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SECOND HALF

A Large Track Depression Project at Minneapolis

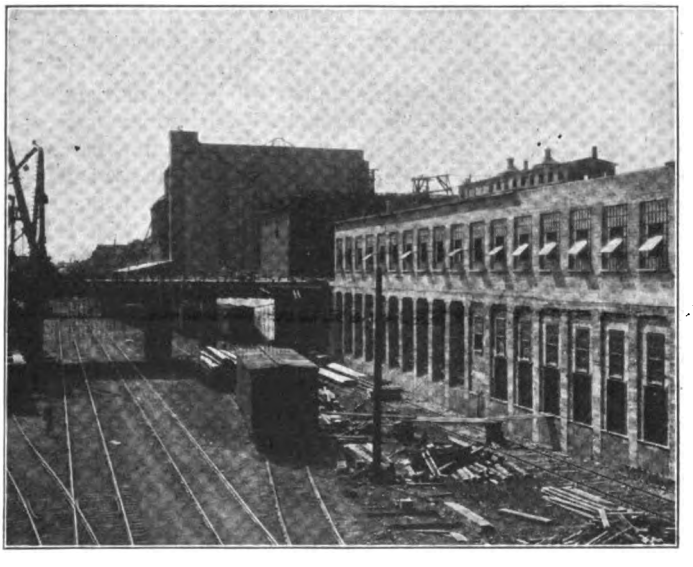
The Chicago, Milwaukee & St. Paul is Building Concrete Street Viaducts to Eliminate 37 Grade Crossings

By C. N. Bainbridge
Office Engineer, Chicago, Milwaukee & St. Paul, Chicago

One of the largest projects for the elimination of grade crossings recently undertaken is the depression of the tracks of the Hastings and Dakota division of the Chicago, Milwaukee & St. Paul through the southwest part of Minneapolis. With but few exceptions, the elimination of grade crossings in cities has been brought about by the elevation of the tracks and the depression of the streets. In the work described herein, these methods are reversed, i. e., the tracks are being depressed from 18 to 20 ft., and the streets are being elevated from 2 to 4 ft. and carried across the depression on bridges. Thirty-seven grade crossings are to be eliminated and the depression extends for approximately three miles.

Just prior to the completion of the Puget Sound extension from Mobridge to Seattle in 1909, the double tracking of the line from Minneapolis through Aberdeen to Mobridge was commenced and the grading has now been practically completed from Minneapolis to Aberdeen, with the exception of a short stretch at the eastern terminus, which is being constructed as fast as the track depression progresses.

In the latter part of December, 1910, the St. Paul was ordered by city ordinance to depress its tracks westward through the city from Hiawatha avenue to Irving avenue, and to carry over its tracks on bridges, all streets within these limits which crossed the right of way at grade. Previous to the passage of this ordinance, Fourth and Fifth avenues, which are located about midway of the depression, formed natural undercrossings with the tracks due to the topography of the site. The ordinance

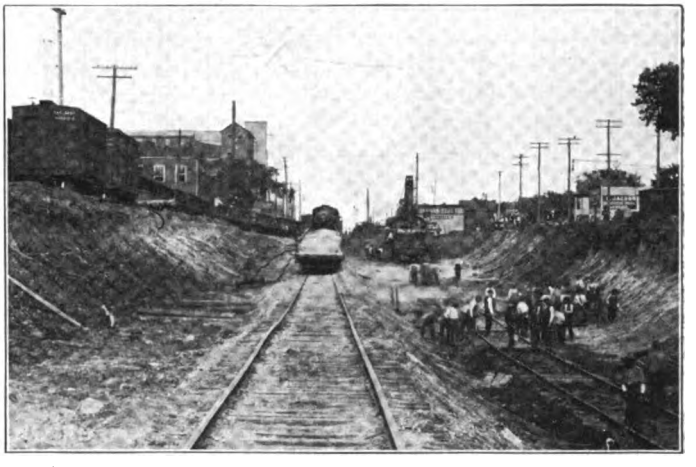


A Building Being Underpinned by Concrete Columns

requires that the street which originally passed under the tracks at Fourth avenue shall be carried over the tracks on a viaduct. Fifth avenue, however, is a less important street, and the ordinance allows this to become a grade crossing, thereby avoiding considerable property damages. Hennepin avenue, situated at the west end of the depression, had previously (in 1897) been carried across the tracks and no further change was required.

