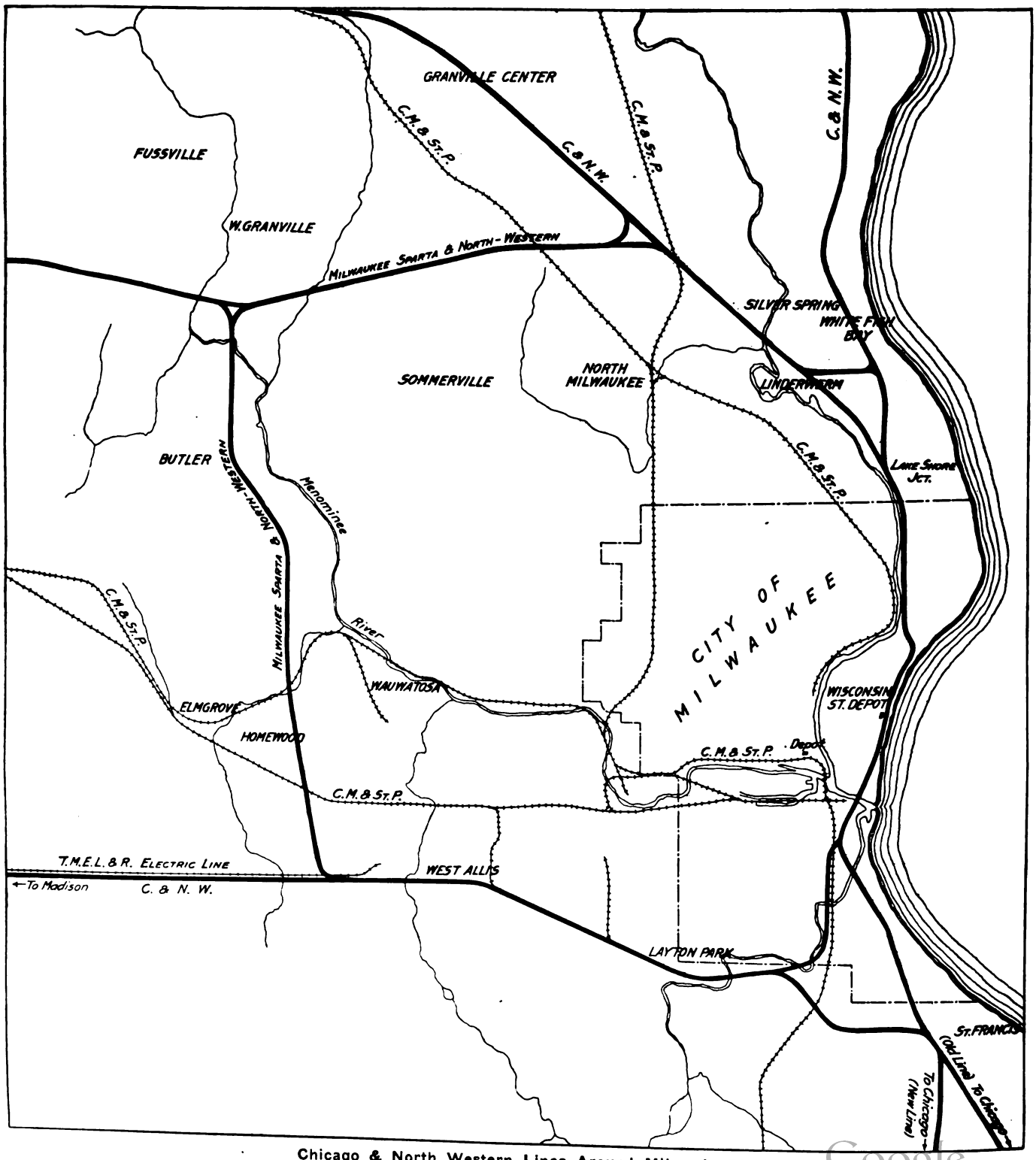
CONSTRUCTION WORK ON MILWAUKEE BELT SECTION OF THE MILWAUKEE, SPARTA & NORTHWESTERN.

In connection with the building of the Milwaukee, Sparta & Northwestern, a low-grade line from Lindwerm, Wis., to Sparta, the Chicago & North Western has added a belt connection around the city of Milwaukee, to eliminate the congestion of traffic in that city and to open a strip of territory desirable for industrial development. The relation of this belt line to the North Western's operation in the vicinity of Milwaukee was shown in an illustrated article in the *Railway Age Gazette* of February 24, 1911, page 354. This section of the new road is now about finished, and it is expected to be turned over for operation in a short time.

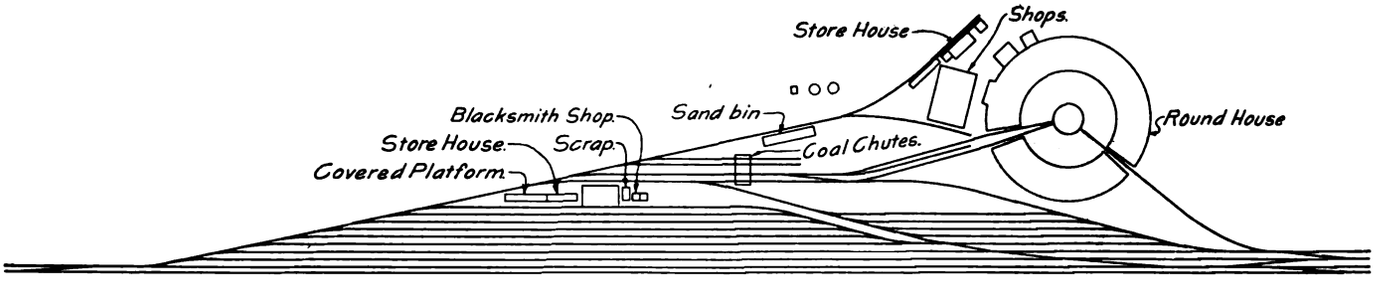
The belt line leaves the Madison division of the Chicago & North Western about one mile west of West Allis, running northerly for about eight miles to a connection with the main line of the new Milwaukee, Sparta & Northwestern. The line is double track with a maximum grade of 0.5 per cent., compensated, and is laid with 90-lb. rail and gravel ballast. The principal construction features are the Butler yard and engine terminal and the structures over the Menominee river, the two divisions of the Chicago, Milwaukee & St. Paul Railway and the electric line of the Milwaukee Electric Railway & Light Company.



Chicago & North Western Lines Around Milwaukee.

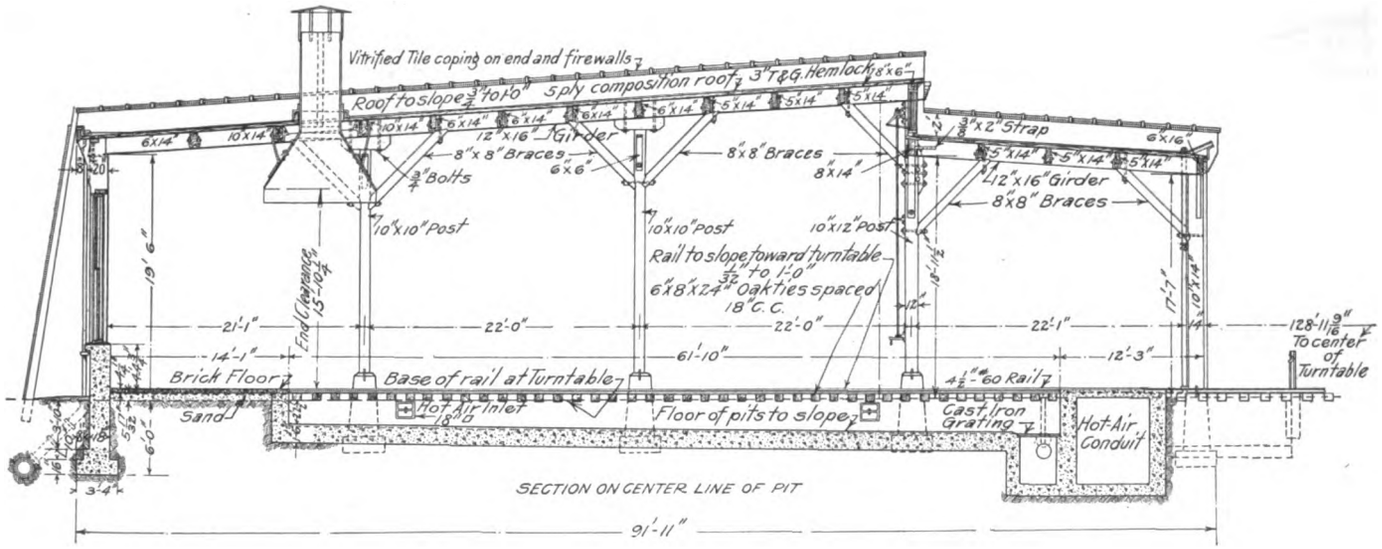
BUTLER YARD.

