GENERAL DESCRIPTION.

When the anchor-plate is put into the anchor-plate some distance, and at the same time insert a number of large points, and drive them all in uniformly. When all the large pins are in, the centre may be released, untwisted, and the wires may be cut off the right length. Then insert thinner points in the centre tube and fill it, and complete the whole job. To give a support to the anchor-plate, it is of course necessary to put up the transverse as far as they rest on the abutment, and to secure them temporarily by timber-bracing. And it will also be necessary to provide for a temporary anchorage of the anchor-plate itself before the arches are put up. This may be done by extending a few wire-ropes from the anchor-plate and posts to the next pier or abutment, and secure them; and if this anchorage is not strong enough, a temporary anchorage of timber and stone must be put up on shore, of sufficient strength to resist the pull of the cables. The same wire-ropes which are to be used for the abutment-stays and for the storm-cables, and which are to be delivered in long coils, may be advantageously used for this temporary anchorage with very little loss or waste.

The tension of each full cable, resulting from their weight when freely suspended, will be 63 tons; and this has to be fully met and supported. By the use of a few railroad bars laid across the posts above and below the anchor-plates, and by passing stirrups or chains around them, the anchor-rope may be attached. On the shore they may be fastened to similar bars, placed in an excavation, the bars to be secured to a rough frame-work of timber and plank, and this may be kept in its place by earth, gravel, stone, and other heavy material; it may also be assisted by braces. Piles may also be driven to increase the resistance of this temporary anchorage.

In order to put up the arches and other parts of the superstructure, a temporary platform and footway will have to be suspended. As to the cables, a light foot-bridge under each will be all-sufficient, and the same anchorage which answers for the main cables will answer for the foot-bridge cables. Of this I shall speak more particularly in a subsequent chapter. But it should be observed here, that the temporary anchorage should be made strong enough to resist a pressure of about 400 tons, because this much tension may be produced by the cables while erecting the superstructure.

While putting the ropes in the cables, they should receive another coat of durable paint. Allowance must be made for the stretch of the cables. All wire will stretch, whether made of steel or iron. A No. 8 steel wire of good quality, capable of supporting a weight of 3,000 to 3,400 lbs. and 5 feet long, will stretch one inch before breaking. After being taxed with a full load for some time, the stretch of the cables will cease, because the material will have assumed a permanent set. After this, no more elongation will take place. The deflection of the cables in the main span, after the wire has attained a permanent set, is to be 60 feet. An allowance of 1 to 2 feet should be made for settlement. If the cables are well made, one foot will be enough; but if poorly made, three feet may not be sufficient. To be more explicit, the cables should be suspended with a deflection of, say 58 feet if well made, and if not, 56 to 57 will be safer. Those who undertake the construction of such a work, and are without experience, will do well to bear these hints in mind.

In order to make the cables bear their allotted portion, the suspenders have to be screwed up repeatedly after full trains have passed over the work. The permanent set of the cables will make itself felt distinctly if attention is paid to it. On the other hand, it would be wrong to tax them too much, and thereby relieve the arches to an undue degree. A proper adjustment may at first sight appear to be impossible, or at any rate attended with great difficulty. But if the directions given here are strictly carried out, this adjustment may be readily accomplished.

The weight of the superstructure, which is to be borne by the cables of the main span, is 290 tons. The number of suspenders is 96, and therefore the weight borne by each is \( \frac{290}{96} = 3.02 \) tons. Each suspender being attached to a stirrup which has two screws, the weights to be borne by each single screw will be 1½ tons, or 3,000 pounds. Now practice a few intelligent men in raising a weight of 3,000 lbs. by such a screw, using a screw-wrench of a certain length, say 18 inches. The screws should be well cut, so as to run easy and smooth. No stirrup should go into the work without having the screws well examined, well cleaned, run smooth, and oiled.

The handles of the wrenches should be just long enough to require the average strength of a man's arm. To make this operation still more certain, the wrench may be tested by a suspended weight, so that the men can compare their strength with the actual weight. I have had this operation performed frequently to my entire satisfaction. Much depends upon the cut of the screws; with good, uniform threads, every suspender may be brought to a fair and equal bearing.

The length of suspenders being calculated, they are manufactured accordingly, and put in place. But the theoretical length will never exactly agree with the actual length, and the difference is made up by screwing. The above remarks on suspenders will equally apply to the stays. The ultimate strength of each stay is 100 tons, and they are calculated to bear an ultimate tension of 1, or 20 tons, caused by the superstructure and a maximum load. Now, the proportion of weight of superstructure to that of maximum load which falls upon the stays is as 150 : 174, as will be seen in the