Work was started at the west end early in 1912, and has been carried on continuously, with the exception of two or three months during the winter seasons. The project is now approximately 75 per cent completed, and it is the intention to complete the work in the fall of 1916.

The tracks which are to be depressed pass through a portion of the better residence district of Minneapolis and although numerous industries line the right of way for the greater part of the distance, it was desirable to have the finished work give as pleasing an effect as possible. Considerable attention was, therefore, given to the selection of the most suitable type of bridge. The tracks cross practically all of the streets at an angle of approximately 90 deg. and the right of way was of sufficient width throughout, with one or two exceptions, where additional land had to be bought, to adopt a uniform span bridge. Although there was some variation in the width of streets and roadways as required by the city, it was thought that probably unit construction (building slab and bent units at a central plant and lifting them into place) could be adopted. Accordingly designs were made and estimates and methods of erection were studied, but after due consideration, it was decided



A Shovel Taking a Third Cut

to abandon the idea of unit construction and build the structures in place, for the following reasons:

(1) About 50 per cent of the concrete in each bridge would have to be built in place in both bridges, of unit construction and those of monolithic construction. This would have required a movable plant for the abutments, as well as a stationary plant for the slabs and bents, if the structures had been built as units.

(2) Estimates showed that a larger yardage of concrete would be required in the unit than in the monolithic construction, as well as more steel, due to erection stresses and simple instead of continuous beam action.

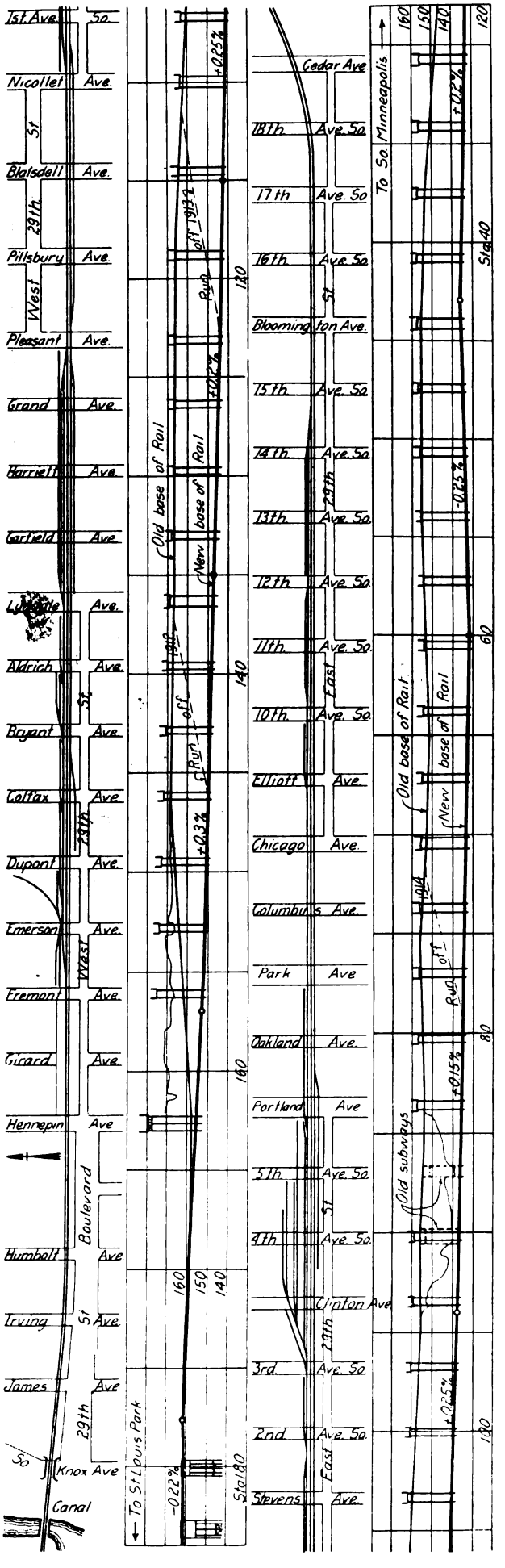
(3) The work would extend over three or four seasons, and in order to run the stationary plant efficiently, all the work on the different units would have to be done continuously, covering a period of about nine months. This would have necessitated space for the storage of some of the slabs and bents for from one to two years, besides tying up a considerable amount of money for a long time before the structures would really be required.

