WAY AND WAY MATTERS

RAILS

Ohio interurban roads generally are using T-rails commonly known as A. S. C. E. standards. The 70-lb. rail is looked upon as standard, although a few roads believe that a 60-lb. section is sufficiently heavy. But two roads of those considered, namely, the Toledo & Indiana and the Scioto Valley, are using heavier than 72-lb. rail. As to length of sections, the majority of roads are using 30-ft. and 33-ft. lengths, but some companies in their later construction work have specified 60-ft. lengths. The advantages of the longer sections are, of course, that the number of bonds and the number of joints to be installed and maintained are correspondingly reduced. With 60-ft. sections it has been found necessary to leave a trifle more space between the ends of the rails to provide for expansion, and one or two roads which did not do this at first found trouble with kinking of rails.

In Indiana and Michigan 72-lb. rails are usually employed in interurban construction. Occasionally, however, the question of delivery necessitates the substitution of some other weight of rail. The heaviest rail used in the two States mentioned is probably 80-lb., which was used in the construction of the track of the Indianapolis Northern Traction Company, between Indianapolis, Logansport and Peru. Rails in 60-ft. sections have been used on several roads, but difficulty has been experienced in keeping them aligned, due to expansion in hot weather. In cities, however, where the paving prevents the rail from getting extremely hot and helps to keep the rail in position, 60-ft. rails are usually found.

Rails of both 60-ft. and 33-ft. lengths are in use by the Indiana Union Traction Company. On this road it is considered that the difficulty in keeping track laid was 60-ft. rails in alignment more than offsets the decreased expense of keeping up the few number of joints and the lessened cost and maintenance of the bonds.

The standard rail used by the Fort Wayne & Wabash Valley Traction Company is 30 ft. long, but some 33-ft. rails are used.

A 70-lb. rail is preferred on the interurban lines of the Detroit United Railways. The preferable length is 30 ft., it having been found that the expansion and contraction of 60-ft rails either pulls the splices apart or buckles the rail. Where 60-ft. rails are used, a slip joint giving a 3-in. movement is placed at intervals of 1000 ft.

Rail braces are found on the curves of several roads. An accompanying illustration shows the method of bracing the rail on curves of the Indiana Union Traction Company. The same type of brace was found in use on several other systems. The Terre Haute Traction & Light Company double spikes the rail on curves.

JOINTS

The majority of Ohio roads are using either 4 or 6-bolt fish plates, and in a few cases 8-bolt plates at joints. The Cincinnati & Columbus Traction Company, the Canton-Akron Railway, the Toledo Urban & Interurban, and others are equipped with mechanical joints, and the management of these roads believe that the joints will keep tight longer and will give a longer life to the track sufficient to pay for the added investment.

Of the 17 roads considered in Ohio, 9 support the joint with ties, while 8 use the suspended method. The majority is clearly in favor of the broken joint, but 2 roads placing the joints opposite and 15 favoring the staggered scheme.

In Ohio a number of the roads do not consider it necessary to use anchoring devices or schemes for holding tracks in gage on curves, although some of them do so on special heavy curves. Six of the roads use tie plates and 7 of them use rail braces. Two of them combine both methods on specially heavy curves, while one road, the Stark Electric, uses a number of tie rods on curves. Few of the roads in this district have been in operation long enough to suffer from broken joints or the necessity for relaying rail.

Twenty-eight miles of track on the Indianapolis & Northwestern are laid with joints opposite. The remainder of the road is laid with broken joints, and this latter construction is preferred. Track on the Indianapolis, Columbus & Southern Traction Company is laid with broken joints, as is also the latest built track of the Terre Haute Traction & Light Company and the track of the Kokomo, Marion & Western Traction Company. Both kinds of joints are found on the tracks of the Fort Wayne & Wabash Valley Traction Company. However, opposite joints are preferred on straight track, as it is believed the car is racked less. On curves broken joints are preferred because of the lessened trouble in keeping the track in alignment. Broken joints are used in interurban construction by the Detroit United Railways and the Detroit, Ypsilanti, Ann Arbor & Jackson Railway.

Practically all of the track inspected had joints suspended between two ties rather than supported. The chief reason for this construction is, of course, that the weight on the joint is supported by two ties rather than by one.

Some roads in Indiana give very close attention to keeping joints tight. Others are somewhat lax in regard to this. The Fort Wayne & Wabash Valley system tightens joints in the spring and in the fall. On the Detroit United Railways joints are inspected about once a week. It is the practice on the Detroit, Ypsilanti, Ann Arbor & Jackson Railway to go over curves and gage them up once a week. In the spring and fall all of the fish-plates are tightened. Practically no trouble is experienced by any of the roads from breaking of joints.

Several roads follow the practice of elevating the outer rail on curves 1 in. per degree of curvature. One road left the elevation of the rail to the track foreman. In general, Trautwine's formula for elevation is followed by the Indianapolis & Cincinnati Traction Company. On the Detroit United Railways the outer rail is not given as much elevation on curves as was formerly the custom. A full-speed curve of 300 ft. radius is given an elevation of 4¼ ins. On the Fort Wayne & Wabash Valley Traction Company all curves are spiraled in accordance with the length of the curve. The rule followed is to allow 60 ft. for each degree of curvature. The track is level at the point of spiral and the outer rail has its full elevation at the point of curve. The interurban lines are elevated for a speed of 50 miles per hour.

T-RAILS FOR CITY STREETS

For city work, the interurbans, wherever possible, have laid 6-in. or 7-in. T-rails, and where this has been prevented by local conditions or local ordinances, they have used high girder rails. The requirements of the authorities in some cities and villages, who have insisted that track be laid with grooved rails, have been responsible for perhaps more trouble than any other feature connected with the entrance of interurban roads into city streets. The grooved rail necessitates cutting down wheel flanges to a degree that is sometimes actually dangerous for roads operating at high speed, especially where the road has many

curves. It is also claimed by some interurban managers that it is impossible to secure good braking effect with grooved rail because the wheels have a tendency to slide on their flanges in the groove. The objections offered against the use of T-rails in paved streets are that it is said to be difficult to lay pavement next to the rail in such a manner as to present a smooth surface for vehicles driving in the track or crossing it. Laying aside the question of the right of teamsters to drive in car tracks, especially in streets frequented by heavy interurban cars, there is no question but that a street can be paved and properly maintained as well with the high T-rail as with the grooved rail. Experience has shown that this is solely a matter of building a good foundation in the first place and then providing a trough along the inside of the rail so that the wheel flange will not bear on the edge of the brick and tip them up, thereby destroying the smooth surface of the pavement. This can be accomplished either by arching the pavement between the rails and placing a course or two of narrow brick lengthwise along the rail, or by using a beveled brick. High T-rails are used in Findlay, Lima, Dayton, Indianapolis, Sandusky and a number of other cities and towns, the city ordinances of some of these cities providing that T-rail shall be used exclusively.

In Columbus the interurban roads have long been opposed to the grooved rail used on the loop which was built around the heart of the city for terminal purposes. This loop is constantly crowded with large cars, and considerable trouble has been experienced when the groove becomes filled with snow. Recently, however, permission has been given to lay 7000 ft. of T-rail on this loop. Some trouble of a similar nature has also been experienced in Cleveland, and the flanges on cars entering that city have been trimmed below a point that is desirable by the interurban managers. In Detroit the entering tracks of some of the interurbans are equipped with shallow grooved rails, and this condition is responsible for the failure of an arrangement to operate through limited cars from Cleveland to Detroit, the Lake Shore Electric declining to trim its wheels to size necessary to accommodate this rail.

In Indiana the Kokomo, Marion & Western Traction Company uses a high T-rail and nose brick in city construction. At the time the track was laid there was vigorous objection to the use of such a rail on the part of the cities, but during the several years it has been in use no fault has been found with it.

TABLE II.—SUMMARY OF LATEST PRACTICE IN TRACK CONSTRUCTION ON ROADS TREATED.

NAMES OF COMPANIES.	Rails.		Joints.	Bonds.					Ties.		
	Section* and Weight in Lbs. per Yd.	Length of Rail Section in Ft.	Type of Joints.	Type.	Length in Ins.	Capacity.	Where Applied On Rail.	Cross Bonding, Ft.	Size.	Wood.	Spacing Between Centers in Ft.
Northern Ohio Group.											
Cleveland & Southwestern	60 & 70	30 & 60	Angle plate	Soldered, brazed, concealed	8	4-0	Base, under plate		6x8x8	Cedar, oak	2
Lake Shore	70 & 72	30 & 60	Angle plate	Soldered, concealed	7 to 10	4-0	Ball	½ mile	6x8x8	Cedar, oak	2
Eastern Ohio	60	60	Angle plate	Concealed	8	4-0	Under plate	1,000	6x8x8	Chestnut, oak	2
Toledo & Indiana	72	30	Angle plate	Soldered	8	4-0	Ball	1,000	6x8x8	Chestnut, oak	2
Toledo & Western	60	30	Angle plate	Ribbon	6	4-0	Under plate	10 miles	6x8x8	Oak, cedar	2
Toledo, Pt. Clinton & Lakeside	70	33	Angle plate	Soldered	8	4-0	Ball	1,000	6x8x8	Cedar, oak	2
Stark Electric	65	30	Angle plate	Soldered, ribbon	6 to 9	4-0	Ball, under plate	1,000	6x8x8	Oak	2
Canton-Akron	70	30 & 60	Mechanical	Concealed	9	2-0	Under plate	1,000	6x8x8	Oak	2
Central and Southern Ohio Group.											
Western Ohio	60 & 70	33	Angle plate	Concealed, soldered	8	4-0	Ball, under plate	....	6x8x8	Oak, cedar	2
Ft. Wayne, Van Wert & Lima	70	33	Angle plate	Concealed, soldered	8	4-0	Ball, under plate	800	6x8x8	Oak	2
Dayton & Troy	70	60	Angle plate	Concealed	9	2-0	Under plate	1,000	6x8x8	Oak	2
Dayton, Cov. & Piqua	70	30	Angle plate	Stranded wire	10	4-0	Under plate	500	6x8x8	Oak	2
Scioto Valley	72	30	Angle plate	Concealed	9	2, 4-0	Under plate	1,000	6x8x8	Oak	2
Cincinnati & Columbus	70	33	Mechanical	Soldered	6	4-0	Head	1,700	6x8x8	Oak	2
Cincinnati, Milford & Loveland	70	30	Mechanical	Concealed	10½	3-0	Under plate	....	6x8x8	Oak	2
Interurban Ry. & T., Cincinnati	70	30	Angle plate	Concealed	9	4-0	Under plate	1,300	6x8x8	Oak	2
Cincinnati, Georgetown & P	60 & 70	30	Angle plate	Soldered	6	4-0	Ball	1,000	6x8x8	Oak	2
Indiana Group.											
Indiana Union Traction	80	33			..	..		....	6x8x8	Oak	2
Indianapolis & Northwestern	70	30	Angle plate		..	..	Under plate	800	6x8x8		2
Indianapolis & Cincinnati				Compressed	10	4-0		2,600			2
Indianapolis, Columbus & South'n	60	30	Angle plate		10	4-0	Ball	1,000	7x8x8	Treated oak	2½
Terre Haute Tr. & Lgt	70	30	Mechanical	Soldered	10	4-0	Flange concealed	....	6x8x8	Chestnut	2
Kokomo, Marion & Western	70	33 & 60	Angle plate	Compressed and soldered	10	4-0		1,300	6x8x8	Oak	2
Ft. Wayne & Wabash	70	30	Mech. & angle plate		11	..		1,300	6x8x8	Oak	2
Michigan Group.											
Rapid Ry., Detroit	70	30	Mechanical		8½	4-0	Ball	1,300	6x8x8	Cedar	2
Detroit, Ypsilanti, A. A. & J	70 & 75	30	Angle plate		7	4-0		....	6x8x8	Cedar	2

* All the roads included in this table use A. S. C. E. standard sections.