The terminal lay-out is divided into two parts by a highway crossing at the new town site of Butler. Although the grades have not yet been separated at this crossing, it is probable that the road will be carried overhead on a steel viaduct. The classification yard is south of this point and the repair yard and shop building group are north. The classification yard is on a level grade and contains 21 tracks with a capacity of 1,525 cars. It is laid with 72-lb. rail on soft ties and gravel ballast. The tracks are laid 13 ft. center to center, with No. 7 turn-outs from ladders. The yard is on a very light fill, the material for which came from a cut about three miles south. This cut furnished about 42,000 cubic yards, which made all fills on the 8-mile section.

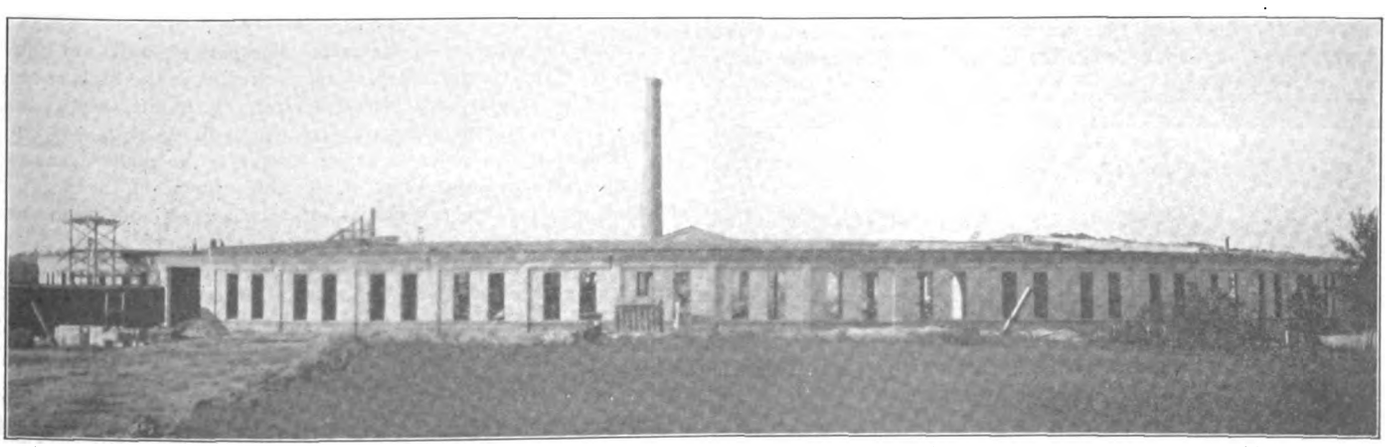


Repair Yard and Engine Terminal.

The repair yard has eight tracks spaced 20 ft. center to center, and is served by a ladder at each end. The group of buildings includes, in addition to the roundhouse, a power house and machine shop, storehouse, sand bin, coal chute, blacksmith shop and air brake room, paint shop, office building and club house. The engine house is the company's standard 90-ft. brick house having a 60-stall circle. The two openings, a single track from the classification yard and a double track from the engine leads, occupy the space of three stalls, leaving 57 stalls for service. There is a standard 80-ft. turntable on a concrete foundation. The foundation and side walls up to 4 ft. 5 in. above the base of rail are of concrete, and the brick wall above the concrete is 16 in. thick. The roof is 3 in. x 8 in. D. & M. planking covered with 5-ply composite tar and gravel roofing. The running rails in the engine house are 60-lb. laid on 6 in. x 8 in. x 24 in. ties on 18 centers set flush with the surface of the concrete. The house is heated by blowing hot air through concrete ducts below the track level from a heating and fan room adjoining the house. The main duct is laid just within the inner circle of the engine house, and connects with laterals between each pair

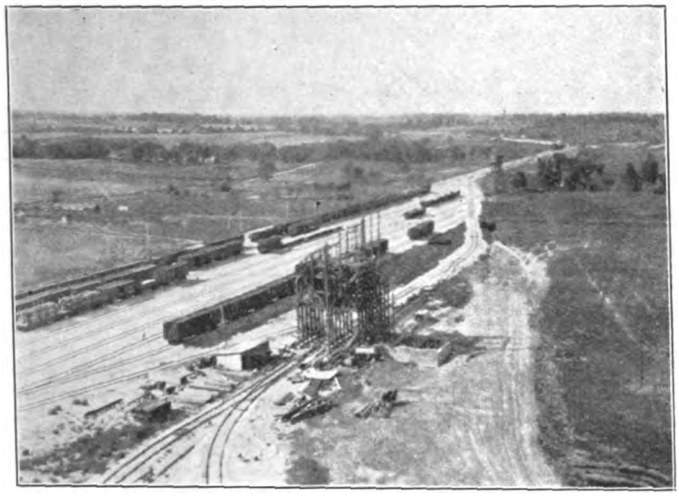


Section of Roundhouse.



Roundhouse; Milwaukee, Sparta & Northwestern.

of stalls. Two openings from each lateral admit air to the track pits, the openings being controlled by dampers. The smoke jacks are of a patented composition sold under the trade name Transite. The concrete in the foundations was placed from three mixers inside the circle located approximately at the third



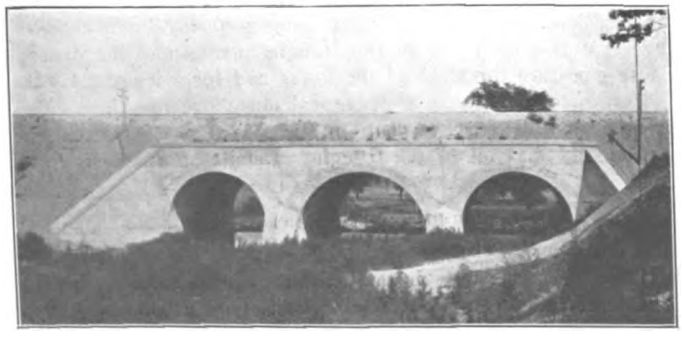
Repair Yard and Coaling Chute During Erection.

points. The material was brought in in standard cars and wheeled to the mixers and the concrete was wheeled away to the forms.

The power house is 100 ft. x 109 ft. 10 in., divided into a boiler room, generator room and machine shop. There will be a

Club House.

battery of five boilers and a generator supplying electric power for operating the machines in the shops, for lighting all buildings and for operating the fan for the heating system. The power house chimney is brick, 120 ft. high and 7 ft. inside diameter at the bottom.



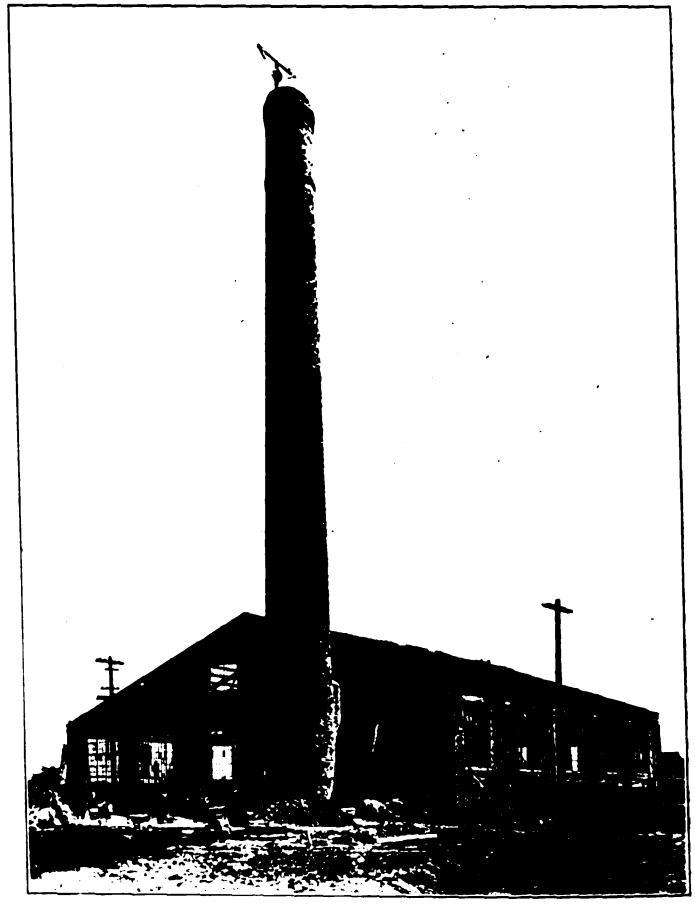
Menominee River Arch.

