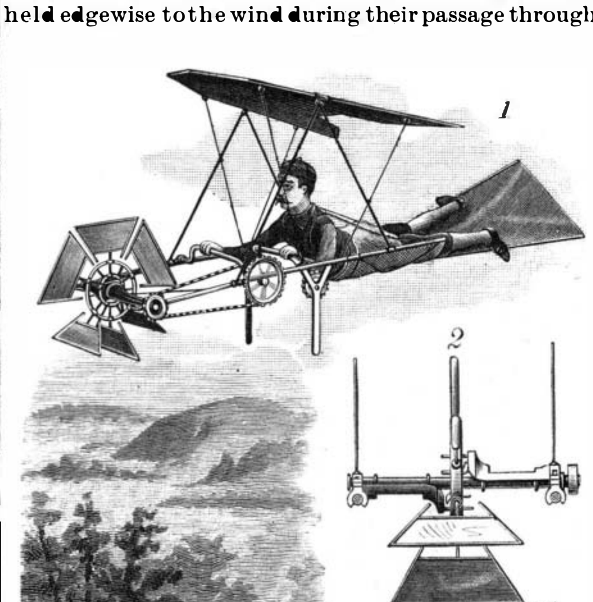
The same author says that the tower will be useful for astronomical observations, being above the level of many ground fogs. To some extent this is no doubt true, for although high towers are of no use for astronomical telescopes, because of the vibration, it is conceivable, for instance, that observations by the naked eye of flights of meteors could be better made from the top of the tower than from the bottom.

M. De Nansouty states that the tower will serve the purpose of supporting electric lamps at great heights. This is unquestionable.

Our author says that the tower will give the means of indicating the time to places at considerable distances. For the first time, except from the unstable car of a balloon, man will have at his command a vertical height of 300 meters, and can then study the fall of bodies through air, the resistance of the air at different velocities, certain laws of elasticity, the compression of gases and vapors, the oscillation of the pendulum, and so on.—*The Engineer.*

AN IMPROVED AIR SHIP.

A light and strong machine for navigating the air, designed to be readily controlled by the aeronaut to give the best results in flight with the least expenditure of power, is illustrated herewith, and has been patented by Mr. John P. Holmes, of Oak Valley, Kansas. The horizontal frame of the machine is suspended by hanger bars or rods from an aero-plane, which is a rod frame covered on one face by a silken fabric. Toward its rear there is attached to the side bars of the horizontal frame a canvas forming a rest or support on which the aeronaut will lie, face downward, on his breast and stomach, so that his hands may conveniently reach two transverse cranked shafts, by working one of which he can alter the incline or pitch of the aero-plane, while with the other he can rotate a propeller wheel journaled at the front of the machine. At the rear is a rudder sail, on the sides of which lie sacks to receive the legs of the aeronaut, and allow him to guide the machine by his legs in its flight. The aero-plane is arranged to be rocked up and down, and locked at any desired adjustment, for utilizing wind currents and the propelling force of the wind to the best advantage. Fig. 2 is a front view of the propeller wheel, which is operated by a chain belt from the cranked shaft in front of the aeronaut. The hub of the propeller is fixed to a tubular shaft journaled in boxes formed at the end parts of sleeve cams and in half boxes held to the opposite side bars of the frame, to cause feathering of the blades, so that they will be held edgewise to the wind during their passage through



HOLMES' AIR SHIP.

the air above the level of the propeller shaft, and will turn their blades flatwise to the wind during their passage around below the level of the shaft, this construction and action of the propeller assuring its maximum lifting and propelling power to raise and urge the air ship forward.