(4) The mixing and placing of concrete would have been cheaper in the unit construction than it is in the monolithic construction, provided the stationary plant were run efficiently and a large number of the units were alike, so that the forms could have been used to advantage. It was estimated, however, that this difference in cost would be practically balanced by the additional yardage and additional cost of storing and erecting units after they were made.

(5) In the case of unit construction, it would have been necessary to know beforehand just how each crossing was to be treated, and no changes could have been made later without discarding units already made. The monolithic construction had the advantage over the unit construction in that it allows a modification of the bridges to meet local conditions up to the time each bridge is built.

(6) Owing to the excessive weight of the units, it would have been necessary to alter the heaviest erecting equipment of the railway in order that it might lift and swing these slabs into position. This would have prevented the use of the equipment for other work for two or three years.

(7) In the case of unit construction, there would have been occasion to interfere with traffic to a greater extent than with the monolithic



Layout and Profile of the Track Depression

construction. This would be caused by the hauling of the different units from the storage yard or plant to the bridge; shifting the position of the derrick car from one track to another, to facilitate the placing of the units; and, finally, the placing of the units themselves, which would weigh from 35 to 45 tons. These would have to be lifted and swung a considerable distance, making the chance of accident greater with the unit system than with the monolithic system.

BRIDGES

The type of structure finally adopted is that shown in the accompanying drawing. The bridges are of reinforced concrete and conform to a uniform design. On account of the various widths of roadways, the structures vary in width from 48 ft. to 68 ft. overall, including the roadway, two 8-ft. sidewalks and hand railings; and with the exception of two structures, they consist of three spans, the center one being 29 ft. 6 in., and the side spans 29 ft. in the clear. They are supported at the ends on abutments, and at the third points on skeleton piers or columns. This arrangement permits placing two main tracks under the center span. The side spans cover the slope of the cut where only two main tracks are depressed, but they are of sufficient width to allow the placing of two additional tracks on either side for industrial purposes or railway use, as conditions require, with the alteration of abutments only.

The two exceptions noted above, one at Fourth avenue and the other at Clinton avenue, are of 10 spans and 6 spans respectively, and carry those streets across a team yard which will be located about midway of the depression. Entrance to the team yard is to be made from Twenty-ninth street, which parallels the tracks, and also from Fifth avenue, which, as previously mentioned, is to become a grade crossing. The clearance over the main tracks is 18 ft. 6 in., and that over the side tracks or industry tracks is 18 ft.

The abutments used under these bridges are of three types:

(1) The small bank abutment used on bridges which do not make provisions for industry tracks under the side span.
(2) The intermediate height abutment, which is high enough to provide for one track under the side span.
(3) The high abutment, which is high enough to provide for two tracks under the side span.

The small bank abutments are of the ordinary gravity type. They are but 9 ft. high from bridge seat to foundation. The footing is 2 ft. thick, and the toe projects 12 in. beyond the neatwork. The abutments extend the full width of the street and have retaining walls, which extend back to the right of way line. They are built in two sections for the narrower streets, and in three sections for streets of 80- and 100-ft. widths. The intermediate height abutments are of the reinforced concrete counterfort type, and are 19 ft. high from bridge seat to foundation. The toe projects 3 ft. 6 in. beyond the face of abutment and the footing is stepped in the rear. Counterforts are provided every 12 ft. The high abutments are of the reinforced concrete counterfort type, and are 24 ft. 6 in. high from bridge seat to footing. The toe extends 4 ft. 6 in. in front of the abutment and is 3 ft. 6 in. deep. The base is stepped twice in the rear, the total width of base being 15 ft. 6 in. The bridge seat on all abutments is 18 in. wide, not including a 4-in. coping; 1:3:6 concrete was used in the gravity abutments, and 1:2½:5 concrete in the reinforced type.