The coal chute is a frame structure on concrete foundation of the standard automatic hoist type, built by Fairbanks, Morse & Company, Chicago. It has a capacity of 600 tons and provides for coaling engines on two tracks.

The club house, which provides living accommodations for trainmen, is a 3-story frame building on concrete foundation, with slate roof. It contains 18 double rooms, in addition to the living room, dining room, kitchen, halls, baths and living quarters for the family conducting the house. The building is equipped with electric light, steam heat and running water.

MENOMINEE RIVER ARCH.

The Menominee river is crossed just south of the junction of the belt line and the main line of the Milwaukee, Sparta & Northwestern, and is carried under the tracks in one 40-ft. and two 32-ft. concrete arches. The footings are on rock and gravel, the maximum pressure allowed being 6,500 lbs. per sq. ft. The arch barrels are reinforced in both directions by ½-in. corrugated bars spaced 1 ft. center to center at a uniform distance of



Power House; Milwaukee, Sparta & Northwestern.

3 in. from the intrados of the arch. The parapet walls are reinforced by ¼-in. corrugated bars set vertically in the back of the wall, and by similar bars placed horizontally in the face of the wall. The up-stream piers are provided with 60-lb. rails set in the surface of the concrete as ice breakers, the method of anchoring these rails by ½-in. rods being shown in the accompanying drawing. The backs of the arch barrels and bench and parapet walls have a smooth mortar finish and were waterproofed in the following manner: The concrete, when clean and dry, was painted with a coat of asphalt cut with naphtha or gasolene. This surface was covered by ½ in. of asphalt mastic, made of one part asphalt to four parts of clean sand, spread in place and well smoothed with smoothing irons. The entire surface was then mopped with hot asphalt and sprinkled with sand. The concrete mixtures used in this structure were as follows: Arch rings, copings and parapet walls, 1:2:4, stone to pass a 1½-in. ring; bench walls and wing walls, 1:3:5, stone to pass a

2¼-in. ring; footings, 1:3:6, stone to pass a 2¼-in. ring. The yardage in the complete structure was approximately 6,000 yards.

CHICAGO, MILWAUKEE & ST. PAUL CROSSINGS.

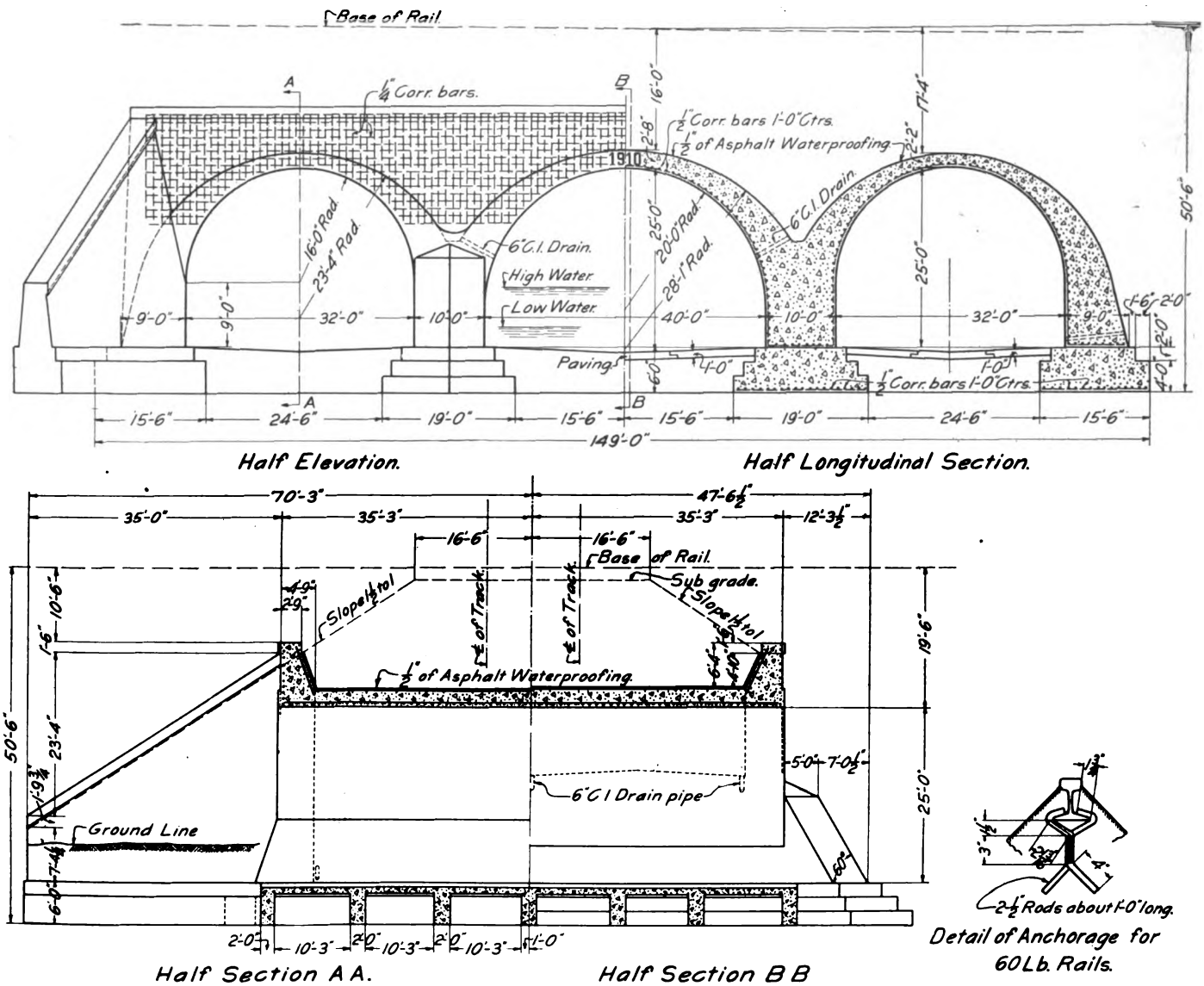
The La Crosse division and the Prairie du Chien division of the Chicago, Milwaukee & St. Paul are crossed by the belt line on riveted through truss structures with open trough floors. The Prairie du Chien division crossing is near a highway crossing, the latter being spanned by the deck plate girder approach shown in the accompanying photograph. The La Crosse division is crossed on a double-track through riveted lattice truss having a span of 170 ft. ½ in. Cooper's E50 loading with the impact formula $I = \frac{3/4 L}{L+D}$ was used to determine live loads for the trusses, longitudinal girders and floor troughs at panel points. For intermediate troughs, 30,000 lbs. on each rail was assumed to be distributed on two ties. The unit stresses used were:

Tension for structural steel, 15,000 lbs. per square inch.

Compression for structural steel, $\frac{15{,}000}{1 + \frac{L^2}{13{,}500\ r^2}}$ lbs. per square inch;

Bending for pins, 22,000 lbs. per square inch;
Bearing for pins and shop rivets, 22,000 lbs. per square inch;
Shearing for pins and rivets, 11,000 lbs. per square inch;
Shearing for web plates (gross section), 9,000 lbs. per square inch.