All of the franchises of the Wabash Valley Traction Company grant the right to use T-rails in cities. The rails used are in 60-ft. lengths. Both 6-in., 72-lb., and 7-in., 70-lb. rails are employed. A special type of nose brick, which was laid in Richmond, Ind., eleven years ago, is used.

The city ordinances in Detroit will not permit T-rail to be used, but it is used in several of the smaller cities entered by the interurban lines of the Detroit United Railways. It is also used in the greater number of cities entered by the Indiana Union Traction Company.

BONDS

The question of the most desirable bond is one that is causing much controversy on Ohio roads. The majority of the earlier roads were equipped with some of the numerous forms of bonds which are attached to the ends of the rails by compression and placed under the fish-plate. This type is still very popular with many operators who are building new roads or new extensions,

but the soldered type of bond is undoubtedly gaining ground. There is a difference of opinion as to the best place for the soldered bond. Several roads, notably the Cleveland & Southwestern, have placed the bonds on the base of the rail. This probably gives a better contact and renders it somewhat more difficut to steal the bond than where it is placed on the ball of the rail, but it is also more difficult to inspect. The ease of application makes the ball of the rail a most desirable place, but roads that are using steam locomotives or cars having wide tread have found that there is a tendency to knock off the bond when it is placed in this position. It is also more accessible for the copper thief, and it is undeniably a fact that the depredations of this class of miscreants have increased since the soldered bond placed on the ball of the rail came into general use. One road, the Western Ohio, has had so much trouble of this kind that it is now changing all its soldered bonds from the ball of the rail and placing them under the fish-plate. A new welded bond is attracting considerable attention, as it gives high conductivity and is difficult to remove. It is being used largely by the Canton-Akron and the Cleveland & Southwestern. Of 17 roads considered in Ohio, 9 are using soldered bonds partially or exclusively, while 10 are using concealed bonds partially or exclusively.

Methods of cross bonding vary greatly. Two roads, the Western Ohio and Cleveland & Southwestern, do not consider it necessary to cross bond except around railroad crossings and switches. The Fort Wayne, Van Wert & Lima cross bonds every 800 ft., while other roads run from that up to one-half mile apart. The Cincinnati, Georgetown & Portsmouth uses a soft iron rod bent under the rail and soldered to the side of the rail, the engineer believing that this serves the purpose of tying the rails together, and it does not furnish a desirable asset for the copper thief. Little information is obtainable as to the conductivity of joints, few roads collecting figures on this subject or paying a great deal of attention to it beyond seeing that joints are frequently inspected, although one or two roads keep a man busy with hand instruments making tests.

The greater number of the roads visited in Indiana were equipped originally with compression or plug bonds. As in Ohio, however, there is a marked tendency towards the adoption of soldered bonds, but trouble has been experienced by soldered bonds coming off, due to faulty application. In general, it might be said that the testing of bonds is not carried on in as systematic a manner as the importance of doing so warrants. Cross bonding of tracks occurs at intervals of from 800 ft. to one-half mile.

The plug bonds installed on the Indianapolis & Northwestern tracks when the road was built three years ago are still in good condition. The bonds were recently tested by means of the Herrick bond-testing car. The tracks of the Indianapolis & Cincinnati Traction Company are cross bonded only at intervals of one-half mile. The fact that this is a single-phase system with 2300 volts on the line removes the necessity of frequent cross bonding. Twenty-seven miles of the tracks of the Indianapolis, Columbus & Southern Traction Company are bonded with a plug bond and 13 miles with a compressed terminal bond. The original bonding was done five years ago and the bonds are still in good condition. Repairs are being made with soldered bonds.

On the Kokomo, Marion & Western Traction system 10

TABLE II.—SUMMARY OF LATEST PRACTICE IN TRACK CONSTRUCTION ON ROADS TREATED.

ROADBED AND BALLAST.						LOCATIONS.						GRADES AND CURVES.			TURNOUTS.				
Character of Ballast.	Cost (in Cents) of Ballast per Yd. Delivered.	Depth Under Ties in Ins.	Slope of Banks.	Width at Top of Fills in Ft.	Width at Bottom of Cuts in Ft.	Miles in Highway.	Miles on Private Right of Way Along Highways.	Miles on Private Right of Way Cross Country.	Width of Right of Way in Ft.	Miles Within Municipal Limits.	Miles Outside Municipal Limits.	Maximum Grade, Per Cent.	Length of Maximum Grade in Ft.	Sharpest Curvature Outside Municipalities in Degrees.	Distance Apart in Miles.	Distance Apart in Running Time in Minutes.	Stub End or Through.	Spring or Throw Switches.	Rail Used in Towns
Cinders, gravel, stone....	..	8	1 to 1	15	14	41	30	44	20 to 50	20	115	3.5	700	6	3	7½	T	S	7-in. girder.
Gravel and stone.....	..	6	1½ to 1	14	16	70	40	40	50	30	130	5.0	200	12	5	10	T	S	7-in. T, 7-in. girder.
Gravel and slag.....	35c.	7	1½ to 1	13	15	10	35	25	40 to 60	3	77	5.0	1,000	60	3	7	T	S	6-in. T.
Gravel.....	50c.	5	1½ to 1	12	14	..	..	52	33 to 50	4	53	¾ of 1	1,000	..	2	5	T	T	6-in. T.
Gravel and stone.....	40-50c.	4 to 6	1½ to 1	14	18	2	46	30	30 to 60	2	76	2.0	1,200	13	4	9	T	Both	High T.
Stone and screenings....	35-45c.	6	1½ to 1	14	15	..	40	10	33 to 40	2	48	1.0	4,500	15	3½	7	T	S	..
Gravel and cinders.....	..	8	1½ to 1	12	16	..	..	33	33	4	29	2.0	2,640	9	3½	8	T	S	High T.
Gravel and cinders.....	..	6 to 8	1½ to 1	12	12	60	..	30	35	10	80	5.0	1,200	45-ft. radius	3	7	T	T	High T.
Gravel and stone.....	35-45c.	8	1½ to 1	16	20	2	85	37	40	11	101	3.5	500	60-ft. radius	2½	4	S	..	..
Gravel and stone.....	..	8 to 10	1½ to 1	16	16	..	25	36	50	3	58	2.1	600	12	2½	4	S	T	7-in. T.
Gravel.....	35c.	6 to 8	1½ to 1	11	12	8	23	..	33	6	25	3.0	1,200	45-ft. radius	2	4	T	S	..
Gravel.....	..	8	1½ to 1	14	15	32	2	..	..	12	22	5.0	1,200	..	5	10	T	S	..
Gravel.....	..	10 to 15	1½ to 1	17½	20	..	..	72	70	2	70	2.0	120	2	2	4	T	T	..
Gravel.....	..	7	1½ to 1	14	15	2	..	50	..	2	52	3.0	1,000	12	3	7	T	T	6-in. T.
Gravel.....	75c.	6	1½ to 1	14	..	2	26	..	30 to 50	2	26	3.5	1,800	50	3	7	T	S	6-in. T.
Stone.....	90c.	8	1½ to 1	12	16	..	56	19	40	25	75	...	.....	40-ft. radius	1½	3	T	T	..
Wash gravel and stone...	38-42c.	4 to 6	1 to 1	14	15	..	..	56	60	..	...	2.5	16,000	..	1½	4	T	T	..
Gravel.....	30c.	8	1½ to 1	16	22	..	10	240	66	..	...	3.5	.....	..	2	3½	T	T	..
Gravel.....	..	8 to 10	1 to 1	16	16	..	..	..	50	10	77	6.0	1,500	6	3½	..	Both	T	..
.....	..	.....	.....	..	..	..	..	..	..	..	...	...	.....	..	..	..	..	..	..
Gravel.....	..	10 to 12	1½ to 1	18	18	..	..	..	20 to 66	4	...	2.0	600	7	3	..	Both	Both	..
Gravel.....	..	6	.....	12	..	..	..	..	40 to 120	..	...	6.0	500	..	3	..	S	T	..
Gravel and stone.....	..	6	1½ to 1	14	18	..	8	15	40	5	23	2.0	700	..	4½	..	Both	T	..
Gravel and stone.....	..	8	1½ to 1	16	26	6	15	..	18 to 100	..	...	1.5	.....	4	2½	..	S	T	..
Lime, rock and gravel....	..	12	1½ to 1	12	..	..	..	..	33 to 60	..	...	5.0	2,600	75-ft. radius	3	..	T	S	..
Gravel and cinders.....	..	6	1½ to 1	..	..	34	37	..	33	..	...	3.0	.....	10	2½ to 3	..	Both	S	..

miles of track is bonded with 4-0 compressed bonds, while on the remaining 18 miles 4-0 soldered bonds are used. Some of the latter type came off, due to faulty application.

Soldered bonds are also used on the tracks of the Terre Haute Traction & Light Company. Some are placed on the flange of the rail, some underneath the flange and some are concealed. Concealed bonds are preferred. Compressed and pin bonds are used on the Fort Wayne & Wabash Valley tracks. At the present time, however, soldered bonds are being tested. Some soldered bonds are being applied by heating with an electric arc.

Pin bonds, with special application and compression bonds, are in use on the interurban tracks of the Detroit United Railways. At the present time experiments are being made with different types of soldered bonds. One test for such bonds is to note the number of pounds pull required to pull them off.

TIES

In Ohio the white oak tie is usually secured wherever possible, and it is almost universally used on curves. A number of roads are using chestnut ties on straight tracks, while others prefer cedar on tangents. Few of the roads in this district have as yet been obliged to replace ties. The Eastern Ohio, now doing some of this work, reports the life of 7½ years on oak and 10 years on cedar, and the Cleveland & Southwestern has been taking up some oak ties after 8 years of use. The standard 6-in. x 8-in. x 8-ft. tie is almost universally used, and hewn ties are in the majority. The Cincinnati & Columbus Traction Company uses 7-in. x 8-in x 8½-ft. ties on all grades and curves. Spacing of ties on 2-ft. centers is almost universal, although the Toledo, Port Clinton & Lakeside uses 18 ties to each 33-ft. rail. None of the interurbans in Ohio has tried wood preservatives or concrete or steel ties, preferring to let the steam roads do the experimenting in this direction.