The piers of the bridges are 25 ft. 6 in. high and consist of four, five or six columns, depending on the width of the bridges, and rest on spread footings of plain concrete. The columns are 2 ft. square, spaced about 11 ft. 6 in. center to center. The footings were poured in one run, reinforcing bars projecting about 4 ft. above the construction joint to form a splice with the main reinforcing steel in the columns. A key block 14 in. square is placed at the construction joint at the base of each column. The cross girders connecting the top of the columns are cast with the floor beams. These girders are 2 ft. thick and 4 ft. 6 in. deep and are joined to the columns by circular arches, which add materially to the strength and appearance of the structure. They are reinforced as a continuous beam with straight bars in the top and bottom and with stirrups and bent-up bars. The fillets or curved portion are reinforced with

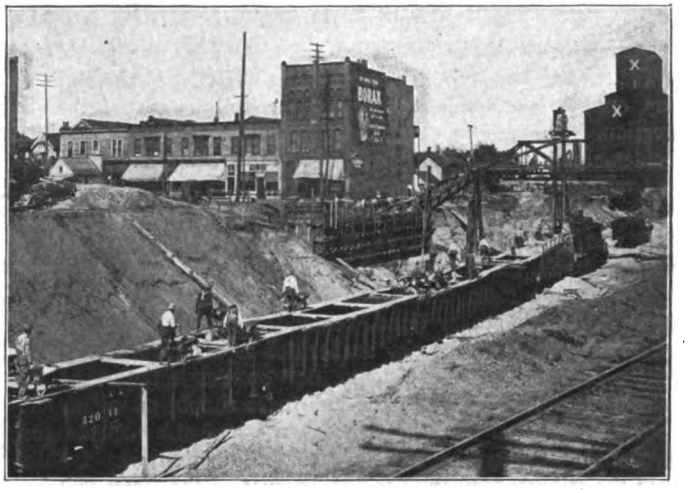
bars placed at 45 deg. The footings are of 1:3:6 plain concrete and the remainder of the bent is 1:2:4 concrete.

The accompanying illustration shows also the saddle which is used to protect the sewers crossing the right of way. This consists of an 8-in. layer of concrete forming an arch, reinforced with ¾-in. bars along the intrados and ½-in. bars along the extrados. A 1-in. layer of felt is placed between the concrete covering and the top of the sewer.

The floors of the bridges are of the T-beam type, are 3 ft. 6 in. deep, including 5 in. of paving, and are built continuous from abutment to abutment, a distance of 91 ft. 6 in., expansion joints being placed at the bridge seats. The stems of the beams under the roadway are 13 in. wide, spaced 5 ft. center to center. The sidewalk slab has a span of 8 ft. The outer beam under the sidewalk was given the form of three 3-centered arches for appearance. All other beams are straight on the bottom with fillets at the supports. The beams are figured as continuous for three spans and are reinforced with 1-in. and ¾-in. bars, part of which are bent up near the supports to provide for shear and negative moment over the supports. Vertical stirrups are also used in reinforcing for sheer. As a precaution against cracks, due to any unequal settlement which might occur at the abutments or piers, a small excess of steel is placed over the center supports and in the beams. The foundations are for the most part of good gravel, and, as the structures are designed for a bearing of only 2.5 tons per sq. ft. on the foundations, the danger of unequal settlement is slight.

