THE NEW YORK RIVER FRONT IMPROVEMENTS.

We publish herewith a view of a series of the arches which are to form the extensive improvements now being carried out on the North River front of this city. There can be but one opinion as to the efficiency and solidity of the construction, the design for which is the work of Mr. J. Newton, assistant engineer, and possesses several interesting and original features. The work which our illustrations (selected from *Engineering*) depict is now in progress on the west side of the Battery, where the river bottom is a hard, quartzose rock. Before the dredging was done, the rock was covered with a deposit of river sediment, in some places upwards of 12 feet in thickness, and varying in consistence from a thin silt to a tough, plastic, black mud. This was cleared away by the dredging machinery already described in our pages. The surface of the rock is jagged and very irregular, and the depth of water over the site of the pier is from 25 to 45 feet. The dimensions of the pier are 500 feet in length; 80 feet in width; hight of roadway above mean high water, 5 feet, and from mean low water, 9·58 feet. The mean rise and fall of the tide in New York harbor, as determined by a long series of observations, is 4·58 feet. The pier is composed of twenty full center arches of 20 feet span; the faces of these arches, exposed on the sides of the pier, down to 3 feet below low water, are of cut granite. The arches are supported by monolithic blocks of concrete, made to exact dimension by ramming the materials in strong wooden molds. These blocks are made with suitable grooves for chair slings: they are transported from the place where they were made, and placed in position in the pier, by the floating derrick previously described. These concrete monoliths are in two series: First, the base; these are 4 feet by 8 feet 6 inches by 13 feet; next, the piers which are placed on these. For the first three or four arches these are 14 feet in hight, 5 feet 6 inches thick, and 10 feet in length, eight being required to complete a pier.

When these tall monoliths are in position the work is so near the water line that it is an easy matter to place the centers which rest on them, and then set the granite voussoirs. The centers being set, the facing of granite is laid in cement; between the granite springing stones of the arches, concrete blocks are laid. These are made in molds to the curve of the soffit, and are plainly shown in the engravings; these blocks bring the work above low water. The joints in the granite being watertight, and the sheathing of the centers nearly so, the space thus inclosed between the stone sides of the pier, if not altogether watertight, is protected from the wash of the tidal current; this space is then filled with concrete, well rammed in, and the work by this means is rendered as solid as that formed in the molds.

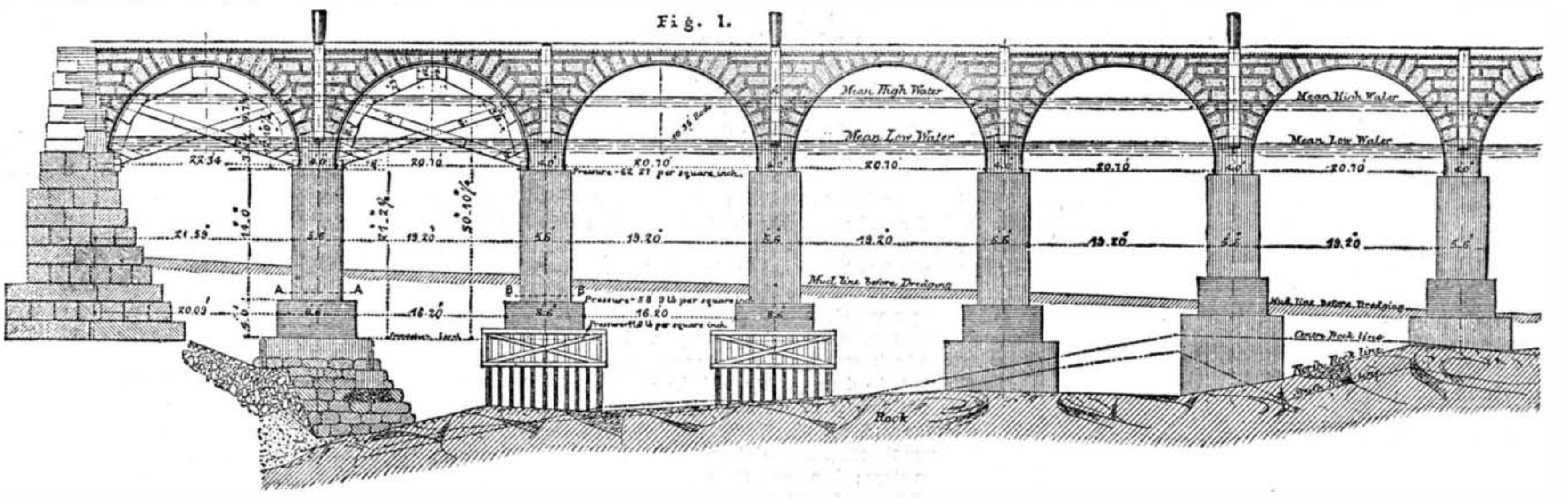
If desired, however, there is no difficulty in making this space perfectly watertight by caulking the sheathing of the centers, so that the concrete could be rammed in at all stages of the tide.