It is also almost universal practice on interurban lines in Indiana and Michigan to space the ties with centers 2 ft. apart. The ties are usually 6 in. x 8 in. x 8 ft. in size. Definite figures as to the life of ties could not be obtained, as the roads have not been built long enough to necessitate replacing ties. In only one instance have preservatives been adopted. Cedar, oak and chestnut ties are used.

Hewn oak ties are in use on the Indiana Union Traction system. On the Indianapolis & Northwestern Traction system the ties are cedar on straight track and of oak on all curves of over 1 degree radius. On the main track they are hewn, but on sidings sawn ties are used.

The Indianapolis, Columbus & Southern Traction Company, on the extension which it is now building from Columbus to Seymour, is using black and red oak ties. These are being treated with zinc chloride. On the Kokomo, Marion & Western system hewn oak ties are used almost altogether, but a few sawn ties are laid. There is no special preference for the hewn other than the fact that the quality of the tie can be more easily seen. The Detroit United Railway uses cedar ties on interurban track and white oak ties on city track. It was stated that in cinder ballast cedar ties had a life of from five to seven years and in gravel ballast a life of from seven to ten years. On the Detroit, Ypsilanti, Ann Arbor & Jackson system white oak ties are used on curves and switches and cedar ties on all other portions of the roadway.

BALLAST

The character of ballast depends largely upon the most available material in the vicinity of the road. Stone is preferred by many builders, on account of the stability of the track produced, the cleanliness and the fine appearance of the track. There appears to be little doubt but that a track stays in place better with a good stone ballast than with any other material. The Detroit, Monroe & Toledo Short Line, Western Ohio, Interurban Railway & Terminal Company, Columbus, Delaware & Marion and Toledo, Port Clinton & Lakeside use stone almost exclusively, and their tracks are noted for smoothness and easy riding quality. The last-mentioned road covers the broken stone with rock screenings, which pack down after having been wet, making almost a concrete roadbed. On the other hand, the Scioto Valley, Lake Shore Electric, Dayton & Troy and several other roads maintain excellent roadbeds with coarse gravel.

The Dayton & Troy has an especially fine track and uses very coarse washed gravel. Operators who have had long experience in the business believe that a gravel track, if properly maintained, gives a smoother and easier riding surface than any other material, but there is no denying that it requires more attention than rock ballast. The Eastern Ohio, Cleveland & Southwestern and Stark Electric are using their power house cinders for ballast, and find that this material makes an excellent foundation. The last-mentioned road traverses a district where there are many potteries and uses broken tile quite extensively on its tracks. Furnace slag is used by one or two of the roads. The character of ballast, cost, depth under ties, slope of banks, width of grade, etc., are shown in the accompanying table.

The majority of roads are paying more attention than formerly to the matter of securing good drainage. The aim is to construct good ditches on both sides of the track and keep them open. Several roads are engaged in raising their tracks. The Toledo Urban & Interurban has elevated its tracks 8 ins. to 10 ins. since the road was built, and the Dayton & Troy and several others are doing the same. Under highway crossings and for small streams, the Toledo, Port Clinton & Lakeside uses tile sewer pipe up to 20 ins. and concrete culverts over that size. The Interurban Railway & Terminal Company uses 18-in. and 24-in. vitrified pipe in many places and concrete culverts where necessary. This company has stayed a number of banks with 30-ft. oak piling with steel points. The Toledo & Indiana laid 4-in. drain tile the full length of all track in towns. At one point the Scioto Valley built a sewer a mile long to drain a low place on its road.

LOCATION

The cross-country private right of way location is growing in popularity. Many of the earlier roads were built on pike location under county grant. Some of these have quite advantageous arrangements. The Lake Shore Electric, for instance, for over about a third of its route traverses the Perrysburg turnpike, which is 10 ft. wide. The Columbus, Buckeye Lake & Newark, the Columbus, London & Springfield, the Dayton, Springfield & Urbana and the Dayton & Western, which are now parts of the Indiana, Columbus & Eastern system, were built for considerable portions of their lengths along the national pike, a wide thoroughfare extending entirely across Ohio. In many places they have the advantage of a ditch and pole line between the track and the highway. The use of pikes is practically obsolete for new work, however, and several of the roads, notably the Northern Ohio Traction Company and the Cincinnati Northern, are buying private right of way and throwing their tracks over to new locations. The short life of franchises, the inability to secure good drainage and grades, and the dangers of operation are the chief drawbacks to the pike road. After the pike road came the line built on private right of way adjoining the turnpike. In securing right of way, it was easier in most cases to secure a strip from a man's farm adjoining the highway than it was to cut through his farm and divide it. The advantage of being close to the farmer's home and securing his business also prompted many builders to

seek this location; but of late years, with the advent of high-speed limited cars and the desire of some of the roads to operate freight trains, the cross-country location enabling the road to fence on both sides of the right of way and to suit its own convenience in matters of grade, drainage and speed, is becoming the almost universal practice. The popular scheme, wherever possible, is to parallel closely the right of way of a steam road. The Scioto Valley, Toledo & Indiana, Fort Wayne, Van Wert & Lima, Lima & Toledo and the new portion of the Western Ohio follow this scheme almost entirely. It is found that it enables the road to limit its stopping points to suit its own convenience, and the old idea that there is likely to be a loss of local trade seems to have been disillusionized by the experience of these roads.

Early builders insisted that, to be successful, a traction line must run through the main streets of villages. This also has become an exploded theory. The Scioto Valley, Dayton & Troy, Columbus, London & Springfield and other high-speed roads have thrown their tracks away from the centers of villages and towns wherever practicable, and find they get just as much business and avoid the loss of time and dangers of accidents incident to street operation. The Cincinnati, Georgetown & Portsmouth, a reconstructed steam road, owns every foot of ground traversed by its tracks, and its operation conditions are most advantageous. The private right of way away from turnpikes and village streets enables the road to eliminate sharp curves, which are dangerous for high-speed operation and the running of trains. The accompanying tables show that many of the roads have reduced their curves and grades to a very marked extent.

More attention is being paid to the matter of banking outer rail on curve. Curves are being lengthened and raised 5 ins. or 6 ins. in some cases. A number of roads are laying guard rails on all curves over a certain radius.

Grades are not as severe as in many portions of the country, the western part of Ohio and all of Indiana being remarkably level. However, there are some severe grades, which well demonstrate the remarkable hill-climbing qualities of the electric motor over the steam locomotive. For instance, the Northern Ohio Traction Company has on its main line a grade of 2700 ft., with from 10 to 12½ per cent rise. The Cincinnati, Georgetown & Portsmouth has a grade averaging 2 per cent for 2½ miles; for a portion of this distance it is about 8 per cent. Through the eastern and central portions of Ohio there are numerous heavy cuts and fills, the Columbus, London & Springfield having a fill of 110,000 cu. yds. There is but one tunnel in the district, that on the Columbus, Newark & Zanesville, about 400 ft. long through solid rock.

TURNOUTS

Reference to the table on this subject shows that there is but little double-track line in Ohio at the present time. Up to very recently none of the roads has felt that it had sufficient business to warrant double tracks. Few of them have had better than hourly headway, but with the advent of numerous limited cars and freight trains, double tracking is becoming absolutely necessary. The Northern Ohio Traction & Light has about 18 miles of second track in the 37 miles between Cleveland and Akron. The Lake Shore Electric is double tracking from Cleveland to Lorain, 27 miles. The Dayton & Troy has 10 miles of double track in 31 miles, and the Cincinnati Northern is now double tracking a considerable portion of its line between Cincinnati and Dayton. These are the nearest approach to fully double-tracked lines in the district. To improve the situation many roads are increasing the number of sidings and lengthening them. Especially is this being done by roads that are hauling freight in trains with electric locomotives. Sidings 1000 ft. long are being installed to enable the roads to handle trains of considerable length. While the average steam road operator and a great many electric road managers look upon it as a crude and cumbersome method, there is no doubt that the stub type of switch is gaining in favor, and that, too, with the speediest lines in the district. The subject of through or stub switches is one which is receiving much attention. The arguments in favor of the stub switch are that it reduces the number of facing switch points and the number of switches requiring attention. It reduces the chances of splitting switches and side swiping cars, and in general accidents, resultant from misunderstanding or confusion of orders. Against it are the undeniable facts, that it causes a loss of time in backing out and changing trolleys, and it is especially cumbersome where several cars are operated in a train. Among the roads which have recently adopted this method, are the Western Ohio, Cincinnati & Columbus, Fort Wayne, Van Wert & Lima, and several of the roads recently merged into the Indiana, Columbus & Eastern. The practice of operating, however, is different. The Western Ohio, for instance, requires that the first car which arrives at the passing point shall take the siding. Some of the other roads mentioned require that the car going in the direction facing the switch shall take the siding and back out after the other car has passed. The 'Schoepf" roads have recently adopted the rule of heading in and backing out of all sidings, whether stub or through.

Spring vs. throw switches is another subject which has been widely discussed of late. Earlier roads quite generally adopted the spring switch as a simple and time-saving device, but there is no denying that in Ohio it is losing favor, although some of the best operated high-speed lines in the district continue to use it with perfect satisfaction. The Lake Shore Electric, Cleveland & Southwestern, and Dayton & Troy, all operating limited cars at a speed of 60 miles an hour, are fully equipped with spring switches and have never had an accident by reason of them. The Dayton & Troy does not even require its cars to slacken speed approaching these switches. Frequent and careful inspection and keeping the switch point in condition, it is claimed by these roads, render this type of switch perfectly safe. The Toledo & Indiana recently removed all spring switches because a freight train was derailed at one of them, caused by a piece of coal dropping into the point. Considering what might have happened had it been one of his 60-mile an hour limiteds, the manager immediately ordered a change. A few of the roads using throw switches do not lock them, but the majority, including the roads above referred to as having adopted stub turnouts, require that the switches be kept locked. Practice is about equally divided between the low-stand switches and the high-stand targets, several roads believing that the high target gives an extra precaution.

Some of the very best roads in Ohio do not illuminate their switch stands or sidings, depending upon the headlight of the car to show the location. The Toledo & Indiana, Stark Electric, Lake Shore Electric and Toledo & Indiana and several others illuminate switch stands with incandescent lights. The lights are usually low voltage and low candle-power lamps placed six or seven in series. The Toledo & Indiana, for instance, places five in a telephone booth and one in each switch light. The Interurban Railway & Terminal Company, Canton-Akron, and Dayton & Troy have lights in the telephone booth and a cluster over the switch, but none in the targets. Some of these roads leave the switch lights burning all the time, believing it more economical than to require the train crews to stop and turn them out. Others require the first crew passing them in the evening to turn them on, and the last crew at night to turn them off. The Scioto Valley lights switches with oil lamps burning seven days. The Canton-Akron, Scioto Valley and several other roads have clusters of lights over all stopping points with

a spring switch on the pole, which is thrown by any passenger who desires to stop a car.