The open trough floor in this bridge, which requires only 1 ft. 10⅞ in. between low steel and base of rail, is typical of the construction which the Chicago & North Western is using in cases where the requirements of clearance demand a thinner floor than can be secured with the common floor beam construction. Longitudinal plate girders, 4 ft. ¼ in. back to back of angles, are placed 2 ft. 1 in. inside of the trusses, and the floor troughs, which are built up of plates and angles, are connected to the web and stiffener angles of these girders. Shelf angles reinforced by vertical angles and connected by cover plates are riveted to the web plates of the troughs at three points under each track, as shown in the accompanying drawing, and the ties laid directly on these cover plates. Every fourth tie is held in position by a bolt and the guard rails are bolted through the ties to the supporting plates. The intermediate troughs are 11⅜ in. wide, center to center of web plates, and the troughs under panel points are 1 ft. 2 ⅞ in. wide. All troughs are 1 ft. 6¾ in. high, back to back of angles. Drainage is provided by setting sections of 1-in. gas pipe, 1 ft. 3 in. long, vertically in the bottom cover plate at each end of the troughs just inside the girders. These pipes are threaded on the lower end for a length of 4 in. and are held in place by a hexagonal nut above the plate. The troughs are filled with asphalt mastic sloped to drain to these openings at the ends of the troughs. Details of this design are shown in the accompanying figures.



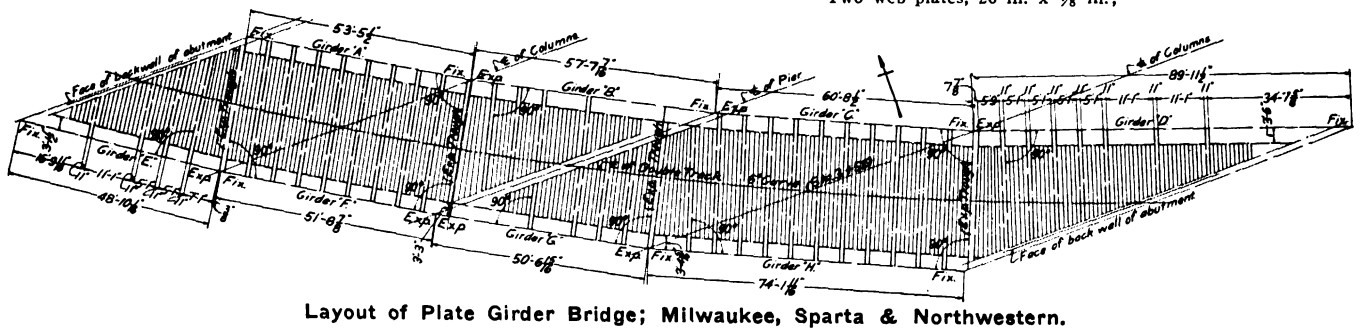
Sections of Arch.

MILWAUKEE ELECTRIC CROSSING.

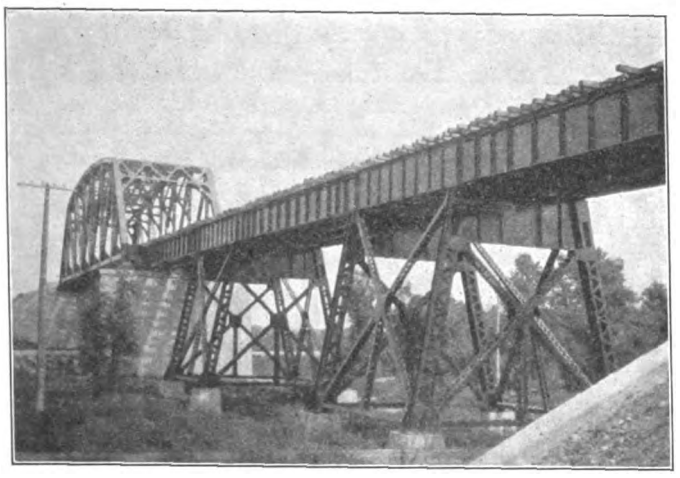
At the point where the belt line leaves the Chicago & North Western, the latter line is paralleled by a double-track electric railway of the Milwaukee Electric Railway & Light Company.

These tracks are crossed overhead by the belt line on a through plate girder structure with trough floor. The alinement is a 6 deg. curve cutting the center line of the electric road at an angle sharper than 30 deg. The girders are carried on concrete abutments, a concrete center pier and intermediate steel columns. The total length of inside girders is 262 ft. 5-16 in., and of outside girders, 225 ft. 7 11-16 in. A clearance of 20 ft. above the top of rail of the electric line is provided, and by using the trough floor construction the distance from low steel to base of rail is reduced to 2 ft. 7¼ in. The curved alinement and sharp angle of intersection made necessary special designs at the ends of the girders. As shown in the accompanying drawing, girders D and E support one end of each of the floor troughs in the end section, the other ends resting on the abutments; girders H and C, and F and A, respectively, support opposite ends of floor troughs, and girders B and G support the outer ends of troughs whose inner ends rest on the center pier. As far as possible the troughs are perpendicular to the supporting girders. The conditions of loading and the unit stresses allowed in this design are the same as for the truss bridge described above. Girder H, the heaviest in the structure, is made up of the following sections:

Two 8 in. x 8 in. x ¾ in. angles;
Two 15 in. x ½ in. side plates;
Two 18 in. x ¾ in cover plates;
One 18 in. x ⅝ in. cover plate;
One 120 in. x ⅝ in. web.



Layout of Plate Girder Bridge; Milwaukee, Sparta & Northwestern.



Crossing of Prairie du Chien Division.

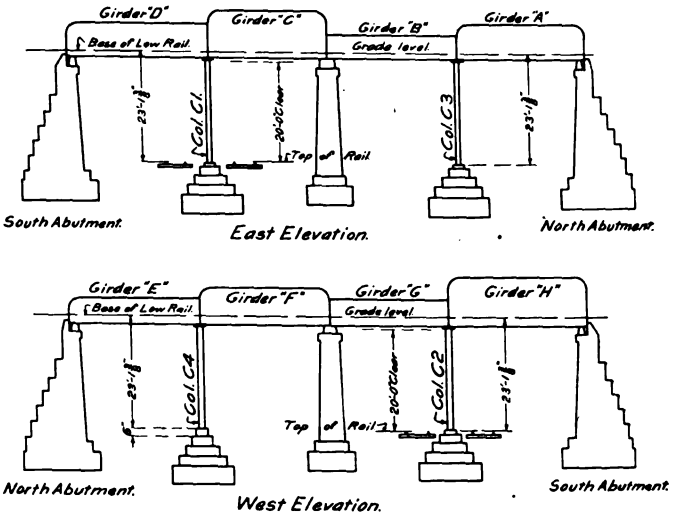
The floor troughs in the section between girders H and C, which are illustrated herewith, are typical of the design used. Gusset plates from girder stiffener angles and auxiliary vertical angles, which are riveted to the girder web, support floor beam troughs. The floor beam troughs have the following section:

Two top cover plates, 10½ in. x 9/16 in.;
Two top angles, 6 in. x 3½ in. x ⅝ in.;
Two web plates, 26 in. x ⅞ in.;
Two bottom angles, 6 in. x 4 in. x ¾ in.;
Two bottom cover plates, 12½ in. x 9/16 in.