The foundations at formation level are 84 feet in hight by 12 feet in width, and vary in distance from datum according to the irregularity of the rock bottom. In all, except in the first pier from the river wall, they have been constructed by sinking a box the full size of the foundation. This box was weighted and sunk, then, by means of vertical timbers, chains, and screws, adjusted to the required hight, This box (see Fig. 2) was roughly fitted on the irregular rock bottom by means of planks sliding in appropriate guides, and it was lined with a heavy canvas sack to protect the concrete from wash; at the formation level, horizontal guides were secured. The box was then filled with concrete, lowered in buckets which opened at the bottom. When the concrete reached the guides just mentioned, it was leveled off by a heavy iron I beam placed on one of its sides, and pushed along the guides from one end to the other; by this means, if the guides are properly placed, the entire foundation is perfectly level. The voussoirs were cut before the foundations were begun, and the top of the pier came at the exact hight required above datum.

The first foundation, already alluded to, was put in by constructing a box or inclosure under water. A number of wrought iron standards (Fig. 2) were placed in line in the centers of the same number of molds on a level platform; these molds were then rammed full of concrete. The blocks, thus made, with the standards firmly imbedded in them, were then placed in line on the site of foundation. Planks were then placed between the standards, the top one, which formed the guide, being carefully placed at the required distance below datum. The filling then proceeded as in the others. Several of the foundations for this work were laid in from 25 feet to 30 feet of water, where the tide at certain stages runs with velocity sufficient to make it very difficult for divers to hold on. The water always holds in suspension so much mud as almost to exclude the light, even on a very bright day, at the depth this work was done; so that the whole of it was performed in what was practically total darkness. On one or two occasions, when the sun was high and the atmosphere perfectly clear, a plumb bob, some 8 inches in diameter and painted white, was barely visible.

The use of concrete in monolithic masses, as above described, enables work of this character to be erected in very much less time and cost than would be required with coffer-dams and ordinary masonry. The preparation of the bed for the monolith, as is evident from the above description, is in fact the only portion of the work which is at all difficult. Under favorable circumstances, with respect to weather, after the foundation is ready, the arch piers, 80 feet in length, were set in 30 feet of water, ready for the superstructure, in 2½ days. It required scarcely ten minutes for the derrick to lift and place a monolith of some 30 cubic yards, but setting it exactly in place occupied longer. It may be observed that, within the capacity of the derrick, the size of the monolith has but little to do with the time required for placing it.

The concrete of which the monoliths are made is composed of the best Portland cement. When the wooden molds are removed, which may be safely done in twenty-four hours after they are filled, they present a smooth and hard surface, and more accurate than it is possible, in practice, to cut the beds and builds of natural stone suitable for hydraulic work. A cube one foot square formed of this concrete, seven days old, did not yield until the pressure brought upon it by a hydraulic press was 80 tuns, and then the concrete in the middle of the block was found to be somewhat damp.