The Columbus, London & Springfield has a circuit of five lamps at each switch; two at the targets, two at the locks and one in the telephone booth. At railroad crossings it has red lights at the derailers, notifying the motorman to stop, and green lights 150 ft. from the crossing notifying him to get the car under control, and white lights over all crossings. The Lake Shore Electric has large illuminated signs showing the word "Derailer" at all railroad crossings. The Dayton, Covington & Piqua has red lights 400 ft. from all derailers.

In Indiana the average distance between sidings on the roads visited, varies from about 2¼ to 4½ miles. Both spring and throw switches are used at sidings. The fact that spring switches may be partly opened by the action of heat on hot days or may not be completely closed by the springs, has discouraged several roads in the use of this type of switch. The switches are usually of the standard steam-road type. With few exceptions the switch stands are lighted at night. On several roads electric switch lights are employed.

On the Indiana Union Traction Company's system two 300-volt incandescent lamps are placed in the lanterns on the switch stands. Trainmen turn the lights on and off by means of a switch in a box on a pole near by. On this system cars are always headed into switches and always backed out when passing each other. This regulation is followed, notwithstanding the fact that time would be saved by permitting the car taking the siding to pass the length of the siding and back on the main track at the other end. The rule of heading in and backing out makes it impossible for a switch to be left open. All of the switches on the Indiana Union Traction system are of the throw type. Spring switches were formerly used at one end of sidings, but these were thought to be directly responsible for two serious accidents in one day, and since that time the use of throw switches has been discontinued.

Both stub and through sidings are used by the Indianapolis & Northwestern Traction Company. The sidings vary in length from 250 ft. to 525 ft. The switches are of the lever throw type and are lighted with oil lamps. East-bound trains take sidings for those west bound, and the rule of heading in and backing out is followed.

On the Indianapolis, Columbus & Southern Traction system, the sidings are about 200 ft. long, and at approximately 3-mile intervals. Those at regular passing points are of the through type, while the others are stub end. Spring switches are used at regular passing points, those at stub-end sidings being of the throw type. The switch stands are provided with a target, but no switch lights are employed. It is a rule that a car heading towards a turnout shall take it. As a precautionary measure, cars slow up while passing switches.

Sidings at meeting points on the Kokomo, Marion & Western system are about 4½ miles apart and about 300 ft. long in the clear. At regular meeting points the sidings are of the through type, but the remainder are stub end. Throw switches alone are used. The switches have no semaphores, but are lighted with electric lights. Three 200-volt lights are used in the circuit. At double-end sidings one light is placed on each of the switch stands at each end of the siding, and the third lamp is located in the telephone booth. At stub-end sidings two lamps are placed in the booth. Trains head in and back out at stub-end sidings, but at through sidings the train taking the siding continues on through and passes out on the main track at the other end. As on the Indianapolis, Columbus & Southern system, trains slow up when passing sidings.

The sidings on the interurban divisions of the Terre Haute Traction & Light Company are about 3 miles apart and 100 ft. long in the clear. The switches are always locked and no switch lights are employed on the switch stands. Cars take sidings when ordered, but when a train having a second or third section following it meets a single car the latter takes the siding.

The sidings on the Fort Wayne & Wabash Valley Traction Company average about 4½ miles apart. They are of both the through and the stub-end type and are provided with throw switches. The switch stands are lighted by electricity. The circuits upon which the lamps are placed run into the sub-stations and other central points and the lights are turned on from these points. An unusual feature in the use of sidings is that cars meeting limited trains are due at sidings 4 minutes ahead of the limited. This gives the trainmen time to get their own orders and clearance orders for the limited.

On the Rapid Railway division of the Detroit United Railways the sidings are located to suit the schedule, but are approximately 3 miles apart. They are of the through type and are provided with spring-trailer switches at one end and throw switches at the other. Switches at meeting points are left open. The first car takes the siding and passes on through it and out the other end.

Sidings are 2¼ miles apart on the eastern portion of the Detroit, Ypsilanti, Ann Arbor & Jackson Railway, and 3 miles apart on the western portion. They are 150 ft. long in the clear. Those at meeting points are of the through type, while all of the others are stub end. Spring switches are used at meeting points and the switch stands are lighted by electricity.

RAILROAD AND HIGHWAY CROSSINGS

Interurban builders in Ohio have, as a rule, endeavored to avoid as many grade crossings with railroads as possible. The steam roads have usually been willing to assist the electrics in building overhead or undergrade crossings. The severe grades usually made necessary at such crossings have made them unpopular with some engineers, but experienced managers after a number of years of operation are of the opinion that the illumination of grade crossings by stationary lights or illuminated signs is a good investment in the long run. Crossing accidents are eliminated, time is saved in making the crossing, and it has been demonstrated by experiments that the power consumed and wear and tear on the machinery in making stops at derailers more than compensates for the extra power on stiff grades at such crossings.

Derailers are almost universally used at grade crossings by Ohio interurbans. The derailer handle is placed beyond the railroad track so that the conductor must cross the track to throw it. The Lake Shore Electric, Western Ohio and Toledo & Western each have one or more half interlockers where a targetman throws a derailer on the electric and a semaphore on the steam line. The Toledo & Western has two full interlockers where the two roads have equal rights and protection, while the Toledo & Indiana has all its crossings thus protected by an arrangement with the steam road which it closely parallels. Several Ohio roads use warning signs at all highway crossings. Four of the roads are using metal signs, which are deemed more durable than wood. The method of working has received some attention. Some of the roads use the words "Look Out For The Cars," while others say, "Railroad Crossing, Stop, Look and Listen." It has been held in the courts that a man must show that he did all three of these precautionary acts or he cannot hold the road for contributory negligence. The Columbus, Delaware & Marion and one or two others have erected alarm bells at especially dangerous crossings, the alarm circuit being closed by a trip in the trolley wire.

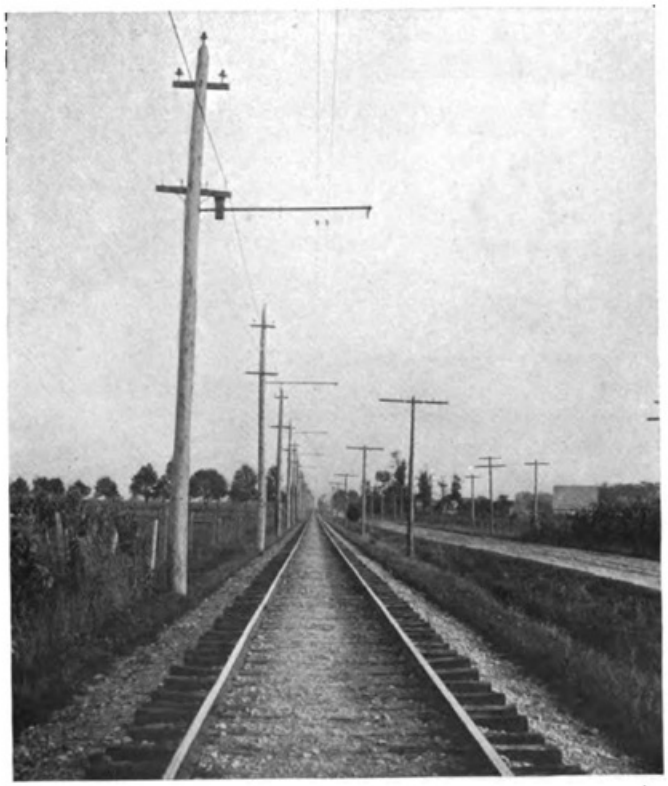
Several of the roads have special "Slow," "Whistle" and "Stop" signs at points where such precautions are considered necessary or desirable.

CURVE CONSTRUCTION, INDIANA UNION TRACTION

VIEW SHOWING FOUR MODES OF TRANSPORTATION ON COLUMBUS, BUCKEYE LAKE & NEWARK—THE ELECTRIC RAILWAY, STEAM ROAD, CANAL AND HIGHWAY

TYPICAL DOUBLE-TRACK CONSTRUCTION, INTERURBAN RAILWAY & TERMINAL COMPANY, CINCINNATI

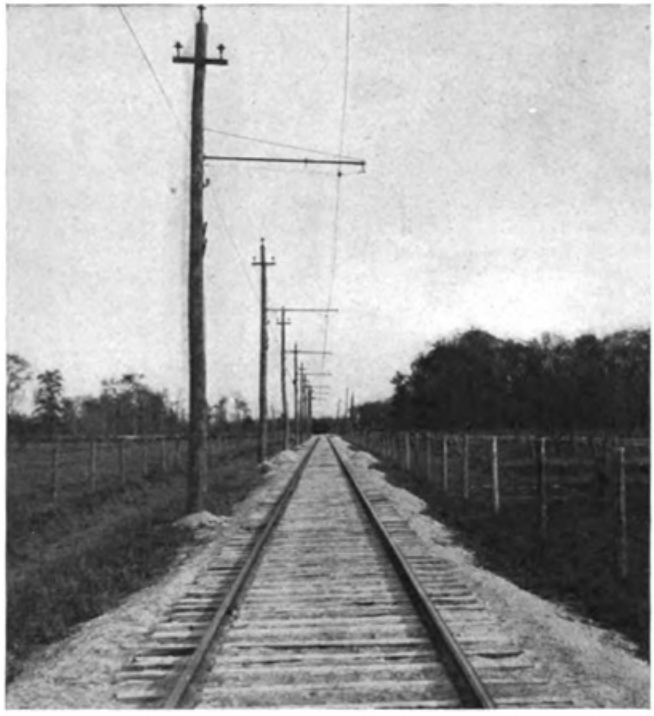
DOUBLE-TRACK CURVE, COLUMBUS, LONDON & SPRINGFIELD



TYPICAL CONSTRUCTION, INDIANAPOLIS, COLUMBUS & SOUTHERN TRACTION

TYPICAL SINGLE-TRACK CONSTRUCTION, INTERURBAN RAILWAY & TERMINAL COMPANY, CINCINNATI

Plate XXVIII



TYPICAL CONSTRUCTION, TOLEDO, PT. CLINTON & LAKESIDE

TYPICAL CONSTRUCTION, DAYTON & MUNCIE

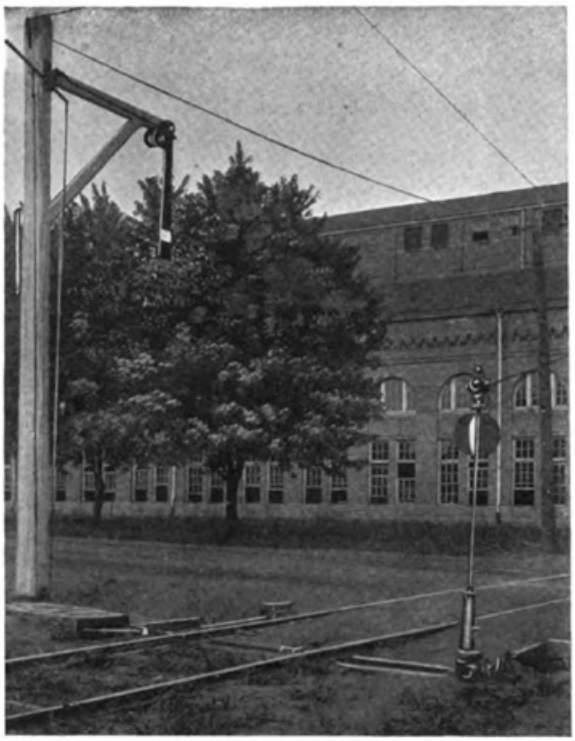
DOUBLE-TRACK CONSTRUCTION, DAYTON & TROY