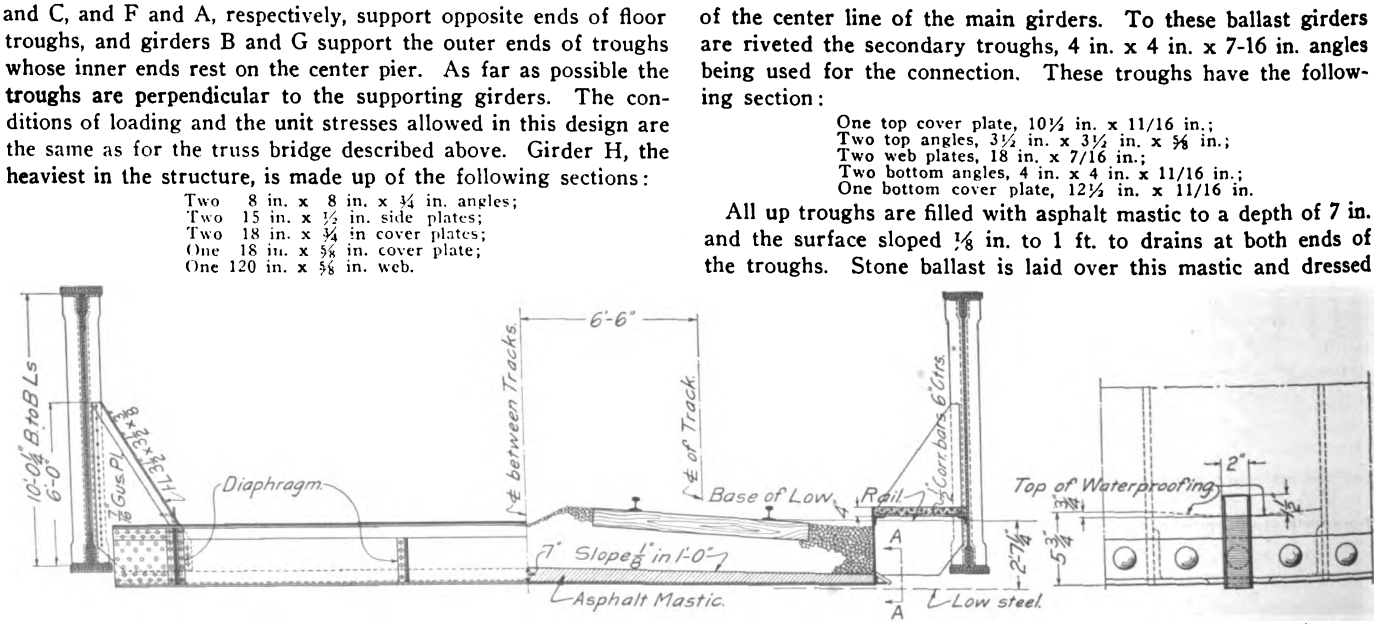
Ballast girders, built up of a web plate 35 in. x 7-16 in. and a top and bottom angle 5 in. x 3½ in. x 7-16 in., are set between these floor beam troughs parallel to and 3 ft. 4 5-16 in. inside of the center line of the main girders. To these ballast girders are riveted the secondary troughs, 4 in. x 4 in. x 7-16 in. angles being used for the connection. These troughs have the following section:

One top cover plate, 10½ in. x 11/16 in.;
Two top angles, 3½ in. x 3½ in. x ⅝ in.;
Two web plates, 18 in. x 7/16 in.;
Two bottom angles, 4 in. x 4 in. x 11/16 in.;
One bottom cover plate, 12½ in. x 11/16 in.

All up troughs are filled with asphalt mastic to a depth of 7 in. and the surface sloped ⅛ in. to 1 ft. to drains at both ends of the troughs. Stone ballast is laid over this mastic and dressed



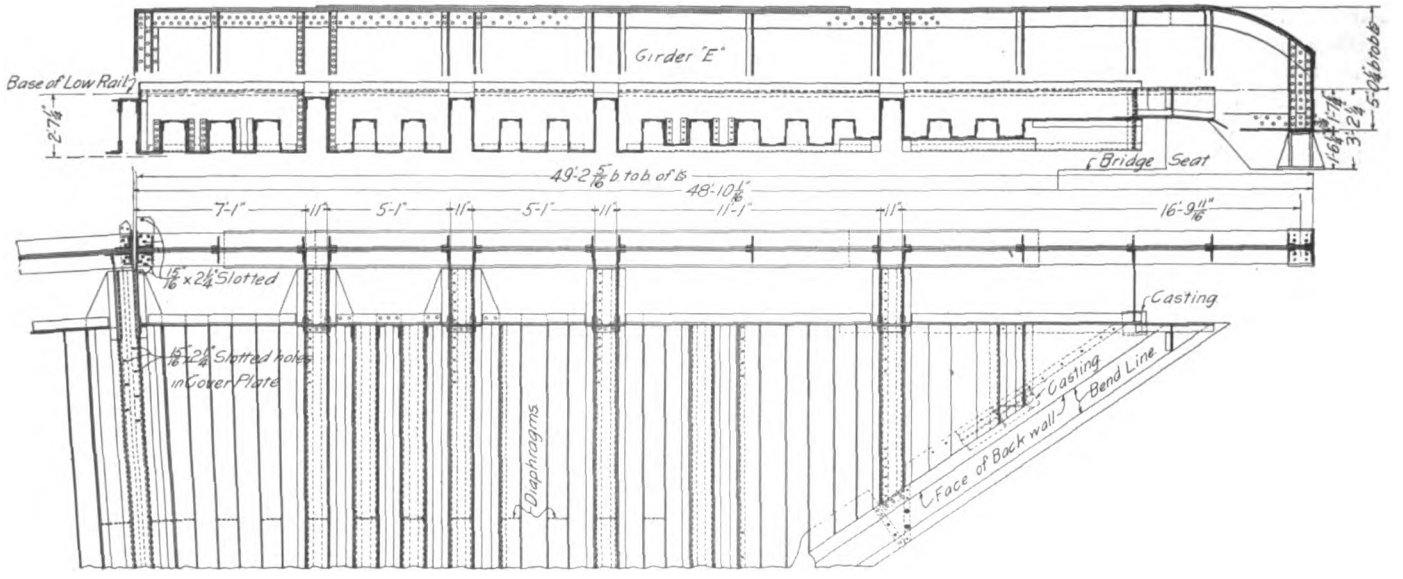
Elevations of Girders.



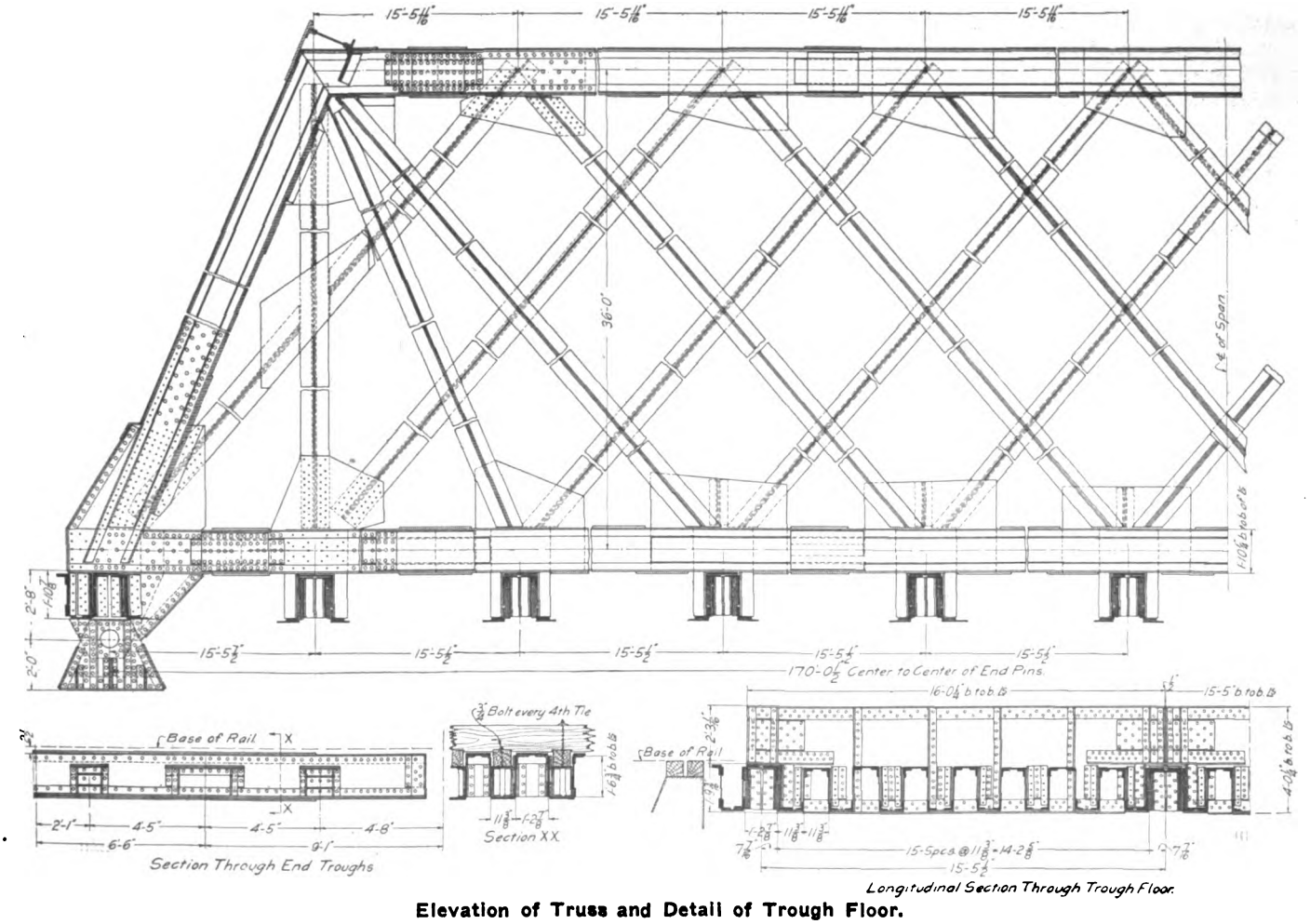
Details of Trough Floor.