NEW YORK RIVER FRONT IMPROVEMENTS—THE ARCHES.

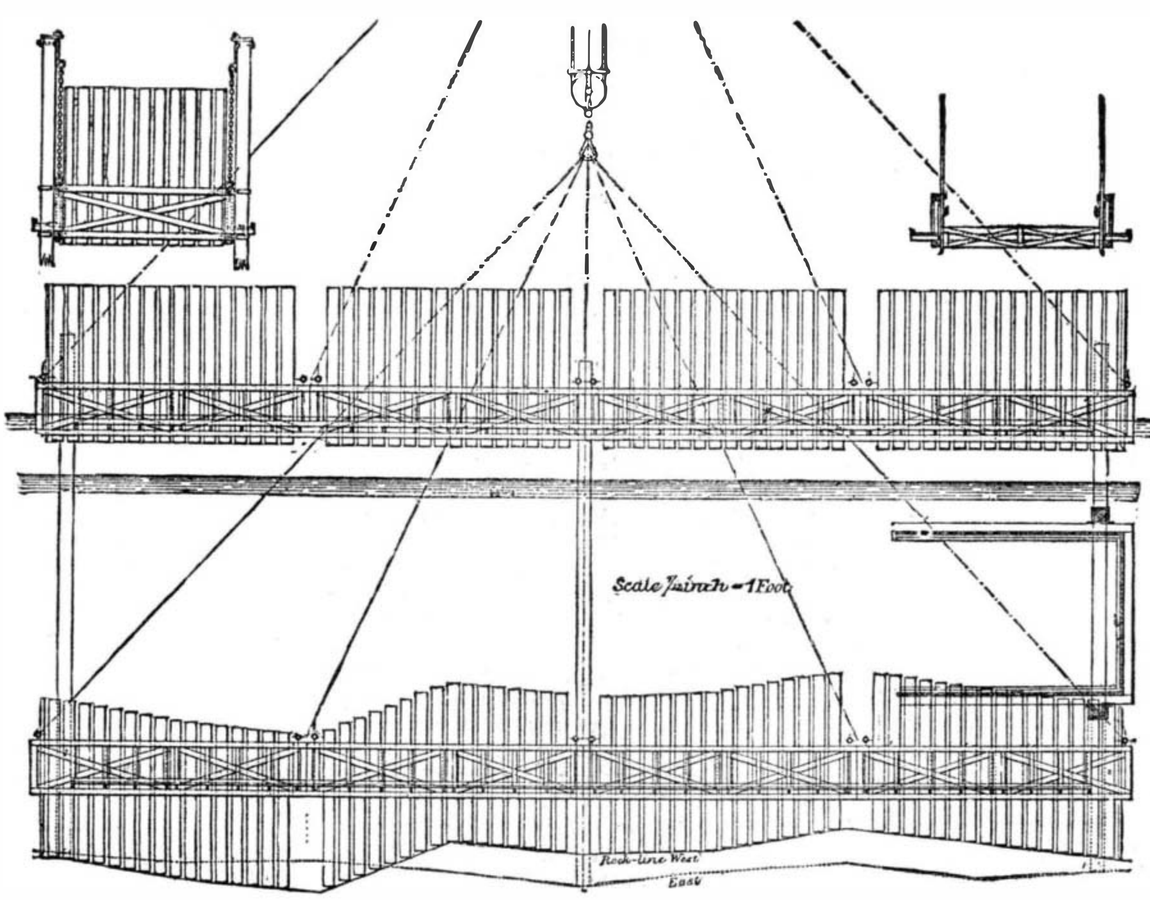


Fig. 2.—CONSTRUCTING THE FOUNDATIONS.

A New Dry Photo Process.

I propose, says M. Carey Lea, to make public a process which, I think I may venture to say, possesses a very high interest; in fact, no photographic work in which I have ever been engaged has appeared to me comparable with it.

