

pine, 34 ft. long were bolted together with a 1-in. by 14-in. through bolt, 14 inches from the top. This, along with a set of 12-in. triple blocks, hand-lines, anchor-pins, etc., makes a cheap and serviceable erecting outfit. The above outfit was used in the erection of a line of 928 towers averaging  $2\frac{1}{4}$  tons each, and only one mishap occurred, this being caused by negligence on the part of the fore-

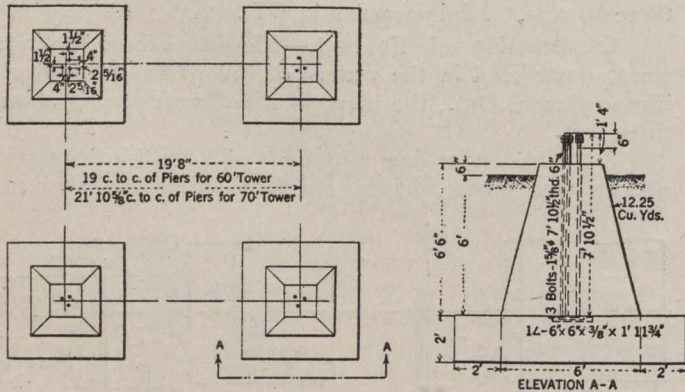


Fig. 3.—Masonry Plan and Anchor Bolts.

man in charge, and was in connection with the first tower erected on the line.

**Guy Anchors.**—Patent anchors for guying should not be used other than for light construction. In light soil, an old-fashioned slug, or deadman, gives the best results. All guys should be periodically inspected and tightened up. When more than one guy is used on a pole, galvanized turnbuckles should be used to obtain best results.

From observations extending over ten years, the writer states that fully 40 per cent. of the guys in use are inefficient, this condition being due to lack of inspection. To obtain the best results in guying, the anchor should be placed at a distance from the base of the pole equal to one-third the height.

In using rock-bolts for anchoring, care should be taken, if the rock is covered with a layer of earth, to

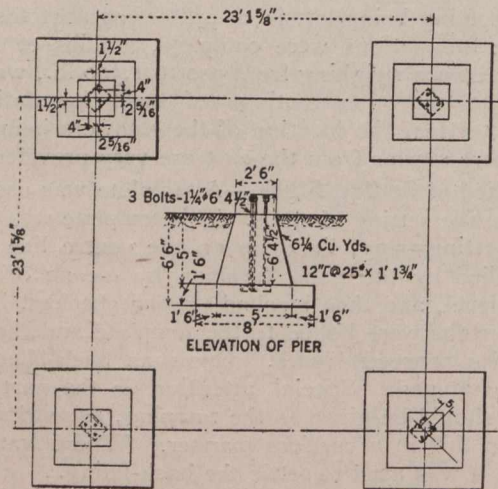


Fig. 4.—Foundation Plan for 75-foot Heavy Strain Towers.

place the anchor so that the ring is just above the surface of the rock; then fasten a long link to the ring, and guy to this. This method will give much better results than if the ring had been left above the surface of the ground and guy attached to it, as the anchor rod will bend in the latter case. These rock-bolts should be grouted in with hot brimstone.

The company is now designing tower footings which include the following points:—

(1) A modification of an ordinary screw-type guy anchor, similar to the Matthews or Stombaugh anchor, with the top of the anchor rod shaped to take the tower leg; this for towers of light wind-mill type.

(2) For heavy anchor, long-span, towers, etc. A large foot-plate supported on a shallow concrete footing sufficient to give a good bearing, and an anchor similar to those mentioned above, with the exception that the end of the bolt will be threaded to take a nut and locknut.

(3) For extra heavy, or four-circuit towers. A large section screw-pile with top plate to which the tower foot plate can be bolted.

The question of threading an ordinary wooden pile is also offered for consideration. There are locations on almost every line where marshy land or muskeg is encountered, and it is usually a very expensive operation to use a pile-driving outfit in these locations.

In connection with this method, it has been found that it is not necessary to drive a pile to refusal to obtain a good footing for a standard tower, as there is sufficient skin friction developed by the pile in the upper layers of the ground to give satisfactory results. Twenty-five-foot piles have been found satisfactory in very swampy ground, where borings had been taken to a depth of forty feet without striking firm soil.

## AERIAL PASSENGER TRAMWAY OVER NIAGARA RIVER.

The Niagara-Spanish Aero-Car Company, representing the Estudios Y Obras de Ingenieria, of Bilbao, Spain, are proceeding to build an aerial tramway across the Niagara Whirlpool, from a location near Colts' Point to Thompson's Point, both terminals being on the Canadian side, in Stamford township of Welland county. The cableway will have a span of about 1,800 feet, and, in crossing directly over the famous rapid, will add to the scenic features of the locality. Obviously it will be used exclusively for sight-seeing traffic.

The design calls for six-inch woven wire carrying cables on one traction cable. One set of terminals will be anchored in reinforced concrete piers, set a few feet back from the cliff, while at the other end the cables will pass over sheaves supported on steel columns and will be attached to concrete counterweights. A 200-h.p. motor will operate the traction cable. The passenger car will have a carrying capacity of about 30 people.

The engineers are Messrs. Howard and Wright, Toronto, and the contractors Norman McLeod, Limited, also of Toronto.

## NEW RAILWAY MAP OF CANADA.

At the special request of Sir Thomas Shaughnessy, the draughting department of the C.P.R. recently prepared a splendid map of Canada, most carefully plotted, showing every railroad right up to date, and every railroad station. The original map, which cost many thousands of dollars to prepare, is hanging in the board room of the C.P.R., at Montreal. Permission has been given by the C.P.R. to Ewing, Lovelace and Tremblay, consulting engineers, Montreal, to reproduce the map, as Mr. James Ewing, of that firm, was in charge of the preparation of the original. Splendid reproductions, only slightly reduced in size, have been printed, and are being sold, either hand colored or uncolored, by Mr. Ewing, Birks Building, Montreal, at very reasonable prices.