T-RAIL IN LIMA, OHIO, LIMA & TOLEDO TRACTION

T-RAIL IN CINCINNATI, INTERURBAN RAILWAY & TERMINAL COMPANY

T-RAIL IN SANDUSKY, LAKE SHORE ELECTRIC

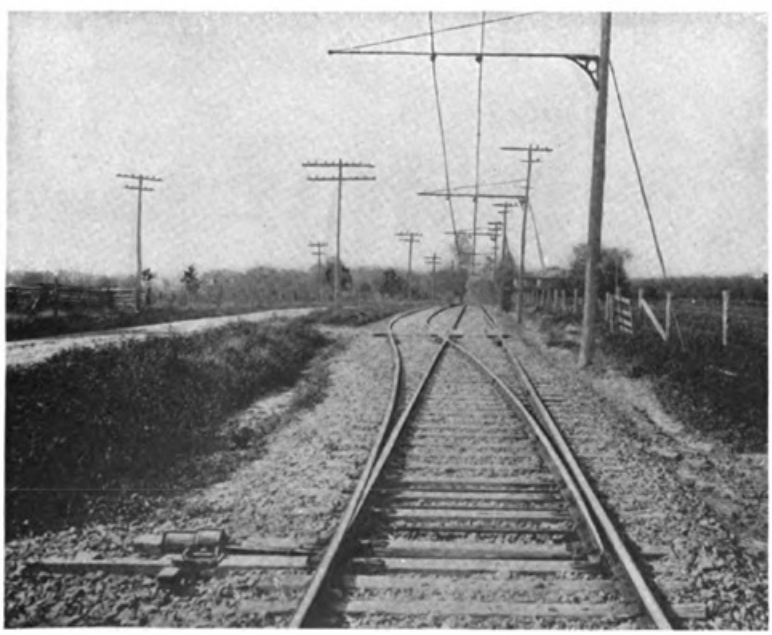
SWITCH LIGHTS, OVERHEAD SIGNS AND TELEPHONE BOOTH
TYPICAL TURNOUT, STARK ELECTRIC



DERAIL AND SEMAPHORE, INDIANA UNION

SWITCH STAND AND TELEPHONE BOOTH, TYPICAL TURNOUT,
COLUMBUS, DELAWARE & MARION

INTERLOCKER AND SEMAPHORE AT RAILROAD
CROSSING, TOLEDO & WESTERN

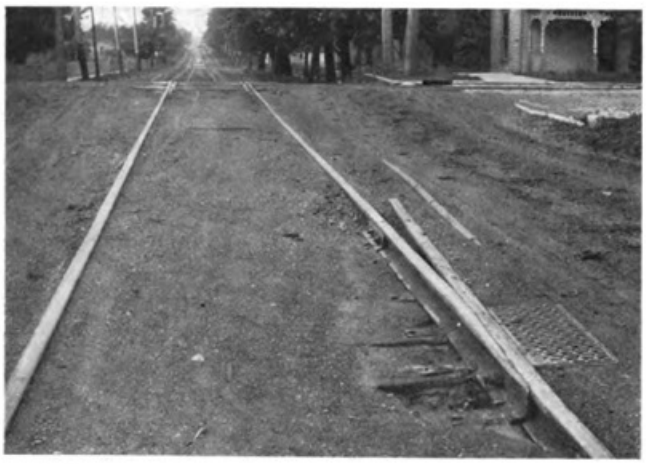


TYPICAL SWITCH, WESTERN OHIO

SWITCH STAND AT TURNOUTS, COLUMBUS, LONDON &
SPRINGFIELD

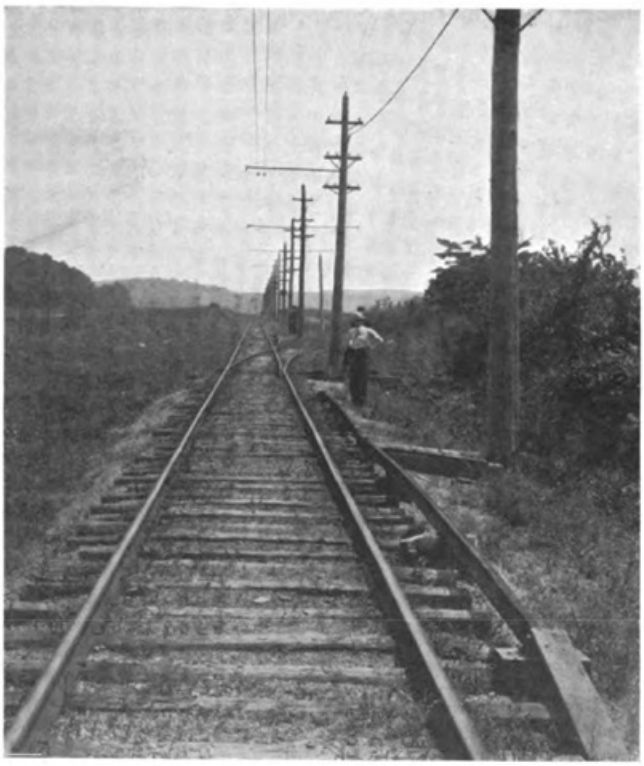
INTERLOCKER, WESTERN OHIO

PROTECTING GUARD-RAIL AT SPRING SWITCH POINT, STARK ELECTRIC



TYPE OF DERAIL, INDIANAPOLIS & NORTHWESTERN

DERAIL AND SEMAPHORE, CINCINNATI, MILFORD & LOVELAND



THIRD RAIL FOR OPERATING SIGNALS AT TURNOUTS, COLUMBUS, NEWARK & ZANESVILLE

INTERLOCKER AND SEMAPHORE AT RAILROAD CROSSING, SPRINGFIELD, TROY & PIQUA

LUDLOW BRIDGE, DAYTON, COVINGTON & PIQUA

BIG DARBY BRIDGE, COLUMBUS, LONDON & SPRINGFIELD

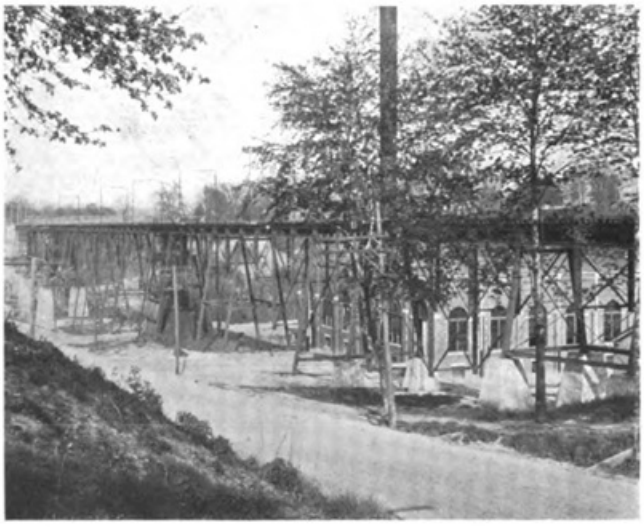
SWING BRIDGE AND TRESTLE AT OAK HARBOR, TOLEDO, PT. CLINTON & LAKESIDE

SCIOTO RIVER BRIDGE, COLUMBUS, LONDON & SPRINGFIELD

THE FAMOUS Y CONCRETE BRIDGE AT ZANESVILLE, OHIO

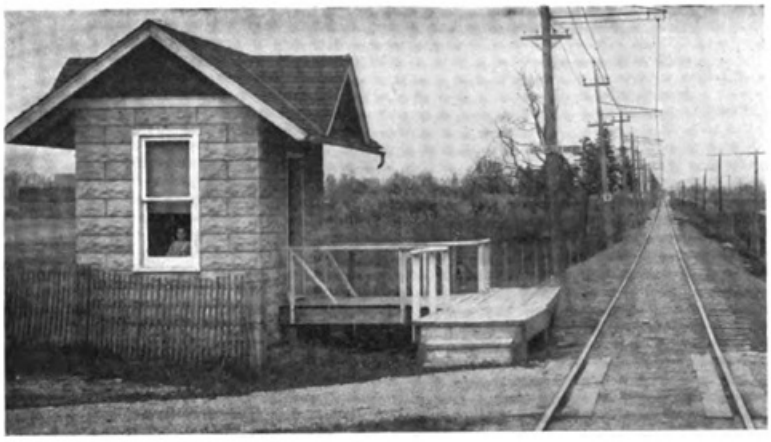
TYPE OF CONCRETE BRIDGE USED BY SEVERAL INTERURBAN ROADS IN OHIO

NEW GORGE BRIDGE, NORTHERN OHIO



BRIDGE REBUILT FROM OLD STEAM RAILROAD BRIDGE, CLEVELAND, PAINESVILLE & ASHTABULA

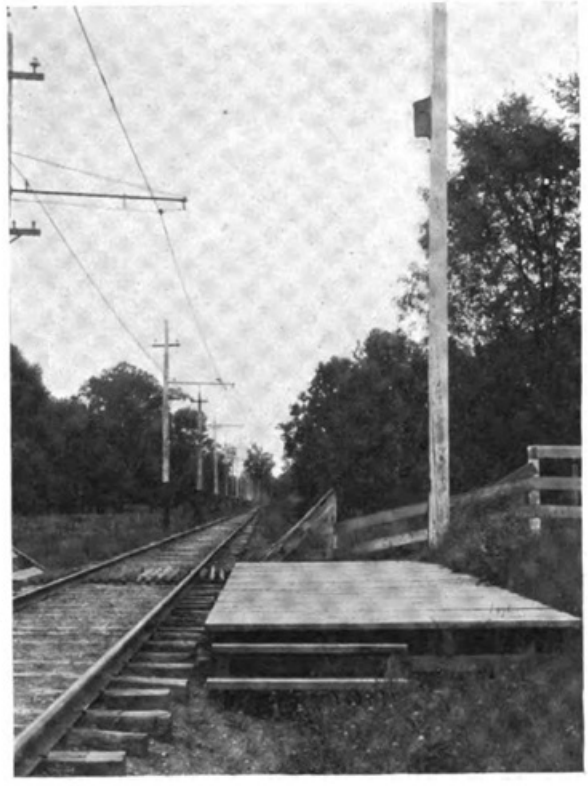
OLENTANGY RIVER BRIDGE, COLUMBUS, DELAWARE & MARION



PRIVATE WAY STATION, COLUMBUS, DELAWARE & MARION

WAY STATION, COLUMBUS, LONDON & SPRINGFIELD

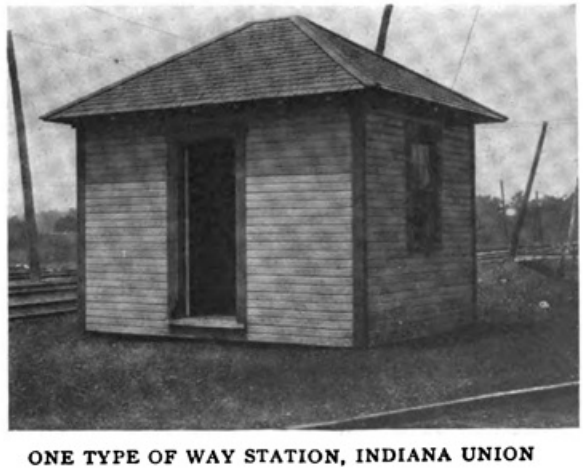
WAY STATION, COLUMBUS, NEWARK & ZANESVILLE