The method gives, by simply pouring an emulsion over glass, not only a high but, I may say, an intense sensitiveness. Moreover, by virtue of the silver iodide which they contain, these plates need no backing. They develope with great rapidity and need no intensifying, so that the whole operation, from first to last, is reduced to the most absolute simplicity. The advantages in the way of facility of management and the high degree of sensitiveness are such that I should not be surprised to see these dry plates largely supersede the wet process; in fact a beginner will more easily work this dry method than the wet when the emulsion is to be obtained commercially, which it soon will be, as I do not propose to place any restriction upon its manufacture by any one who may choose to prepare it.

COLLODION.

To each ounce of solvent, consisting of alcohol and ether in equal parts, take ordinary crystallized cadmium bromide, 6½ grains; ammonium bromide, 2 grains; ammonium iodide, 1½ grains; cupric chloride, 1½ grains. About eight grains of intense pyroxylin to the ounce, with two drops of *aqua regia*. Sensitize with silver nitrate, using from twenty to twenty-five grains to the ounce. The first-mentioned quantity is excellent for ordinary work; when a very high degree of sensitiveness is desired, the larger quantity may be used.

For the reason that the emulsion is to be dried, some economy may be practised by making a more concentrated emulsion, as follows: ordinary cadmium bromide, 9 grains; ammonium bromide, 2½ grains; ammonium iodide, 2 grains; cupric chloride, 2 grains.

Use about ten grains of intense pyroxylin. The silver nitrate must be increased in the same proportion as the salts, so that twenty-five to thirty grains to each ounce of concentrated collodion will be proper. Three ounces of this collodion will, after treatment, give four ounces of finished emulsion.

The best results are obtained by keeping this emulsion, with occasional shaking, for from twenty-four to thirty-six hours. It is then to be poured out into a flat dish and allowed to set. Particular care is needed in this part of the operation; the preservative must be applied just at the right time—neither too soon nor too long after the pouring out. The emulsion must be occasionally examined and moved about in the dish to promote equal drying. As soon as a skin forms on it, holes must be made through it, and the collodion underneath be made to flow out and over it. If this be ne lected, the surface will become hard and leathery before the emulsion is set underneath. The object is to keep the whole mass as nearly uniform as possible, and, as soon as it is gelatinous, to apply the next treatment. The proper condition can be judged of by touching with the tip of the finger; as soon as nothing comes off upon the finger the emulsion is ready for the preservative.

Any preservative may be used. As to the effects of different preservatives, I will speak presently. If the lesser quantity of silver be used, the preservative may generally be applied in its ordinary condition: but if the larger, then it will be well to add to the preservative one tenth of its bulk of ordinary acetic acid (No. 8 or Beaufoy's).

The preservative is to be poured into the dish, and then immediately the film is to be plowed up with a porcelain, horn, or glass spatula (not a metallic one), and reduced into small pieces; and the whole, preservative and film, is to be transferred into a convenient glass jar—not too small. The flakes of emulsion are to be occasionally stirred and left in contact with the preservative for fifteen minutes from the time when it was first poured over the mass. (In operating upon a large scale, commercially, it will probably be found better to leave a little longer in contact with the preservative, and *always* to acidify. For working with a few ounces, the foregoing is the right way.) The preservative is then poured off and water poured on, the flakes well stirred up, and the water changed several times. The flakes are then left to stand under clean water for about an hour; then several more changes; then stand another hour; then several more changes. By this time everything soluble is extracted from the flakes; indeed, after the first hour no silver can be found in the wash water. We have now only to dry. This may be done at ordinary temperatures, or the vessel may be set over a stove, provided its bottom be not allowed to become hotter than the hand can bear. The drying must be thorough; the flakes shrink wonderfully, and curl up like tea leaves. They are not white, but of a medium grey color, notwithstanding which they make a pure cream-colored emulsion.

