absolutely what his tower is good for, and the contractor avoids the necessity of throwing away metal, as a precaution to being on the safe side.

Shop Work and Galvanizing.

The actual manufacture of the towers in the shop is practically the same as for other structural steel work. The draughtsman makes up his shop detail drawings from the design plans, then the template maker lays out the full-size tower on the floor to obtain the correct lengths and bevels of the various members, and from this, in conjunction with the detail drawings, makes up his wood templates for every member in the tower.

After all shop work is finished, such as punching of holes, shears, forgings, etc., the material is passed into the galvanizing building. As it is necessary to keep the steel as clean as possible, extreme care is taken from the time it is actually rolled until ready for galvanizing. It is shipped from the mills to the shop in closed box cars and at all times kept under cover.

The galvanizing is done in a separate building. The material is first placed in a long wooden tank and submerged in a pickling bath of sulphuric acid and water, with the temperature of the solution at about 150° Fahr. It is allowed to remain in this bath until all scale and rust has practically been removed. After the steel seems clean, it will have a smooth surface and a dark gray slate color. It is then placed in a storage tank containing enough water to cover it. From the storage tank it is taken to the flux tank, containing muriatic acid and water. This serves two purposes: first, it removes whatever rust or scale the pickling bath had failed to remove; and secondly, it serves as a flux. It is then taken to the drying tables and left there to thoroughly dry, care being taken not to burn the acid. When properly dried, the muriatic acid should show on the surface in the form of a white powder. Without being allowed to cool, it is then taken to the galvanizing or spelter kettle. For tower work the kettle is about 30 feet long, 2 feet wide and 3 feet deep. It is made of 1⅛-inch steel plate, one width piece, curved, giving a cross-section through the kettle in a form of the letter U. This kettle is supported on masonry in such a way that the heat from the fire has direct contact with the entire outside surface. When the zinc spelter has been placed in this kettle and melted down, the kettle is ready to receive the material which is to be galvanized. This operation is simply to submerge the object for a moment or two in the molten spelter, lift it out, rap it sharply on the side of the kettle, to remove all superfluous zinc, and lay it on a rack to cool

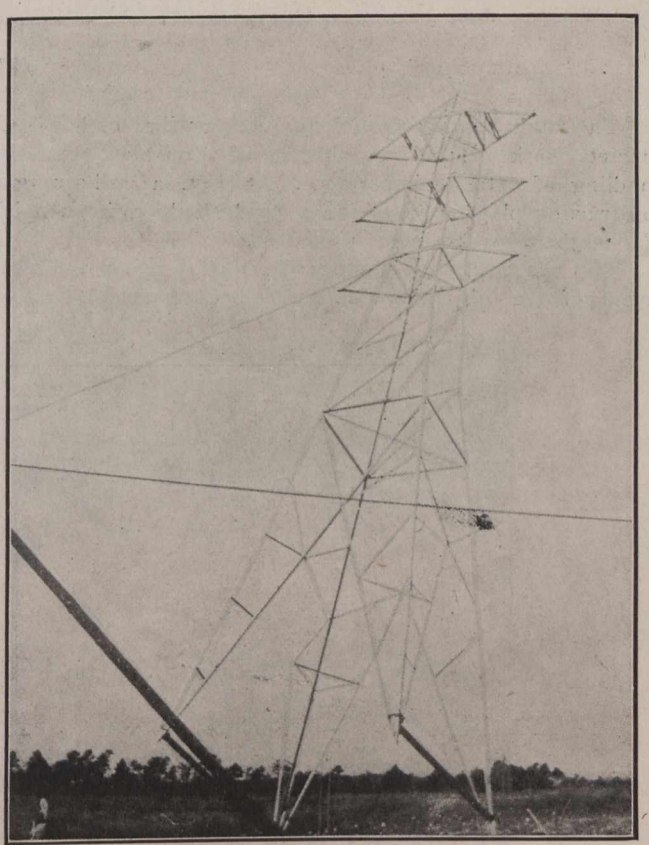
This method of galvanizing is known as the "Hot Process," and when properly done gives almost permanent life to the towers. The standard test for galvanizing is to immerse the sample piece in a solution of sulphate of copper for one minute, then remove it, immediately wash it and wipe dry. This process is repeated, and if after the fourth immersion there should be a copper-colored deposit on the sample, or if the zinc should be removed, the piece must be rejected.

The galvanizing of our towers has stood as high as ten immersions without showing deteriorating signs, and moreover, we have given severe tests for adhesion of the galvanizing. Pieces have been taken out at random from a tower, been twisted, bent on itself and straightened, without the slightest sign of scaling.

Bolts and nuts are usually galvanized by the electrolithic process. This method permits the galvanizing after threading, which it is impossible to properly do by the "Hot Process." This method, however, does not stand the copper sulphate test very satisfactorily. The most recent process, that of "Sherardizing," which we now use, we believe is the best for this class of work. Instead of the zinc applying itself as a shell or coating, it forms an alloy with the steel without seriously increasing the size at all, therefore making it applicable to thread work of bolts and nuts. It stands the copper sulphate test fully as well as the "Hot Process."

Shipping and Erection.

The material is taken directly from the galvanizing building out to the marking and shipping yard. There the various pieces are stenciled with the erection marks corresponding to the marks shown on an erection drawing previously prepared. The towers are all connected at the joints by means of bolts. In order to save freight on shipments, the tower is shipped completely "knocked down." All parts of each tower, which are exact duplicates, are bundled together by wire and tagged. All pieces which are exact duplicates are given the same marks; in other words, they are interchangeable. The required number of bolts for each tower is boxed separately. In arranging to transport material to its final destination, all that is necessary is to pick



Erecting Towers.

out the bundle of each mark which goes to make up one tower and include with the shipment one box of bolts. The material is shipped to railroad distributing stations as close to the line and location as possible and from there carted to their proper location along the line. The complete material for each tower is dropped at their respective locations.

As concrete footings are expensive and unnecessary, in the ordinary tower work, ground stubs are used. These stubs are made of a single angle, going into the ground about 5 to 6 feet, with a channel-plate fastened to its bottom end. This stub projects out of the ground about 12 inches, just enough to bolt the tower to. This connection is made by a "lap" splice; that is, the corner leg angle of the tower fits on the outside of the stub angle and then bolted, which makes it practically a prolongation of the corner leg into the ground.