are estimates for cost of construction in New Orleans, where steel poles cost more and wooden poles less than in northern cities. For one mile of span wire construction 104 steel poles, at $15 each, would cost $1,560, and assuming their life to be 30 years, the interest on the investment for 30 years at 5% per annum would be $2,340, or a total first cost and interest of $3,900 The setting of steel poles necessitates the use of concrete. I estimate the cost of this and the labor of placing it at $4 50 per pole, or $468 per mile, which, with interest for 30 years at 5 per cent per annum, would be $1,170, or a total for interest and first cost of material and labor of $5,070 for the steel poles.

Assuming the life of heart pine poles to be 12 years (instead of 20 years), I will make a comparison on that basis. Such poles for one mile of span wire construction at 104 poles to the mile at $4.50 each, would cost $468, labor and material for erecting, at $2 50 per pole, $260, or a total first cost of $728, to this must be added interest for 30 years at 5 per cent per annum, $1,092, making the first investment at the end of 30 years $1,820. At the expiration of 12 years the construction must be renewed at a cost of $728, and to this must be added interest for 18 years at 5 per cent. per annum, $655 20, making the second investment at the end of 30 years cost $1,383 20 At the expiration of 24 years the construction will be renewed for the third time at a cost of $728, and to this will be added the interest for six years at 5 per cent. per annum, $218.40, making the third investment at the end of 30 years cost $946 40, a grand total for wood pole construction of $4,149.60. The difference between the total costs of steel and wood pole construction for a period of 30 years would be $920.40 per mile, which would be more than a liberal allowance for changing span wires and other work necessary in renewing the wood poles, but assuming it would take this amount we would stand even at the end of 30 years and still have six years more life in the wood pole construction.

If steel span poles are used I would recommend for the average span of 40 feet a pole weighing about 700 lbs., made in two parts. The lower section to be constructed of 6-inch extra heavy standard steel pipe, and the upper section of 5-inch, swaged at the joint for a distance of 18 inches. Such a pole should be 28 feet long, 18 feet for the lower and 10 feet for the upper section, and provided with a cast-iron and wood pole top for the attachment of the span wires There should be a wood filling to fit the bottom of the lower half to prevent it from sinking, and the pole should be set 6 feet in the ground with a rake of 10 inches from the perpendicular to allow for being straightened when under strain. The average size of hole to be dug would be 20 inches in diameter, with a depth of a little over 6 feet, requiring (after the pole is inserted) a mixture of about ½ cubic yard of 1, 2 and 4 Portland cement concrete. The cement should be set at least three days before attaching the span wires Whenever it is practicable, allow poles to bear against the curbing, as it affords an efficient stay for the pole. Otherwise a good sized rock having a bearing surface of about 1 square foot would assist very much, and keep the pressure from cracking the cement

If wood poles are used where it is necessary to provide neat and substantial construction, I would recommend for the average span of 40 feet a long leaf yellow pine pole dressed and chamfered, 30 feet long, sawed square, 11 x 11 inches at the base, and 7 x 7 inches at the point, free from sap, rot or knots, and corners evenly chamfered, 1½ inches, beginning at a point 14 feet from the base, and terminating in an octagonal form and roofed evenly for a space of three inches In setting wood poles where concrete is not used (and I do not consider it necessary) a great deal depends upon the soil encountered In a soil of medium clay, and average condition, poles should be set 6 feet in the ground with a rake of 12 inches from the perpendicular, and the hole should be dug to a vertical depth of 6 feet (or more if necessary to allow the pole to stand a given height above the track), and should be about 2 feet square at the top and not less than 18 inches at the bottom. Where it is practicable, allow poles to bear against the curbing (or paving). Place a substantial bearing at the heel to prevent the pole from pressing through the earth, for this purpose a small quantity of coarse broken stone or brickbats will answer every purpose. Where this is not easily obtainable, and the earth is soft, a piece of plank 12 inches wide by 3 inches thick, 4 feet long, sharpened and driven in the earth to a depth of about 2 feet at the back and base of the pole, will give good results.