To re-emulsify, the dried flakes are put into a bottle and are covered with one third ether, one third alcohol, and one third plain collodion. They must be well shaken at intervals. The new emulsion is not in good order till after, at least, forty eight hours, and is better at the end of a week. When it has once been thoroughly mixed with the liquids, and has been shaken at intervals for some days, it seems to lose all disposition to settle, and makes a most excellent emulsion. There is no reason why it should not keep indefinitely. Or it may be preserved in the dry state and emulsified at any time, using from twenty to twenty-five grains of the dry emulsion to each ounce of solvents. Three and a quarter ounces of collodion, formula No. 2, will yield about one hundred grains of dry flakes.

PRESERVATIVES.

The character of the image will depend very much upon the preservative used.

Albumen Preservative.—This gives an exceedingly sensitive and delicate plate, with much less density than most of the other treatments. For this reason I prefer it to the rest, as tending to give detail in both lights and shadows, with great varieties of half tone. My formula is: Water, 12 ounces; thick gum and sugar solution, 1 ounce; prepared albumen, 1 ounce; sixty-grain alcoholic solution gallic acid, 1 ounce; sixty-grain tannin solution (in water), ½ ounce. *To be added in the order named.* If rather more density be required, double the tannin. I use it as above. This preservative works very cleanly and satisfactorily: I use it exclusively.

Gallic Acid and Coffee.—A mixture of gallic acid and coffee, using about two ounces of sixty-grain solution to twelve ounces of infusion of roasted coffee, gives very good results; it should, however, be acidified with acetic acid, using about half an ounce of Beaufoy's (No. 8) to the above quantity. It gives a blacker image than No. 1, and more intensity. It will probably be useful when the pyroxylin is deficient in intensity. It gives excellent transparencies by exposure under a negative, but too intense for lantern work, for which No. 1 is much better, as well as for negatives.

DEVELOPMENT.

For a 6½x8½ plate pour four ounces of water into a 7x9 dish, add half a drachm of sixty-grain solution of pyrogallic acid in alcohol, and put in the plate. Mix in a bottle equal quantities of a fifteen-grain solution of potassium bromide and an eighty-grain ammonium carbonate. Of this mixture pour one fluid drachm into the dish. When the detail appears add another drachm, and later, if necessary, a third; or add half a drachm of the ammonium carbonate solution without bromide. The two first additions must have bromide; the third is best without for a negative—best with for a transparency. Fix in hyposulphite solution of the same strength as used for wet plates.

I should have mentioned that I always keep the collodion for a month—for several if possible. The plates should be edged with a solution of india rubber in benzole.

The principle of applying a preservative to a mass of material at once and then washing it out again could be patented. This is common to the new processes. The plan of applying a silver bath to a mass of partially dried collodion is also new and patentable. Convinced as I am of the very great usefulness of these processes, I believe that such patents would be very valuable. I prefer, however, to give them freely to anyone caring to use them, asking only, in return, to have them ascribed to their author and not appropriated by those who may make trivial modifications on them."

A glue which will resist the action of water is made by boiling 1 pound of glue in 2 quarts of skimmed milk.

Correspondence.

Adjusting Locomotive Valves.

To the Editor of the Scientific American:

I will give you a method for setting slide valves of locomotives, which is practical and easy. Make a steel tram, about 5½ inches long, with two points at right angles with the straight bar, one point to be 2¾ inches in length and the other 1½ inches. Both points are to be sharp. Take a centerpunch, and make a center mark on top of the steam chest packing box; then take a strip of tin and put it in the steam port. Draw the valve slowly back until you can just move the tin between the edge of the valve and the edge of the steam port (which is now closed, except as to thickness of the strip of tin). Take the tram, place the short point in the center mark on the packing box; then make a scratch on the valve stem, and go through with the same process with the opposite steam port. Now you have marks on the valve stem just where the valve begins to open. The valve stem must next be got into radius (as we term it), which is to show the proper length for the valve stem. It is done thus: Cover the steam ports equally with the valve, put the center of rock shaft and the rocker pin at a right angle with the bore of the cylinder; and when the valve stem is adjusted to this, it is of the proper length and should not be altered.