PLATFORM AND STOP SIGNAL, INDIANAPOLIS & NORTHWESTERN

WAY STATION, COLUMBUS, DELAWARE & MARION

JUNCTION STATION, LAKE SHORE ELECTRIC



ONE TYPE OF WAY STATION, INDIANA UNION

PRIVATE WAY STATION, FORT WAYNE & WABASH VALLEY

TYPICAL WAY STATION, INDIANAPOLIS & NORTHWESTERN

WAY STATION, KOKOMO, MARION & WESTERN

OLD SHELTER AT ARLINGTON, WITH NEW FREIGHT AND PASSENGER STATION IN DISTANCE, INDIANAPOLIS & CINCINNATI TRACTION

WAY STATION, DAYTON & TROY

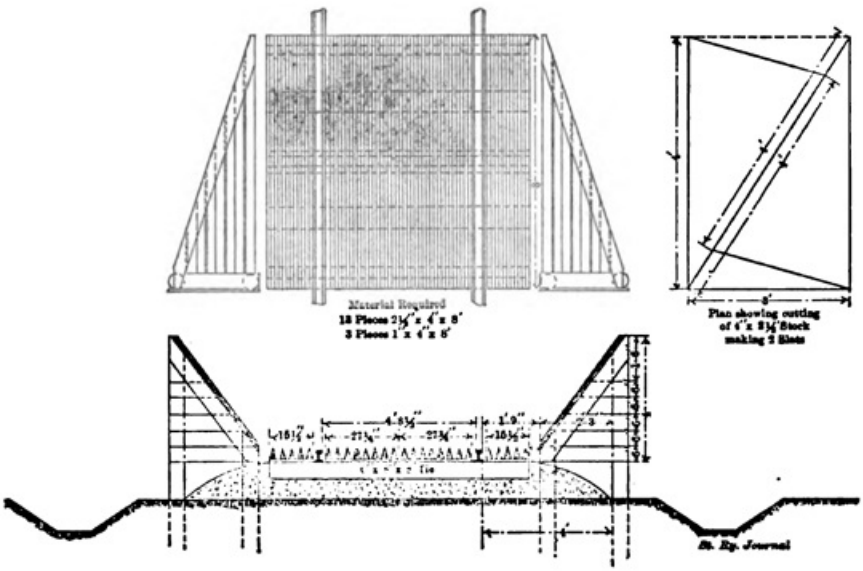
PASSENGER AND EXPRESS STATION AT NORWOOD, CINCINNATI & COLUMBUS

ENCLOSED STATION AT PARK, TOLEDO, PT. CLINTON & LAKESIDE

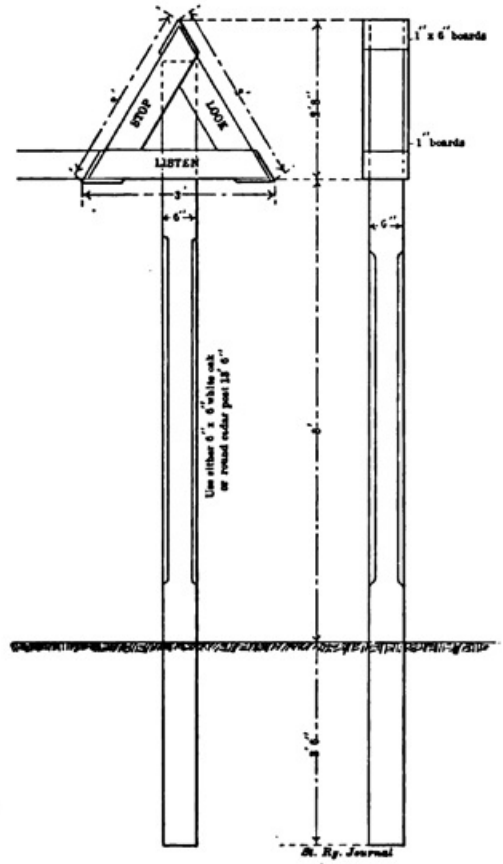
BRIDGES, TUNNELS AND CULVERTS

There is a growing tendency on the part of Ohio interurbans to build their own bridges crossing large streams instead of using highway bridges as many of them did in the earlier days. The increasing weights of cars, the desire to haul freight trains and the delays from team traffic were responsible for this. One of the finest traction bridges in the country is that of the Toledo Urban & Interurban over the Maumee River, near Toledo. It consists of five steel spans, resting on concrete piers with steel and timber approaches, in all about 1800 ft. long. This bridge is said to have cost about $75,000. The Northern Ohio Traction & Light Company recently built a double-track bridge at the Gorge, south of Cleveland. It is about 800 ft. long and 100 ft. high, and eliminates a very heavy grade and two severe curves. It cost $50,000. The Cleveland, Painesville & Ashtabula has a 1200-ft. bridge over Grand River at Painesville, which was rebuilt from two steam railroad bridges. It is amply strong for interurban cars, but was discarded by the steam road when it began running fast Pullman trains. The Lake Shore Electric Railway has a similar bridge on its Elyria branch. The Toledo, Port Clinton & Lakeside has an interesting swing bridge, the high tension lines being carried over the top of the swing portion on towers. The tower over the center span has a pole set on a revolving center so that while the bridge revolves the pole remains stationary. The Cincinnati, Georgetown & Portsmouth, the Scioto Valley, the Dayton, Covington & Piqua and the Cleveland & Southwestern each have some noteworthy steel bridges. Many of the roads in their earlier periods had numerous wood trestles or trestle bridges, but the practice is to fill at these places as rapidly as possible. The Lake Shore Electric and the Western Ohio have each filled several trestles, while the Cincinnati, Georgetown & Portsmouth, which a few years ago had forty-one trestles in 50 miles, now has but eleven, and is rapidly filling these. The Toledo & Western, which handles heavy freight, designed its bridges to carry two 100-ton locomotives coupled together. The Toledo, Port Clinton & Lakeside figures its bridges to carry 62 tons on single span. The Toledo & Indiana figures bridges for 65 tons, and the Interurban Railway & Terminal Company for 100 tons.

Some little work has been done in this district in the way of solid concrete bridges. The Lake Shore Electric, Western Ohio, Detroit, Monroe & Toledo Short Line and other roads have a number of concrete culverts and there are a few 30 ft. to 40-ft. highway crossings of solid concrete, but the usual practice is to use concrete only for the supporting walls with a steel span for the track. Concrete has been used extensively in building piers for larger bridges and in building retaining walls. Some unusually heavy work in the way of retaining walls is being done by the Cincinnati Northern in the reconstruction of its line between Cincinnati and Dayton.



STANDARD CATTLE-GUARD AND WING FENCE, FORT WAYNE & WABASH VALLEY



STANDARD CROSSING DANGER SIGN, FORT WAYNE & WABASH VALLEY

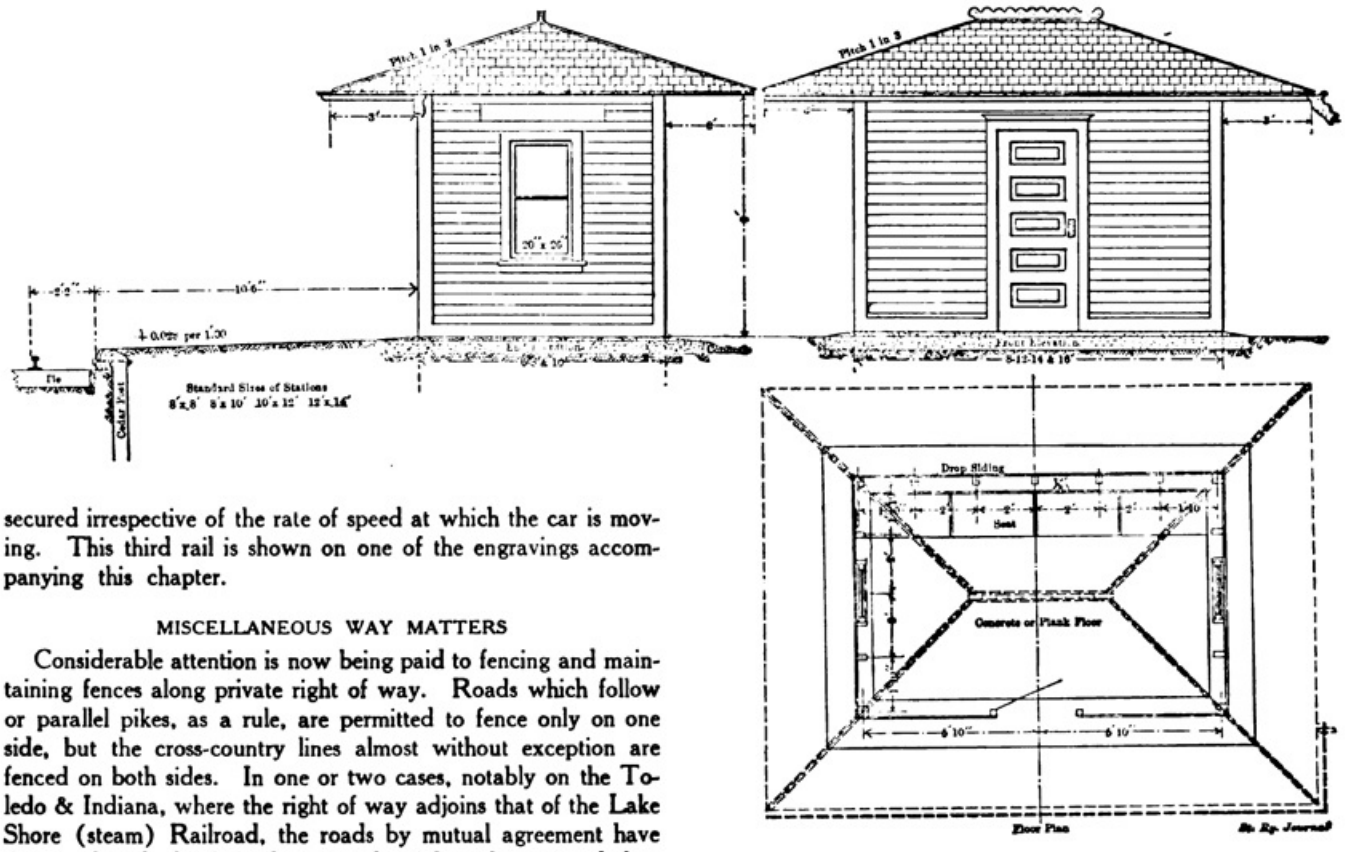
LAYOUT FOR STANDARD SIDING, FORT WAYNE & WABASH VALLEY

BLOCK SIGNALS

Block signals on interurban roads are not as popular in this district as they were two or three years ago. This is not due entirely to the unreliability of the block signals themselves, but because the roads which used them, as a rule, attempted to place the entire dependence for train handling upon these signals.