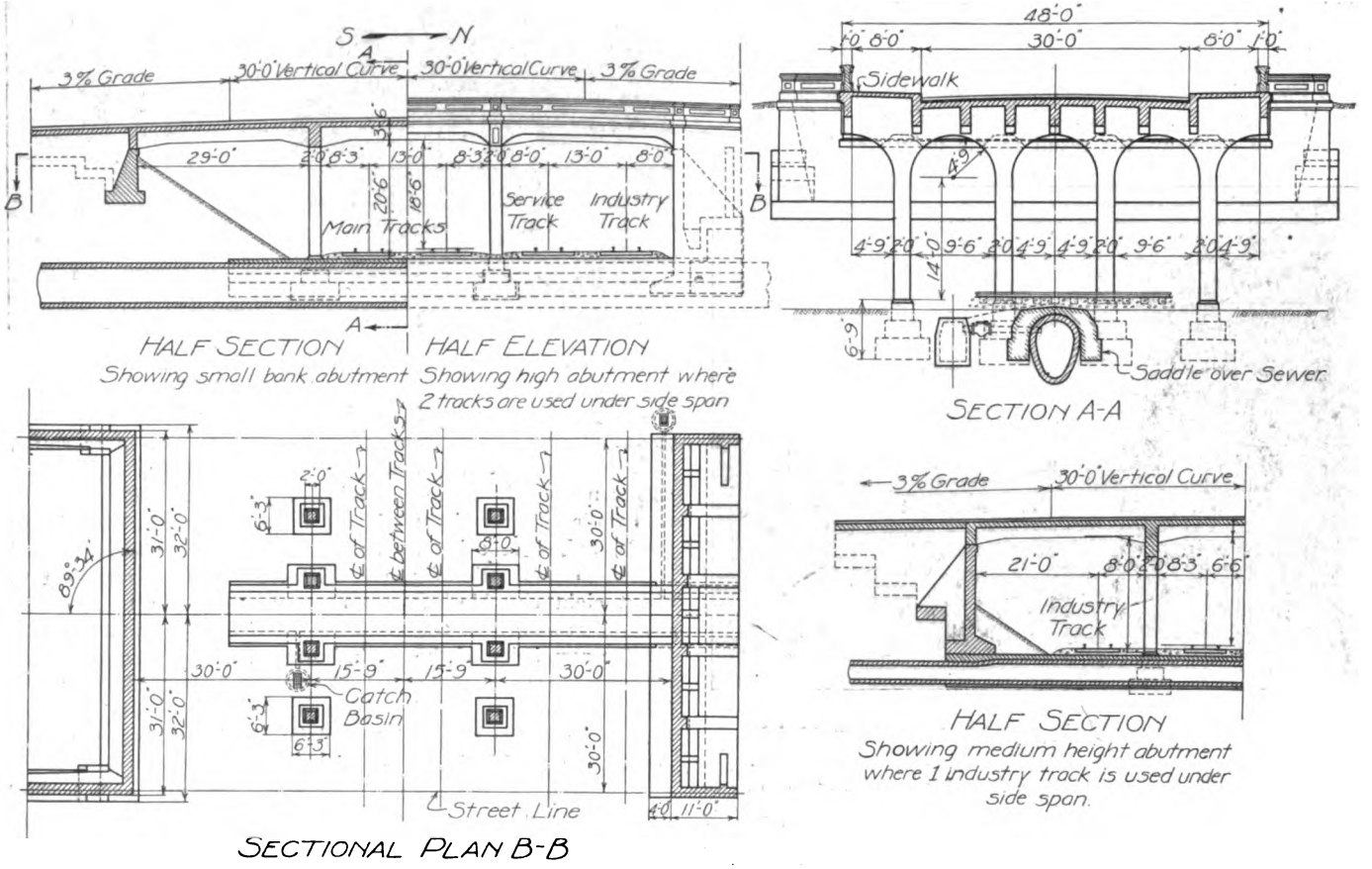
The slabs between the T-beams vary in thickness from 6½ in. to 11 in., to provide for the crown of roadway and the grade on the bridge. They are reinforced with straight and bent ½-in. bars spaced 6 in. center to center. The sidewalk slabs are 5½-in. reinforced concrete and is built in place, after the floor is completed.

Water and gas mains as well as numerous conduits of various utility companies were encountered at the majority of the streets. Ledges are provided on the side of the stems of adjacent



The Concrete Plant—A Temporary Foot Bridge in the Background

T-beams to carry the conduits across the bridges. At first the gas and water mains were carried across the depression beneath the abutments and tracks. The cost of this, however, proved to be excessive and provisions are now made to carry the water pipes across under the bridge floors in a similar man-



Typical Plan of Reinforced Concrete Viaducts

thick, have a 1-in. finishing coat on top, and are reinforced with ½-in. bent bars spaced 7 in. center to center. Concrete in the slabs, beams and cross girders is of 1:2:4 mix. A layer of 1:2 cement mortar is placed in the bottom of all beams and slabs to a sufficient depth to insure the covering of all bars before any concrete is poured. The hand rail is of the solid type

ner to that used for the conduits. A compressed fiber covering of about 3 in. in thickness is placed around the pipes, the fiber being moulded to fit the pipe. Wrought pipe with screw threads is used across the bridges in place of the usual cast iron pipe.