To adjust the valves in forward motion, hook the reverse lever in the forward notch, take the dead points for centers, and alter the eccentric rods until the spaces are equal on the valve stem, which is determined by the use of the tram. Take the forward centers and give $\frac{1}{16}$ inch lead to the valve, for either passenger or freight engines. By adopting this plan the engine will reverse her action promptly. Hook the reverse lever in back motion, and repeat as above.

If the job is to be done quickly, and the eccentrics are in the proper position, it can be done by the travel, in this way: Move the engine slowly forward with steam, take the tram, and trace the movement of the valve on the valve stem until the stem stops; then trace the return movement until that stops. Take a pair of dividers and measure each distance from the valve mark on the stem, to the extreme of the travel line (or where the valve stopped). Alter eccentric rods until the spaces are equal. By these means, you do not require to take the steam chest covers off.

East Saginaw, Mich. THOMAS M. HAYES.

An Invention Wanted.

To the Editor of the Scientific American:

I would invite the attention of inventive minds to the subject of respirators for miners, to protect them from the foul gases which trouble so many men, especially in coal mines. An invention that would protect them when laboring to subdue a fire in a coal mine would certainly prove a very valuable one, and be the means of saving many lives, and millions of property.

Hazleton, Pa. C. F. H.

The New British Patent Bill.

The Lord Chancellor's new Patent Bill, briefly described by us a few weeks ago, meets with vigorous opposition in some of the English papers. Among the ablest remarks upon the subject are those given in *Engineering*. In a recent number the editor says: "Contrary to our anticipations, the Patent Bill has passed through committee with all its powers of mischief intact. In spite of the almost unanimous opposition which it has met with out of doors, the only modifications which have been introduced merely relate to matters of detail. Instead of four examiners we are to have six, the referees are to be appointed by the Commissioners of Patents alone, without the concurrence of the Board of Trade, as was at first suggested, and their services are only to be called in when necessary, and not as a matter of course.

The radical vice of the measure still remains; and although it is pretended that the examination clauses have been framed to meet a universally expressed wish, we are quite sure that nothing of this kind was ever asked for by the general body of inventors. It is perfectly notorious that the idea has been fostered chiefly by a small knot of shameless placehunters, who will not be satisfied with any system which leaves them unprovided for. By dint of appearing now as members of this society, now of that, and by reading papers here and delivering lectures there, a delusive impression has been created that inventors are really desirous of seeing the system of preliminary examination introduced. We do not for obvious reasons mention these persons, but a careful examination of the various propositions for patent law reform put forward during the last ten or fifteen years will reveal their names. There are of course some advocates of preliminary examination who are perfectly disinterested, having only joined in the cry on purely theoretical grounds. These goodnatured individuals have in all probability never made a search in their lives, and are totally unaware of the enormous difficulty of deciding whether an invention has really been anticipated or not.

The Lord Chancellor has been at great pains to explain that he does not propose any examination as to "utility;" but what is the meaning of "frivolous" if it does not include projects which are "useless," in other words, void of "utility"? It is the same thing in another form—an old friend with a new face. Lord Cardwell sneers at an invention (of American origin) which consisted in placing a piece of india rubber at the end of a pencil, so that the person using it could rub out with one end what he had written with the other. This may be "frivolous" or not, but it was a sufficiently valuable patent to be worth a very costly lawsuit, which is well known as the "india rubber tip case." Those who have followed the question need scarcely be reminded of the case of Smith *v* Buller, which occupied the Court of Chancery for many days, the costs amounting to about $20,000, and in which the matter in dispute was a very minute improvement in swivels. So small was the improvement that ordinary observers would not have detected the difference between the old swivel and the new. Large fortunes have been made out of "solid headed" pins, and buttons have raised many to affluence. Only the other day a large technical college was founded and endowed by a philanthropic manufacturer who stated that a very large portion of his princely fortune had been amassed by making steel pens and split rings. The question of frivolity is in some respects more delicate than that of novelty; and when the examiners have once tasted blood, we shall probably find them rejecting as "frivolous" contrivances which, though seemingly insignificant, may have cost a man years to invent, and which the whole of a trade has been in vain endeavoring to produce.