to the section shown. The trough spacing is 13 in. and 11 in., center to center of web plates for up and down troughs, respectively, and ties are spaced 2 ft. center to center, being arranged to come directly over the up troughs. Concrete slabs 4 in. thick reinforced with ½-in. corrugated bars placed transversely on 6-in. centers are provided to cover the open spaces between the main girders and the ballast girders. These slabs rest on the upper angle of the ballast girder and shelf angles riveted to the web of the main girder.

The sections of girders and troughs in other parts of the structure vary from that given above, due to differences in loading and span lengths, but the essential features in all cases are the same. The troughs that are supported on an abutment or pier are carried on castings similar to base castings, which are planed top and bottom. At expansion joints, troughs are provided which have the connection of top cover plate to top angles made by ⅞ in. round bolts in holes slotted to 2¼ in. The holes are covered under the nuts by 2½ in. x ¼ in. washers. On the pier the space between the castings supporting the troughs was filled with concrete level with the top of the castings before the steel was erected. The intermediate columns are braced by top and bottom struts and diagonal bracing, one column of each pair



Details of Girder and Floor Connections.



Elevation of Truss and Detail of Trough Floor.

being arranged to slide on a phosphor bronze plate to care for expansion.

The John Marsh Construction Company had the contract for all excavation and masonry work on this section; Gindele & Company built all buildings in the shop group except the coal chute, which was erected by Fairbanks, Morse & Company, and the Alphonse Custodis Chimney Company had the contract for the stack. All this work was planned and carried out under the immediate supervision of E. C. Carter, chief engineer of the Chicago & North Western, with the following organization: W. H. Finley, assistant chief engineer; J. F. Stern, engineer of bridges; D. Rounseville, resident engineer; and W. A. Brewer, assistant engineer in direct charge of the work in the field.

REBALLASTING BY CONTRACT.

The Michigan Central has for the past three years been doing stone ballasting by contract, which has proven entirely satisfactory as to the amount and quality of work done, and a considerable saving has been effected over the cost of similar work done by company forces. Since the only available labor is Italian, the contract was let to an Italian who had been in the service of the company for a number of years, supplying labor for track work. This man had always dealt honestly with both the railway company and the men, and, although he knew nothing of stone ballasting, it was found that he could secure from his own countrymen more and better work at a less cost than could the company by employing white foremen with the usual interpreters. There has been no labor trouble whatever since adopting this method, the contractor being able to handle all the stone furnished by the quarry with a much smaller force than was required by the company when doing the work themselves.

Under the terms of the contract the company prepares the track to receive the stone, by skeletoning out the old ballast, spacing and replacing the old ties, applying anti-creepers and distributing the stone. After the stone has been distributed the contractor is responsible for the condition of the track until accepted by the inspector. In connection with the stone ballast considerable work has also been done in raising small sags to improve the grade line before making the lift on stone.

The company's forces consist of two gangs of between 20 and 30 men, one gang being used for skeletoning out and the other for spacing and renewing ties. Both gangs are combined into one when any considerable length of track is to be lifted on gravel or cinders. Where track is lifted before receiving the stone it is necessary to do but very little skeletoning, and the two gangs work together lifting and renewing and spacing ties. At the time the track is skeletoned out, all swings in the alinement are taken out.

The contractor's force consists of from 35 to 50 laborers, divided into two gangs, with two foremen and an assistant foreman, one foreman and twelve men being used almost continuously picking up rough spots and lining behind the lifting gang.

The specifications under which the work is done require that the track be lifted in such a manner that after a lapse of three days it will require a second lift of not more than 2 in. nor less than 1 in. to bring the track to the grade of the stakes. On the first lift the ties are tamped with spades, which are found to be more satisfactory for this work than the ordinary shovel. After this lift has been under traffic for at least three days it is given a surface lift of from 1 in. to 2 in., lined to stakes, and trimmed to the standard ballast section.

The contractor, at a price of 3 cents per ft. for lifting and 5 cents per ft. for lining, surfacing and trimming, makes a reasonable profit, and the company saves about as much as the contractor earns. The price of 3 cents per ft. for lifting is for any lift of 8 in. or less, and ¾ cent per ft. is paid for each inch over 8 in. up to 10 in. It is intended to give the track at least a 6-in. lift, and very little is lifted over 8 in. Contractor's and company's laborers are paid $1.60 per day, foremen $75 per month, and the inspector $85 per month.

Both the contractor's and the company's foremen are subject to instructions from the inspector, who is selected from the regular foremen and is generally one who is very familiar with stone ballasting work. When the contractor finishes a mile of track it is carefully looked over by the inspector and if, after riding over it, he finds it up to specifications, it is accepted and the contractor is relieved of further responsibility.

WORK TRAIN FOR HANDLING TRACK MATERIAL.

A special work train with a small extra gang has been employed for several years on the Aurora division of the Burlington for loading and unloading all track material for construction work, as well as relaying rail. This division is a very busy one, and each year there is a great deal of miscellaneous construction work of various kinds which requires the handling of a large amount of track material. The old way was to have the way-freight load or unload it with the aid of several section gangs, to avoid calling out extra power. After the recent federal legislation, especially, it was found that this work could not be handled economically in this way, so a special work train was put on at the beginning of the season. All material for construction or renewal work on various parts of the division is handled by this train and gang, and their use has been found to result in greatly decreased interference to tracklaying and section gangs. Rails, ties, splices and bolts, etc., are unloaded systematically and promptly, and it is possible to complete arrangements for track work far enough in advance to eliminate the frequent waiting for material. This advantage was also found in picking up second-hand rail, in supplying mills for sawing, and in redistributing this rail for use on the line. In addition to the service for construction gangs, the outfit is useful in filling bridges, unloading odd lots of ballast, and cleaning up scrap on the main line where traffic is dense.

The main result of the use of this train is the saving of time lost in collecting large forces of track laborers, and the more rapid performance of track work on account of material being on hand ready for use. There is a further economy in the use of such a train on a large division where small roundhouses are maintained at junction points, as the outfit can be laid up at the most convenient point and avoid the time of running into headquarters, as was necessary where the train was called out for but one day at a time.

The outfit used on this division consists of an engine, way car, tool car and bunk car, with a gang of 12 men in charge of the work train conductor. The conductor selected for this work is a man experienced in accounting and rendering reports for all material loaded and unloaded. Being on this train from season to season he becomes familiar with the requirements of maintenance work and in this way simplifies the distribution of material.

We are indebted for this information to W. S. Kirby, superintendent of the Aurora division, under whose supervision this train has been in operation.