Later, as more cars were added, and freight cars with their irregular habits, and limited cars with their higher speed came into prominence it was found necessary to install despatching systems with train orders and the use of the block signals was dispensed with. This was the case with the Toledo Urban & Interurban, the change being made to accommodate the fast cars of the Dayton-Toledo service. Several of the roads are experimenting with block signals of various types.

The Columbus, Newark & Zanesville management is working out a system for operating block signals. This includes a stretch of third rail at the entrance to each turnout and a third-rail shoe or contact maker on the car truck. By establishing contact between the car and the section of third rail, a positive and quick-acting medium for automatically actuating the signals will be secured irrespective of the rate of speed at which the car is moving. This third rail is shown on one of the engravings accompanying this chapter.



PLANS OF STANDARD SHELTER SHED AT WAY STATIONS, FORT WAYNE & WABASH VALLEY

MISCELLANEOUS WAY MATTERS

Considerable attention is now being paid to fencing and maintaining fences along private right of way. Roads which follow or parallel pikes, as a rule, are permitted to fence only on one side, but the cross-country lines almost without exception are fenced on both sides. In one or two cases, notably on the Toledo & Indiana, where the right of way adjoins that of the Lake Shore (steam) Railroad, the roads by mutual agreement have dispensed with the fence between the rights of way, and they co-operate in the maintenance of a common ditch. Woven wire fences are used by practically all the roads. Several roads use a fence having a fine mesh below and a large mesh above, the smaller mesh keeping out small domestic animals. Several roads use iron posts for fence posts.

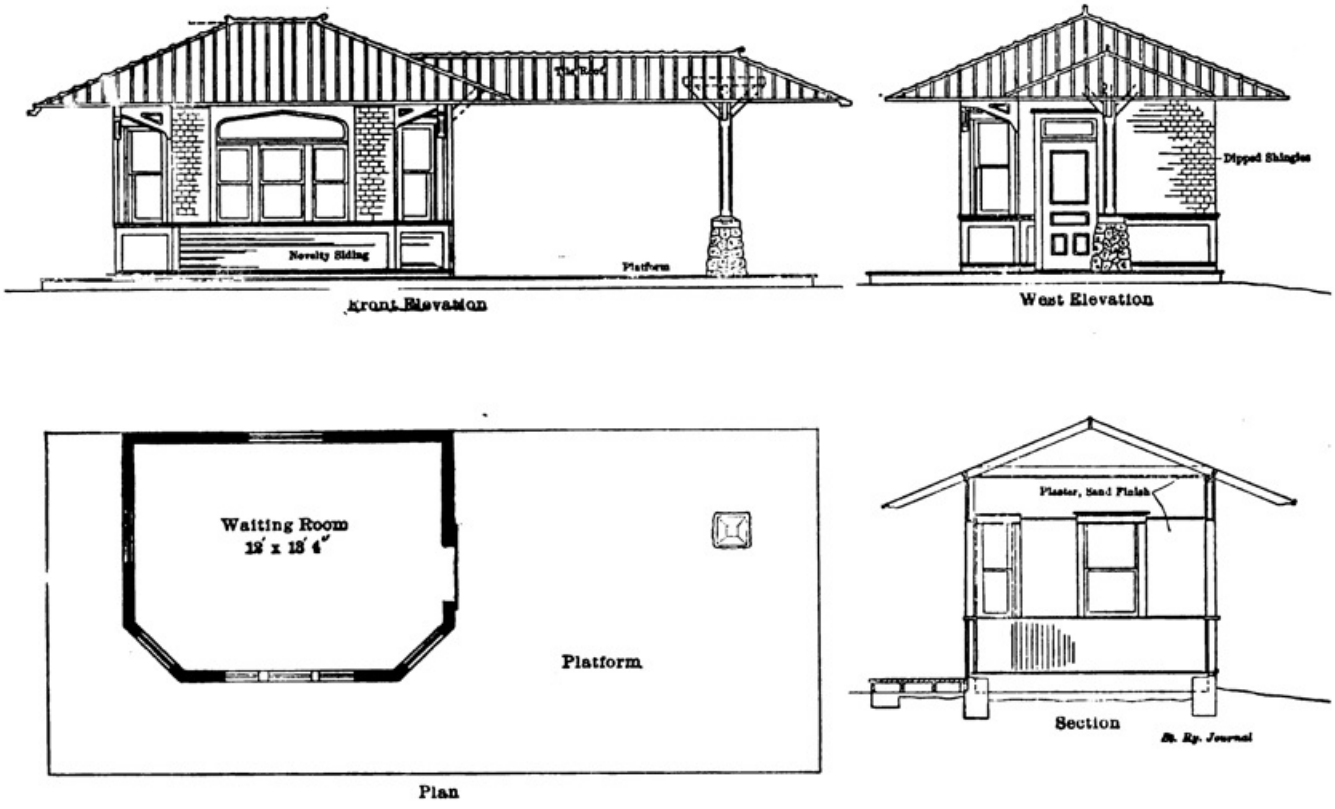
The roads are about equally divided between the use of vitrified clay cattle guards and wood guards. One road is using a stamped metal cattle guard.

Some tremendous crops of weed have been grown on the rights of way of interurban roads this year and the destruction of them with the small track forces which the majority of roads can afford has been one of the chief sources of worry for the operating men of late. Various methods have been pursued to get rid of weeds. The Lake Shore Electric, Cleveland & Southwestern and several roads pull their weeds in the spring and then cut them two or three times during the year. The Dayton & Troy has a force at work all summer and the men go over the entire track about once in three weeks pulling the weeds. The Fort Wayne, Van Wert & Lima covers its line once in four weeks, and the Canton-Akron once in five weeks during the summer months. The Scioto Valley goes over the route twice during the spring with scuffle hoes cutting off the roots of the weeds. After that they are cut at intervals as often as they grow beyond a certain height. The Toledo, Port Clinton & Lakeside burns weeds with hand torches early in the spring and cuts them twice during the summer. The Interurban Railway & Terminal Company has used weed exterminator sprinkled over the line with a sprinkling car with considerable success, the cost being about $20 per mile for material and labor. The Dayton & Western tried this plan, and while it killed the weeds it also killed several cows that had browsed on the right of way, bringing the cost of weed killing up to a prohibitive figure. The weed-burning car designed by Manager Darrow, of the Toledo & Indiana, described in the STREET RAILWAY JOURNAL for Aug. 4, 1906, is reported to be giving excellent satisfaction. The cost of exterminating is said to be but $3 a mile. Manager Franklin, of the Toledo & Western, is building a weed burner of somewhat different type. The floor and sills of the car will be of metal, and there will be an iron fire-box hung under the car. This will be bricked and heated red hot by oil sprays and sprays of oil will be sprinkled over the track in front of the burner, the oil being ignited as the burner passes over it. Manager Mowrey, of the Stark Electric Railway, is also getting out plans for a weed burner.

While methods and appliances may have some bearing upon the condition of a track, the securing of a fine roadway depends more than anything else upon the number of track men constantly employed in track work. The writer was recently going over a line which closely paralleled the main line of the Pennsylvania Railroad. The difference in the appearance of the two tracks was most marked, and with a sigh the manager of the electric road remarked that he hoped some day his track might look like the beautiful stretch adjoining. "How many track men do you employ was the inquiry." "That is the whole story," he replied. "The Pennsylvania has four men to the mile, and we have one to about every 4 miles." The Dayton & Troy

maintains its fine track by employing forty-one men on 31 miles. The Western Ohio, with heavy heavy rock ballast in which weeds do not grow readily, has a man to the mile. The Lake Shore Electric has about the same, while the others in the district vary from that on down to one poor road which has seven men for 50 miles; small wonder if the weeds rub the motors, and the passengers are troubled with seasickness. The Dayton & Troy and Fort Wayne, Van Wert & Lima use hand cars for track men and have section houses for storing of tools and track supplies. The latter road bought a number of small school houses adjoining its right of way for this purpose. The Toledo & Western, Springfield, Troy & Piqua, and one or two other roads use gasoline cars for inspection work. The Dayton & Troy employs track walkers who cover the entire road and inspect all switches daily.

One of the points looked after by roads anxious to develop apolis, Los Angeles, Milwaukee and several other centers, but two years from now conditions will be different in a number of large Ohio cities. Plans have been completed for a very fine station in Toledo. The work is being held up temporarily owing to the action of the city on refusing a franchise for the necessary turnouts to enter the site selected; a blind and senseless policy of obstruction in view of the tremendous amount of business brought into the city by nine interurbans centering there and the inconvenience to the public of the present inadequate method of landing passengers from a street station. Plans for the proposed Toledo station were illustrated in the STREET RAILWAY JOURNAL for Feb. 3, 1906. In Cleveland the interurbans have a fine union freight station with adequate facilities for future growth, and they own a tract adjoining where it is probable that a union passenger station will be erected within a year or two. Preliminary plans for such a station have already been made. The



SHELTER STATION AT GROUNDS OF COUNTRY CLUB, FORT WAYNE & WABASH VALLEY

their business is the erection of suitable station buildings and shelter houses in all towns and way stations. The Scioto Valley has particularly fine buildings in all towns, a number of them in connection with sub-stations, while in other towns the company has erected neat frame buildings, heated in winter by stoves. The smaller stations at cross-roads are not heated, although they are enclosed. The Cincinnati, Georgetown & Portsmouth has twenty-one station buildings with agents in 50 miles of track, with small enclosed station buildings at other points giving an average of five stops to the mile. The Western Ohio, Lake Shore Electric, Dayton & Troy, Fort Wayne, Van Wert & Lima and several roads have their own station buildings in all towns, with small, open or enclosed buildings at stopping points. In a number of instances, the roads assist the farmers in the erection of way stops and shelter houses. Groups of typical way stations in the districts are shown in this connection.

TERMINAL STATIONS

At the present time there are no terminal stations in Ohio, which compare with the magnificent stations erected in Indian-

Cleveland interurbans at present radiate from the Public Square and have the advantage of a large shelter house and public comfort station erected by the city at a cost of $12,000. The cars are permitted to lay up in front of the station, and there is a ticket office opposite the building. This arrangement was described in a recent issue of the STREET RAILWAY JOURNAL.