Whenever it is necessary to erect poles in the absence of substantial material at the surface, such as paving or curbing, I would recommend that the base of the pole be well rammed with broken rock for a distance of 18 inches, taking pains that the greater quantity is placed at the back where the pressure is greatest and leaving a small quantity in front where no pressure takes place. The space to within 20 inches of the top may be filled with earth taken from the hole and well rammed. To prevent the pole from yielding at the surface a breast plank of oak (or cypress) timber 3 x 12 inches x 6 feet should be placed and spiked in front and at right angles to the pole about 8 inches under the surface of the ground. About 20 inches from the top of the hole and in front of the breast plank should be filled and well rammed with the same material that is used at the base of the pole. The necessary quantity of broken rock required would be about 1-5 cubic yard per pole.

Poles of wood or steel which may be used for holding strains at curves should necessarily be heavier than those used for straight line construction, and should also be set at greater depth in the ground A steel pole for curve construction should be 29 feet long, made of 6-inch and 7-inch extra heavy pipe, the larger section to be 19 feet long and the smaller section to be 10 feet long and made to weigh 1,050 lbs Such poles should be set 7 feet in the ground, and raked 10 inches from the perpendicular in a direction radiating from central point of curve where strain is required. The filling would be the same as specified for straight line iron pole construction. Wood poles for curve construction would be made similar to those specified heretofore for straight line construction, excepting dimensions of such poles should be 31 feet long by 14 x 14 inches at the butt, 9 by 9 inches at the top. Such poles should be set 7 feet in the ground and raked 12 inches from the perpendicular in a direction radiating from the centre of curvature where strain is required The hole should then be entirely filled with about 7-10 cubic yard of broken rock well rammed.

The holes for eye bolts should be bored in wood poles before their erection and the bolt should incline slightly downward towards the eye to prevent the water from following in and rotting the top of the pole. The correct location for eyebolt holes would be determined by the height at which the trolley wire is to be placed; 22 feet from the base of the pole would be correct, assuming that we allow 2 feet for drop in the earbody and ear, and also dip in the span wire would make the height of trolley wire about 20 feet. To facilitate the setting of poles to a uniform height it is a good plan to place grade stakes near the location selected for poles, indicating a given height relative to the grade of the track.

Centre pole construction is required in many locations, but I consider span construction better owing to its flexibility and for being less unsightly. There are now on the market appliances for making bracket suspensions flexible, which are an improvement over the old type of rigid construction. One of the most practical which I am familiar with is an attachment to receive a short span of flexible wire and the ordinary straight line hangers.

Poles used for centre and bracket construction should be made according to the same specifications as those used for span construction, excepting that an ornamental pole top would be required for the steel pole instead of an insulated one. For the bracket arm a 1½ inch pipe of the required length attached to a malleable iron collar made in halves and encircling the pole, and supported by truss rods leading from the end and centre of the arm to near the top, makes an excellent and neat construction.

Wherever guard wires are required it will be necessary to leave about two feet additional space on the top of the pole above where the trolley span wires are attached, for the attachment of the guard wire span It would hardly be practical to provide an insulated pole top for both span wires, so the trolley span would be supported by means of a wrought iron clamp collar encircling the pole at the proper point and provided with suitable insulating fastenings I do not especially approve of this method of construction (as I do not favor guard wires), but I would recommend it where it is compulsory to erect guard wires

All poles should be painted with one coat before their erection, as it affords better opportunities to carefully apply the priming coat and at less expense than after the poles are set. A paint of dark green composed of graphite mixture I find to wear well, and although it costs more than some other paints, it has better lasting qualities (especially in iron work) A second coat of this paint after the poles are erected will cover marred places made necessary in setting, and will look well and last for at least two years.

Span Wires.—Span wires should be of flexible steel, 5-16 in. in