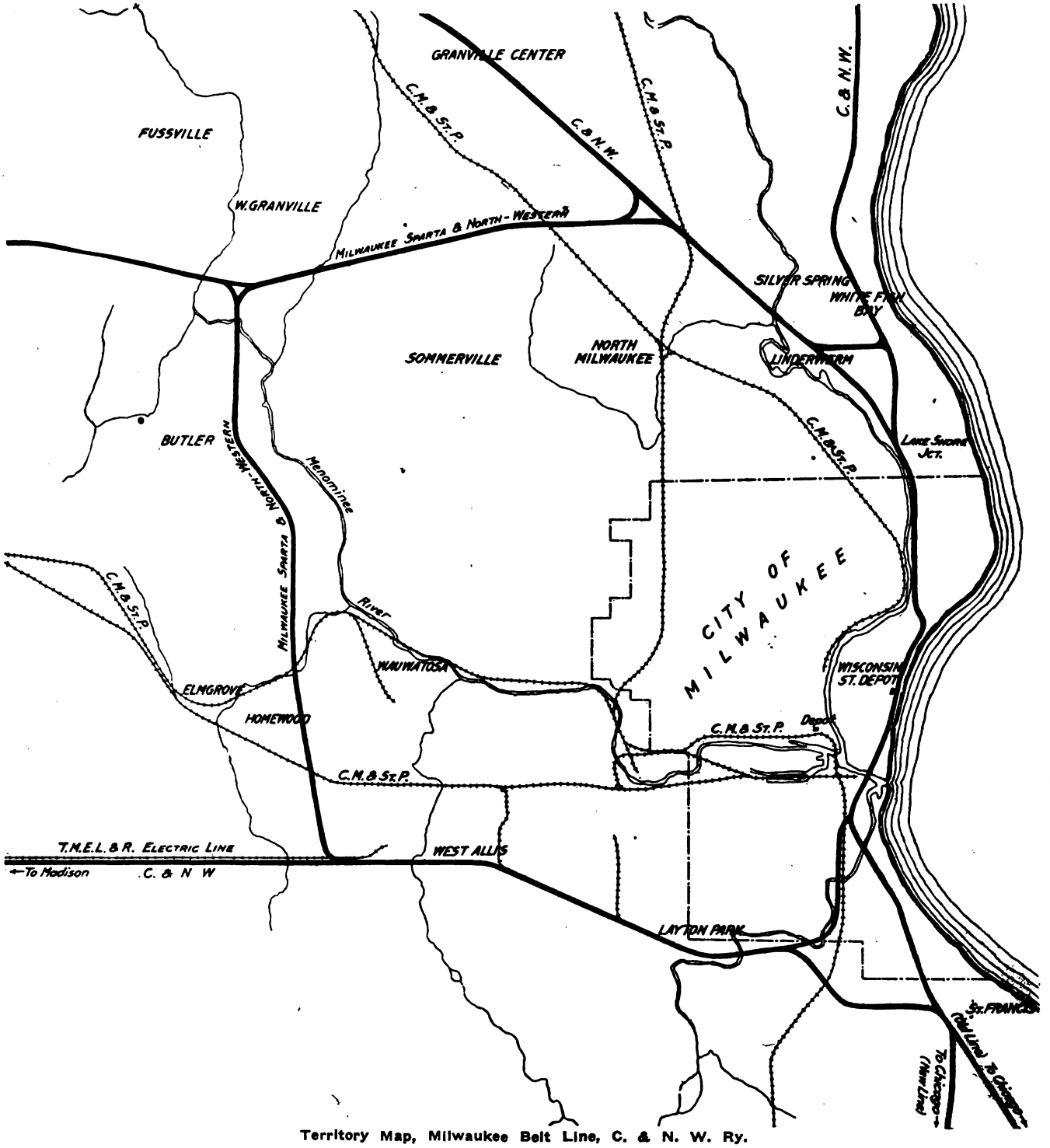
The track elevation department of the city of Chicago has issued a report covering the period since January, 1909, which shows that the total mileage of track elevation work covered by ordinance to June, 1911, has been 140 miles of roadbed and 843 miles of track. It is also estimated that 192 miles of roadbed and 1,265 miles of track remain to be elevated which are not yet covered by city ordinances. The principal work under way at the present time is that extending from Grand Crossing southeast through South Chicago, elminating the complicated crossing at Ninety-fifth street, South Chicago. The plans for this work were described in the *Railway Age Gazette* of March 24, 1911, page 758. The report is signed by Francis J. Owens, commissioner of track elevation.

Cross ties are particularly liable to decay, since they are used under conditions which are favorable to the growth of wood-destroying fungi. Consequently, the railroads have always taken a leading part in timber preservation in the United States. Fifteen railroads report the operation of timber-treating plants; many also have ties and other materials treated by commercial plants.

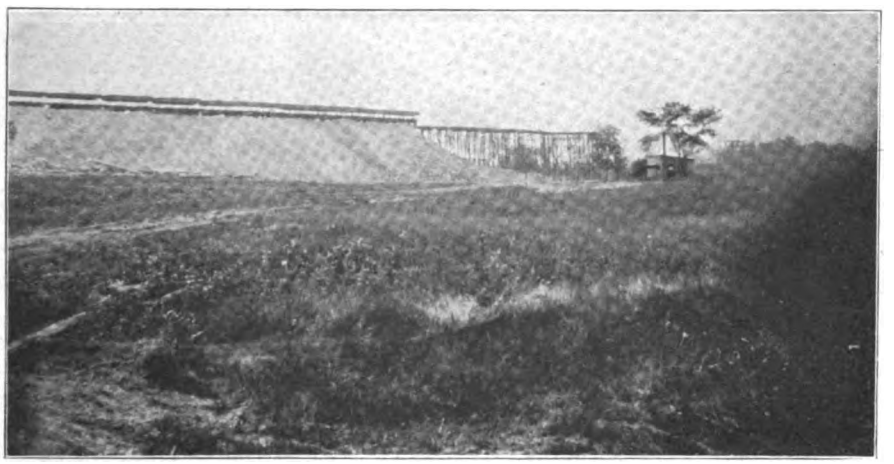
The perusal of the individual reports for 1910 shows also a tendency toward the treatment of certain classes of material which have not heretofore been treated to any great extent. For example, the railroads report the treatment of large amounts of tie plugs, pole brackets, fence posts, pole steps, tunnel wedges, and planks. Other commercial concerns also report a treatment of much material which goes into conduit and sewer pipes, barge timbers, and lumber for use in exposed places. The treatment of mine timbers also shows a decided increase.

C. & N. W. RY. BELT LINE, MILWAUKEE.

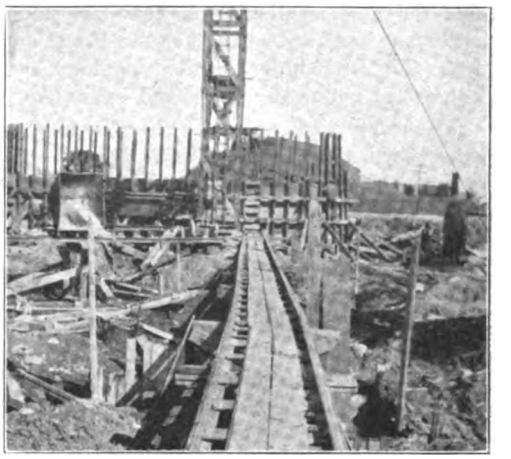
The new double-track line now being built by the Chicago & Northwestern Railway from Lake Shore Jct., on the Wisconsin Division, west to Butler Jct., and south to West Allis, on the Madison Division, will form a belt line that completely encircles the city of Milwaukee. That portion of the line from Wisconsin Division Jct. west will be part of the new branch now being built to Sparta. Formerly through traffic was routed through the city from Lake Shore Junction as far around as West Allis, both local and through business traversing a narrow throat in the city along the lake front. When the Belt Line and the new line to Sparta are finished, business originating at and destined to points beyond Milwaukee will be moved via the Milwaukee, Sparta & Northwestern, thus eliminating the congestion incidental to the mixture of local and through traffic, and making it practicable both to better serve the industries already



Territory Map, Milwaukee Belt Line, C. & N. W. Ry.



Method of Making Hill Fill from Temporary Trestle.



Tower Which Was Used for Distributing Concrete, Bridge at Station 139+.

located on the Northwestern and to open up a large new territory suitable to industrial development.

Construction work was begun in the spring of 1910 and is still under way. From West Allis west for about a mile and a quarter the work is along the existing track of the Madison Division. There the line turns north, crossing the tracks of the T. M. E. R. & L. Ry., which is adjacent and parallel to the old C. & N. W. Ry . At this point an overhead crossing and a long fill approach were necessary, which necessitated the construction of a detour for the old Madison Division track around the high fill and a bridge on a 6-degree curve to span four tracks of the T. M. E. R. & L.