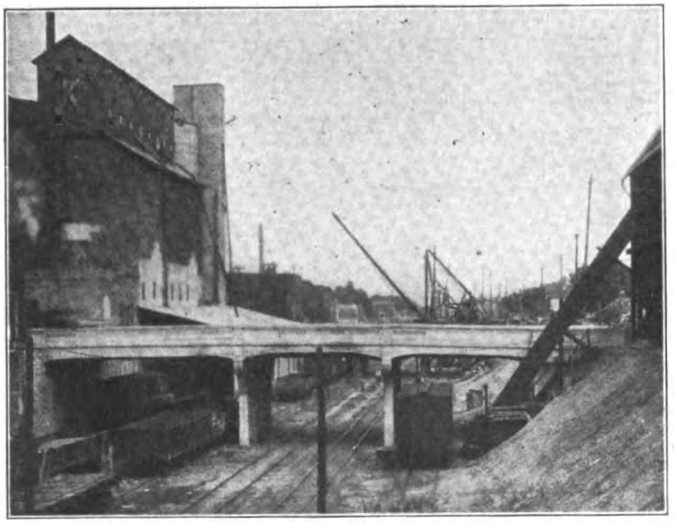
The bridges which do not carry street cars are designed to carry a moving concentrated load of 24 tons on two axles at

5-ft. gage and a load of 100 lb. per sq. ft. upon the remaining portion of the roadway. The six bridges which carry street cars are designed to carry two 40-ton cars and 100 lb. per sq. ft. upon the remaining portion of the roadway. The live loads are increased 50 per cent to provide for impact.

INDUSTRIES AND INDUSTRY TRACK FACILITIES

The majority of the industries are located on the north side of the tracks, Twenty-ninth street being adjacent to the right of way on the south side for nearly the full length of the depression. The presence of these industries introduced special problems and was the cause of considerable delay and numerous controversies.

The industrial concerns maintained that the railway company was liable for the cost of all changes to industries and industry tracks made necessary to continue service on the lower level after the main tracks had been depressed. The railway company, on the other hand, contended that the tracks were lowered by order of the city authorities as a measure of public safety, and not for the benefits, nor on the initiative of the railroad, and that therefore the industries should make any adjustments required at their own expense and also pay the cost of changing the tracks serving them. Litigation was avoided when the railway company decided, because of the many switches and the great amount of switching which would otherwise come off of the main track, to construct a third track from which to serve the industry spurs. As in practically all cases the right of way was only wide enough to depress two main tracks without resorting to retaining walls, the railway company contributed to the industries an amount approximately equivalent to what it would have had to expend to construct a retaining wall, within the right of way, adequate to provide for the third track, if the spur tracks were absent. The industries expended this money in altering their plants and providing the spur tracks, while the railroad was relieved from any further responsibility for retaining adjacent lands. Notwithstanding this decision of the railroad company, the result to the industries in providing



Elevation of a Typical Viaduct—Elevator for Raising Coal on the Right

themselves with industry tracks and adjusting their plants to the lower level, was a very large and burdensome expense, and it was also a large additionad burden to the railroad.

There are about 20 industries situated along the depression and no two were treated alike. Each industry required special treatment to meet the requirements of the particular situation. For the most part, each industry handled its work with its own engineers, although the railroad assisted to a considerable extent with suggestions. In some cases where the buildings were old and of little value, they were torn down and the entire property excavated to the new track level and new buildings constructed. Other concerns underpinned the buildings, and added shipping and receiving floors beneath, while still others allowed the slopes to extend under the building, supporting the buildings on skeleton framework. The accompanying photographs illustrate some of the methods used in solving the various problems.

CONSTRUCTION

The excavation work is being done with a 65-ton Bucyrus shovel, the material being removed by two trains of 20 standard gage 12-yd. air dump cars each. The excavated material varies from sand to gravel and is used largely for filling a site for a freight yard at Bass Lake, about nine miles from the depression, and also for taking out some sags in the main track immediately west of the work. The excavation for the abutments is made in many instances in advance of the shovel, the material being thrown in front of the abutment site and then loaded on cars as the shovel passes. Where this is impossible, material is loaded on wagons by hand and used for grading the street approaches to the bridges. Two train crews are employed to handle the cars to and from Bass Lake, each crew spotting its own cars at the shovel. A third crew and engine handle the cars at the yard, using a spreader.