The Interurban Railway & Terminal Company, of Cincinnati, owns a large three-story building with train shed for both passenger and freight cars, which is used by its three lines and by the Cincinnati, Milford & Loveland Traction Company. The terminal has the disadvantage of being laid with broad-gage track and the standard gage roads are unable to reach it. Plans of the station are shown on another page.

The union station at Columbus has long been inadequate to accommodate the numerous interurbans. Last year the Scioto Valley withdrew from the arrangement and established its own station, which is referred to in another part of this issue. The Indiana, Columbus & Eastern Railway has had under consideration the erection of suitable terminal stations in Columbus, Springfield and Dayton, and if built they will doubtless be

designed to accommodate all of the roads entering these centers. Dayton has long felt the need of a union station, and the establishing of such a station has only been held up by the inability to make satisfactory arrangements between three city companies and seven interurbans. Now that the Schoepf syndicate controls several of these roads, the plan will doubtless be carried out. The important terminal station at Indianapolis was fully described in the STREET RAILWAY JOURNAL for Nov. 12, 1904.

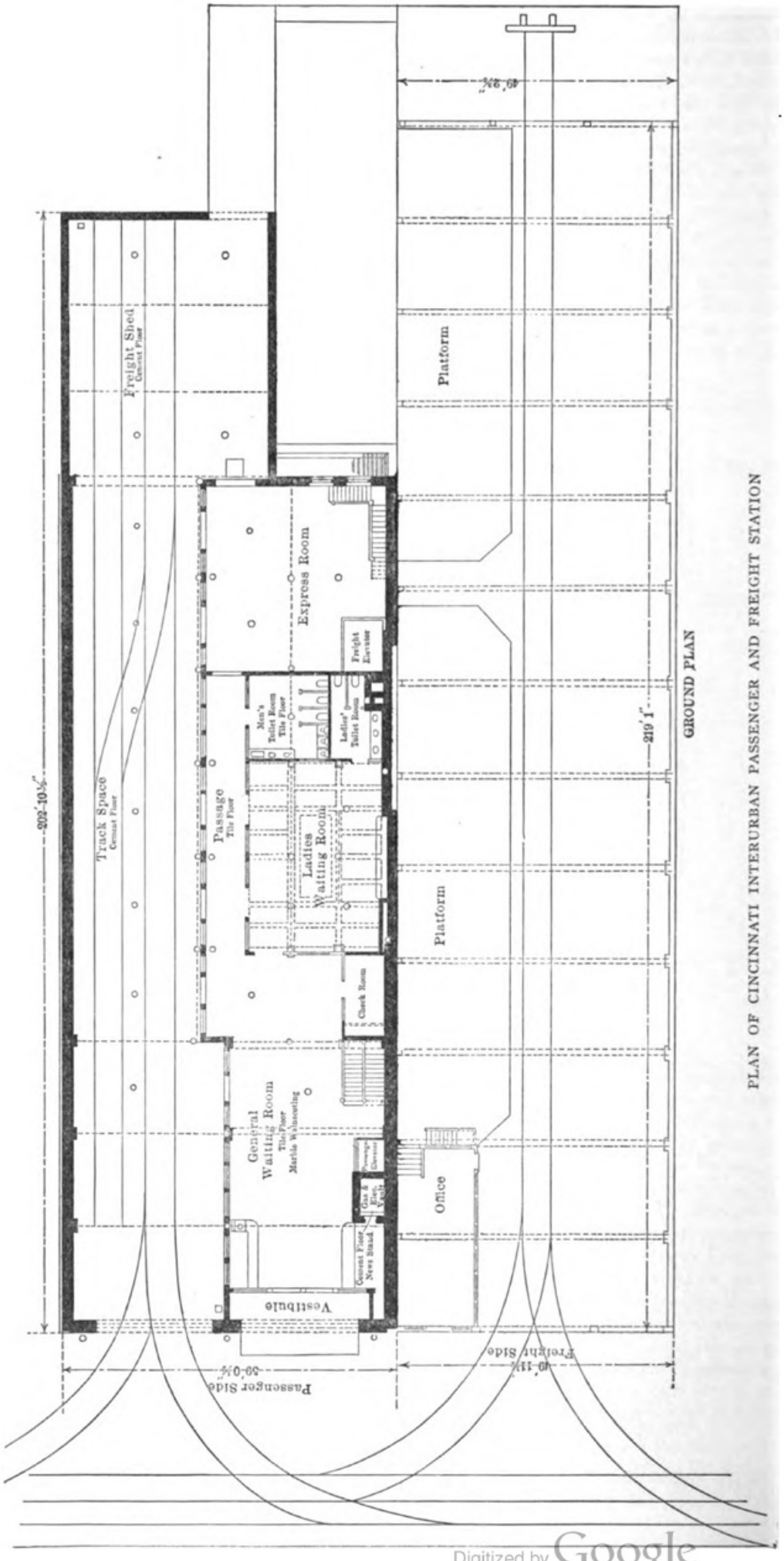
WAY STATIONS

All the interurban systems visited in Indiana and Michigan provide small shelters at the more important stops in the country, and in towns several companies have elaborate passenger and freight stations.

On the interurban lines of the Detroit United Railways an open way station, measuring 12 ft. x 12 ft., is erected at all highway crossings. At the larger towns combination passenger and freight stations are built.

A small enclosed square building is erected at stopping places on the Indiana Union Traction system. The building, which has a hip-roof, is without ornamentation. At some of the larger towns on this system large combination freight and passenger stations are erected. The front portion of the station at Kokomo contains division offices, ticket office and waiting room, and in the rear are freight sheds .

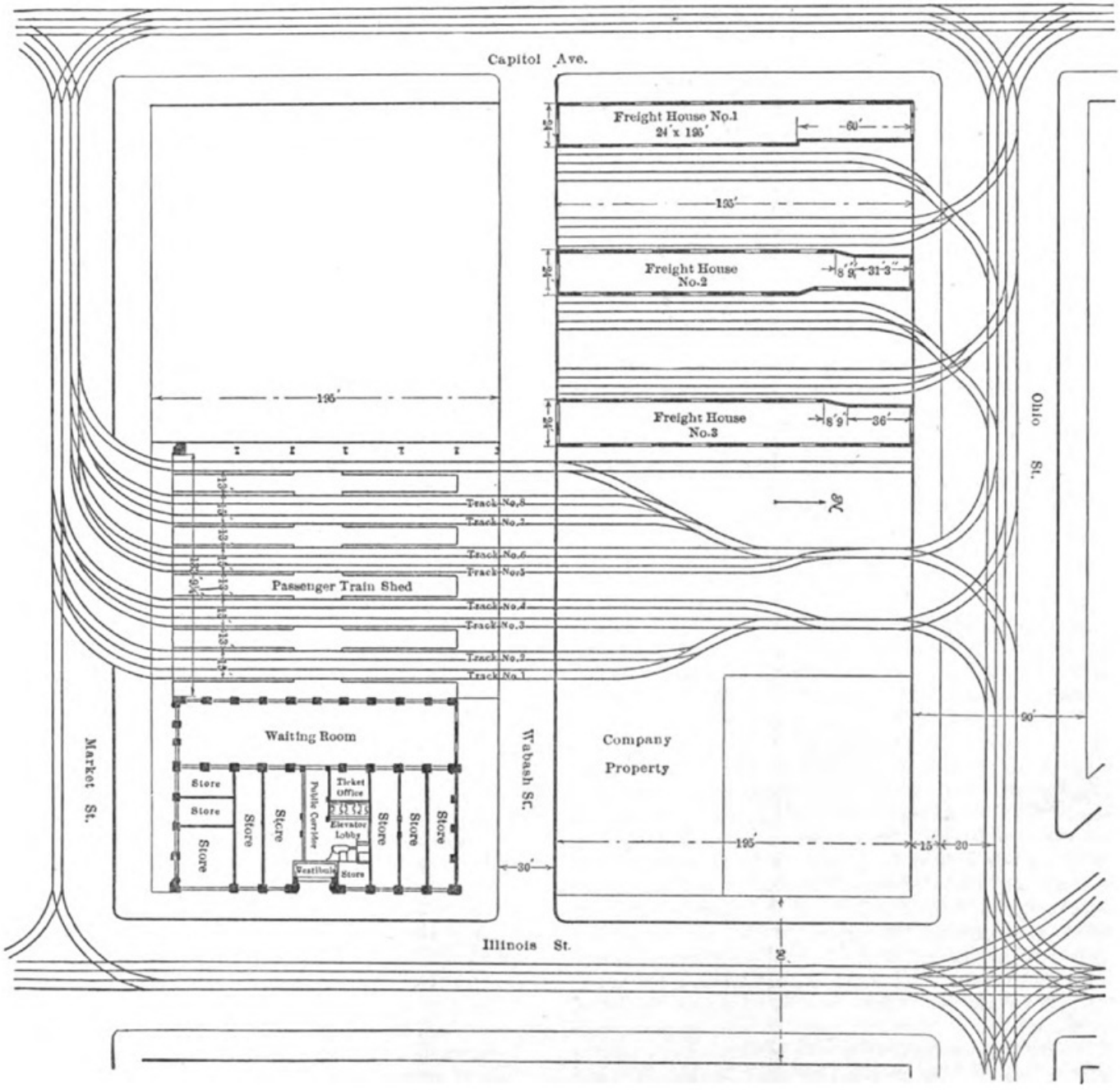
All scheduled stops on the Indianapolis & Northwestern system are provided with platforms measuring 8 ft. wide and 30 ft. long. Signal lamps for signalling the cars are located on a nearby pole, the switch for lighting the lamps being secured to the pole a few feet above the platform. At country stops where the number of passengers warrants it enclosed stations,



PLAN OF CINCINNATI INTERURBAN PASSENGER AND FREIGHT STATION

measuring 8 ft. by 10 ft., are erected. The overhanging pagoda roof of these shelters adds much to their appearance.

On the Kokomo, Marion & Northwestern system a very small enclosed building is erected at all stopping places. On the Sullivan division of the Terre Haute Traction & Light system the line. Where sub-stations are usually located at towns, a combination sub-station and passenger and freight station is erected. These stations, one of which is at Roanoke, are so arranged that the duties of sub-station operator and ticket and freight agent can be attended to by one man.



GROUND-FLOOR PLAN, INDIANAPOLIS TRACTION TERMINAL BUILDING

a small building, enclosed on three sides and provided with seats, is placed at points where traffic warrants them.

The standard type of way station of the Fort Wayne & Wabash Valley Traction Company are painted a lemon yellow. A sign, bearing the name of the station and the distance in miles from Logansport and Fort Wayne, is suspended from the eaves of the building. Several private stations have been erected along

At the unimportant stops on the Indianapolis & Cincinnati Traction system is built a small shelter with a gable roof. The building is enclosed on three sides. At the more important stops combination freight and passenger stations are being constructed by the management. These structures are one and one-half stories in height and are built back a short distance from the track.