For years past we have done all in our power to warn inventors as to the almost certain results of an arbitrary system of preliminary examination like that embodied in the present bill. We showed some time back, in a series of articles on "Anticipated Inventions," how some of the greatest inventions of the day would most certainly have been refused by any moderately well informed examiner. If inventors permit this bill to pass in its integrity, they will find themselves in the position of the man who made a monster, and was in due time destroyed by it. For a few years we shall have chaos, soon to be followed by the entire abolition of those laws which have done so much to foster inventive talent, and have borne no inconsiderable share in bringing the manufacturing industry of this country to the high position which it now occupies."

The Heliograph.

Through the general introduction of electric telegraphy, and the all but universal adoption of the Morse alphabet, it occurred to Mr. Mance to produce an instrument which is very compact, very portable, easily set up, and easily worked. Although he was first in favor of larger instruments (which are still preferable for permanent stations), he is now convinced that an instrument of the size here described is all that is requisite. The chief objection to the adoption of the sun telegraph is that we cannot command the sun to shine in the same manner that we can control a galvanic battery; and it must be understood that Mr. Mance advocates his system only as an auxiliary to other systems of field telegraphy.

The instrument consists of a light, but firm, tripod stand, similar to those used for prismatic compasses. On the top a plate is moved by a tangent screw which admits of quick and slow motion, and the plate carries on a pin a semicircular ring, which again carries on pivots the round mirror, the silvering of which is removed in the center for the space of a circle about 3-16 inch diameter. To the plate is also attached a simple key, which is pressed down and springs back like an ordinary Morse key. This key is connected with the top rim of the mirror by a steel rod, which can be lengthened and shortened—as occasion may require—by turning the handle and screwing the rod through the small brass ball which secures it to the edge of the mirror.

By means of the last named adjustment and the tangent screw, the glass can be altered, as the ever-changing position of the sun may require.

From 12 to 15 yards in front of the instrument is placed a sighting rod. This rod is to mark a spot exactly in a line with the center of the heliograph and the distant station. A metal stud marks the spot, and a wooden cross piece marks where the flash rests when not directed on the opposite station.

The instrument can be set up ready for working in a few minutes. When the exact position of the distant station is not known, a flash of sunlight must be thrown in the direction of the most likely points, and this must be continued till it is answered by a flash, which indicates that a distant signaling party is on the lookout. Then, after releasing the tangent screw, the glass must be turned to a convenient angle, and the sighting stick must be directed in a line with the distant station by looking through the small aperture in the center of the mirror. When this is effected, the stud must be raised or lowered till it is in the line of vision on a level with the center of the glass and the distant flash, and the short cross piece must be placed at right angles to the upright, about a foot below the stud. After being thus adjusted, the instrument must not be moved.

The spot will be observed gradually to rise or fall, according to the direction in which the sun is apparently moving. The handle of the key, or the tangent screw, or both, as the case may be, must be turned slightly after every two or three words, to ensure, as far as possible, that the center of the spot shall be on the stud when the key is pressed down.

When the sun is rather low in the heavens, and behind the signaler, it becomes more difficult to direct the flash with accuracy. In consequence of the obtuseness of the angle, the spot loses its circular form, and becomes rather dim when reflected on the stick. If it is required to work frequently with the sun in this position, the employment of a second glass on a light tripod stand is recommended.

But it would be useless here to enter more into the minutiæ of working the instrument: suffice it to say that, in experienced hands, twelve words and more per minute have been obtained, while others state that men—after a fortnight's practice—could attain only from four to five words per minute. As to the distance, 10 and 20 miles—and in very close weather 40 miles—have been obtained.—*Telegraphic Journal.*