The line from the Madison Division north is through a rough country for about four miles and the grading and bridge work were heavy. The first railway crossing is at Sta. 3+, mentioned above; this bridge is a four-span through plate girder with trough floor on concrete substructure. The next one, at Sta. 67+, crosses the La Crosse Division of the C., M. & St. P. Ry. This bridge is a through-riveted span 170 feet long on submerged concrete abutments. The next bridge, at Sta. 139+, is over the Prairie du Chien Division of the C., M. & St. P. Ry., Watertown Plank Road, and Underwood Creek. This bridge has five deck plate girder spans over the highway and creek, an 182-foot through lattice span over the railway and another deck plate girder to the north abutment. Both of these abutments also are of the submerged types. The entire substructure is of concrete. The remainder of the structures north to Butler Jct. are waterways consisting of concrete arches, concrete boxes and cast-iron pipes. At Sta. 396, where the Menominie River is crossed, is a triple arch, the two outside arches having a span of 32 feet and middle one 40 feet.

The grading for the first four miles north of the Madison Division was nearly all done with steam shovels and car outfits hauled by engine. Blue Mound Cut—widened for borrow—supplied the material for the fills from Watertown Road, about Sta. 136, to the Madison Division, about 450,000 cu. yds. in all, a small part of this being side borrow. North Avenue Cut supplied the remainder of the material for the four miles—about 90,000 cu. yds. The rest of the work north to Butler Jct.—except in Butler Yards—was comparatively light. The heavy fills were nearly all made from high trestles, the contractor constructing the trestles to grade and then operating for the most part standard gauge equipment. The new yards, roundhouse, etc., are located at Butler. The yards have wye connection with the line to Sparta, so that freight can be sent by West Allis to Chicago without going through the Milwaukee Yards. The freight yards have a large capacity and the roundhouse is a complete circle—60 stalls. At Butler there is a power house, machine shop, coal chute, railway men's clubhouse and the numerous other buildings necessary to such a plant.

From Lake Shore Jct. northwest to Wisconsin Division Jct., about two miles north of Lindworm, the work consisted mostly of widening embankments and bridges for second-track construction. The bridge over the Milwaukee River is a double-track through plate girder 80-foot span, the masonry piers of the old bridge being entirely encased in concrete when widened for the second track. Near Wisconsin Division Jct. there is another bridge spanning the C., M. & St. P. Ry. and the Milwaukee Northern Electric Ry.

Wisconsin Division Jct.—Sta. 00—is where the new line leaves the Wisconsin Division and turns west toward Butler Jct. At Sta. 91+ there is a bridge exactly like the one described at Sta. 67+ on the West Allis-Butler line; the latter bridge also spans the C., M. & St. P. Ry. This bridge,

Form Work for Concrete Arches, Station 396.

10 Foot Concrete Arch, Station 178+70.

like the first mentioned, is a ballast floor girder on a concrete substructure over the old Fond du Lac road at Sta. 247. The remainder of the openings are for drainage and consist of concrete arches and boxes and cast-iron pipe.

The earthwork in this section was also fairly heavy and was taken care of by steam shovels and car outfits. The widened cut near Wisconsin Division Junction was taken out by a standard gauge outfit; they handled about 170,000 cu. yds. Another cut between stations 114 and 152 yielded about 200,000 cu. yds.

Throughout the whole line—except in yards and sidetracks—90 lb. A. R. A. rail was used and automatic signals are being installed. The switches at the various junctions are all operated manually from towers. On the main line treated ties (creosote process) and gravel ballast are used; all grades are compensated for curvature.

The work on the Milwaukee Belt Line was performed under the supervision of E. C. Carter, chief engineer, D. Rounseville, resident engineer. The assistant engineers in direct charge of construction were N. Mann and W. A. Brewer, and to the latter we are indebted for the above information.

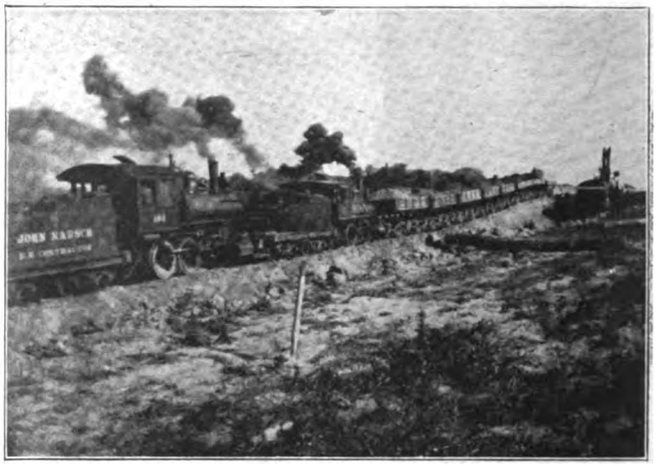
Bucyrus 97C Steam Shovel Starting Work at Blue Mound Cut.

CROSS-TIE RECORDS, A. T. & S. F.

A system of keeping cross-tie records for the purpose of studying the relative merits of various woods, preservative treatments and rail fastenings has been introduced on the Atchison, Topeka & Santa Fe, in which observations on selected short sections of track are substituted for the collection of data on all ties put in the tracks. The plan has been in operation about a year so that its utility is now established.

Prior to May, 1910, every tie inserted either in main track or side track was marked with a dating nail showing the year in which it was placed, a round-head nail indicating a treated tie and a square-head nail an untreated tie. A report was made each month by every section foreman, showing the ties placed in and removed from the track on his section. All of the data thus supplied were compiled in the office records. This method was considered unsatisfactory, due to the difficulty in getting correct information from all section foremen. It was therefore decided to abandon it and substitute a system in which carefully prepared, reliable data from a representative section would give an index to conditions on an entire division. Each section under observation was placed under the supervision of an experienced and careful foreman.

At the time of starting the new system an actual inventory was taken of the ties in the track on each selected section. Under its operation all ties inserted in any section are marked with dating nails, as formerly, but no ties elsewhere are so marked. Dating nails are placed uniformly



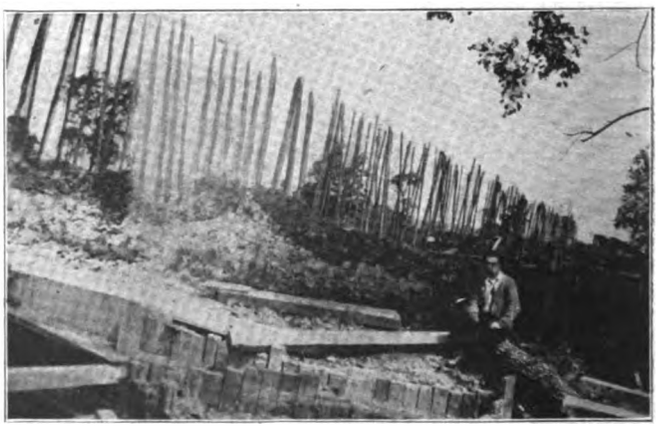
Steam Shovel and Car Outfit, Blue Mound Cut.

about 8 in. from the outside rail on the south or west side of the track and are carefully driven home. Treated and untreated ties are differentiated as before by round and square nail heads. Nail heads are stamped with the last figure of the year in which the tie is laid.

At the end of each month the foreman on an experimental section sends in a report showing ties inserted in and removed from the track during that month. The report form is subdivided so as to classify separately ties taken out and ties put in the main track and the same for side tracks. In every case separate columns are provided for treated and untreated ties under each classification, the number, year mark, kind of wood and kind of treatment being recorded. Under ties removed the foreman reports the reason for removal, whether rotten, broken through accident, burned, rail cut or shattered. If ties are put in on the section on account of new track, a record is made of this fact. The number of tie-plate renewals and new tie-plates placed in the track is also recorded. The foreman notes on this report the number and kind of tie-dating nails he needs, so that he will always have a proper supply on hand.

Ties already in the track but taken up and relaid on another part of the same section are not entered in the monthly report, but if they are taken up and moved for relaying on another section they are entered as removed and relaid in the records of the respective sections. In the latter case the original year mark is preserved and entered in the relaying record, while a note of the transfer is made with the removal record.

Where it is necessary to turn a tie over in relaying, so that the dating nail is on the ground or in a position where it cannot be seen, it is withdrawn and redriven in the regular specified place, where this can be done without defacing it. Otherwise it



Piling for Temporary Trestle From Which High Fill Was Made.