the circumference clear the tie-bolts but not the bushings. The drum should first be turned in the rough on its axle, the circular rings be then driven on and the whole be finally finished in the lathe, including the oiling and shellacing. When the machine is ready for the electric light cord, which should have a thin inner insulation of rubber, a strap can be used between one of the lathe pulleys and the drum to wind the springs up. When so wound up, one end of the cord can be pushed through a hole in the flange and the two conductors be connected to the two circular rings. The drum can then be allowed to unwind and thereby wind up the cord. Attached to the side of the drum, opposite to the side having the rings, is a ratchet wheel to be used in conjunction with a pawl pivoted on the second plate. This is to check the reel from rewinding when unwound.

To assist the surveyor to stretch his wire and keep it high enough for vehicles to pass under, and also to keep it above the trolley wires of cross-lines, it is necessary to have some light portable poles. Some idea of the way these poles are constructed and used will be gained from

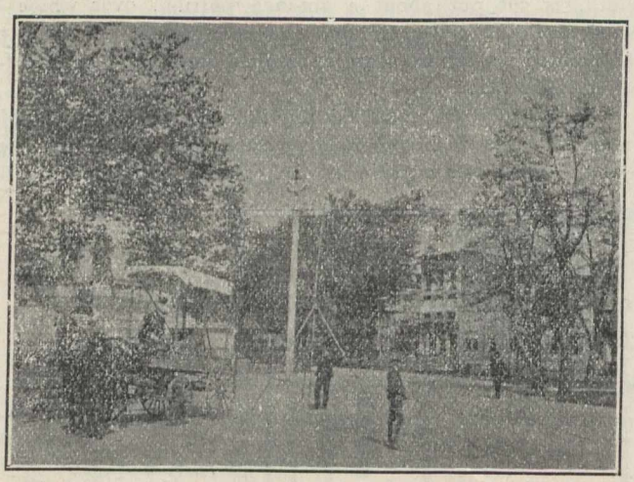

Fig. 22.—The Use of Tripod and Pole for Spanning Street Crossings.

an examination of Fig. 22, which is a reproduction of a photograph of the wagon when in service.

These poles, in the main, consist of a tripod supporting the pole proper, which is in the centre and made of two poles about one and one-half inches in diameter jointed together by means of a piece of iron pipe about fourteen inches long and firmly fixed in a circular block of wood. The bottom pole, which is about twelve feet long, is permanently fastened in the pipe, while the top one, which is about fourteen feet long, has its bottom end so turned that it can be easily taken in and out of the pipe (ferrule). Near the top end of the pole is screwed a strong iron screw-hook for the wire to slip in and out of. The tripod portion of three similar poles about fourteen feet long is hinged to the circular block by means of strong iron screw-eyes. The bottom ends of the pole and the three legs of the tripod are provided with spikes. These are made by screwing in strong iron wood-screws for about half their length and then grinding the projecting portions to a point on an emery wheel.

To use the testing wagon, which is provided with a canvas covering stretched on a light framework, the reel is placed on the rear end and the two wires which run from the brushes are connected in multiple to one of the meter posts. To the other post of the meter is attached a short length of flexible cord with a small iron clamp connected to its outer end. A similar clamp is connected to the two ends of the two wires from the reel. This latter clamp is then attached to a hydrant and the driver ordered to go ahead. As the wire unwinds, it is hooked up on such convenient places as lamp-posts, pole-steps and branches of trees. At cross streets, the portable poles are used. When the next hydrant is reached, the other clamp is attached to it and a reading taken. This clamp is then loosened and the wagon proceeds to the next hydrant, where the clamp is again used and another reading taken. This is repeated until all the wire is unwound and the last reading for this stretch is taken. The wire is then loosened from the first hydrant and allowed to rewind. If the weight of the wire or its resistance is sufficient to check the winding, such is easily assisted by one of the attendants.

After readings have been taken on all the streets running in one direction, similar ones are taken on those running at right angles to the first ones.

When all the readings have been taken, the expert works out from them the relative voltages of the different points as compared with a chosen zero, and the drawing office is supplied with them in order to plot the contour lines.

Fig. 23 is a reproduction of a map with contour lines which was so gotten up by the writer for the City of Richmond, Va., and it shows, from an electrolytic point of view, a condition very favorable to the traction interests of that city.

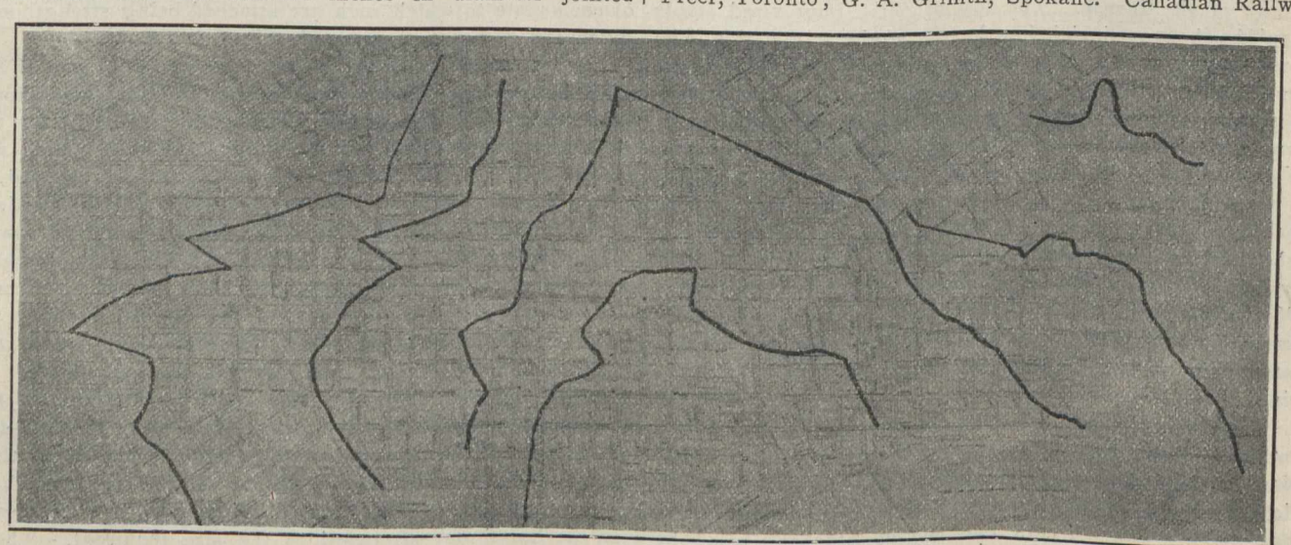

Fig. 23.—Reproduction of Map With Voltage Contour Lines Plotted.

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