In lowering the tracks, two methods were employed. The first 5,000 ft. of right of way is largely confined between private

A Building Underpinned by a Masonry Wall

property and was not of sufficient width to allow a temporary operating track to be constructed, without one or more shifts, while excavation to the final grade was being made. Excavation was consequently made in stages, the shovel making several cuts while the operating track was shifted several times to lower levels, before reaching its final position. The shovel worked in cuts of a length of about 2,500 ft., which is equivalent to about eight city blocks, with temporary run-offs to meet the original grade of the tracks on grades of from 2.5 to 3 per cent. On the remainder of the work, however, a temporary operating track was constructed along Twenty-ninth street, which is parallel and adjacent to the right of way. This permitted the shovel to operate in the cut unrestricted by regular train movements. After the shovel had started and was in operation, it was necessary to block traffic on seven or eight adjacent streets, until the excavation was completed to the final grade. A temporary timber bridge was then erected at one street to provide for street traffic until some one of the concrete bridges could be constructed and opened to traffic.

At the six streets where street car traffic had to be handled, a temporary bridge for street car traffic spanning the first cut of the shovel was constructed as soon as the shovel had made its first cut across the street. After the shovel passed through for the second time, however, street car traffic was discontinued across the cut and passengers were required to transfer from cars on one side of the cut to cars waiting on the other side,

crossing the cut by steps leading down into the portion excavated in the first stages. As the shovel progressed and the cut became deeper, an overhead foot bridge was provided, which was lowered after each trip of the shovel, until on the approximate grade of the final bridge. The abutments for the bridges carrying street car traffic were, as a rule, in course of construction before street car traffic was discontinued, and the bridge was completed as soon as possible after service was discontinued.

For the first two seasons of work, stationary stiff leg derricks were erected at each bridge site at the original ground level and in such a position as to reach any portion of the structure. This allowed the derrick to be used in erecting the falsework, forms and reinforcing, and for placing the concrete for the whole bridge. During this last season, however, A-frame derricks fitted with hand crabs or hoists were used to erect the falsework and forms. The concrete was then placed from a portable concrete plant, traveling on the construction track at the low level. This consisted of a ½-yd. mixer of the drum type, mounted at the rear of a flat car. Following this was a track pile driver converted into an elevator, using the leads as guides for a specially designed ½-yd. dump bucket with the discharge door at the bottom of the forward side. The concrete was raised and then conveyed to the forms by chutes. The accompanying illustration shows the complete concreting plant in operation. Owing to the similarity of the bridges, unit forms are being employed to good advantage and are being used from three to five times with but slight alterations.

In all, there will be about 900,000 cu. yd. of material excavated about 33,000 cu. yd. of concrete and 900 tons of reinforcing bars will be required for the bridges, abutments and retaining walls.

According to usual practice on the St. Paul, the work is being done by company forces under the direction of C. F. Loweth, chief engineer. The plans are prepared under the direction of H. C. Lothholz, acting engineer of design, and the construction work is in charge of W. R. Powrie, district engineer, Minneapolis.

THE SHIPPING BILL

By W. L. STODDARD

WASHINGTON, DEC. 1

Signs are increasing that the fight for the shipping bill, which is to be one of the most important items in the Administration's program this winter, will be of more than cursory interest to the railroads. The congestion of freight in the east, due to lack of ships, is being used as an argument for government-owned freighters, and in a despatch from Washington early in the week, bearing all the marks of official inspiration, it is declared that the Interstate Commerce Commission, at the suggestion of the President, has been investigating ocean freight rates and the relations between rail carriers in the United States and trans-atlantic steamship companies. Some of the information thus collected, it is declared, reveals close relations between the land and sea carriers, "particularly in matters connected with through freight shipments from interior points to foreign ports. If power is granted to the shipping board to prescribe reasonable rates for steamship traffic, it probably would include the power to fix, possibly in conjunction with the Interstate Commerce Commission, joint through rates from the interior to ports in other countries."

In this connection it may be well to state that from interviews had with officers of the Administration who are in the thick of the work for the shipping bill, it would seem that the bill is almost certain to be received very favorably by Congress. During the last year, so the reports which come to Administration leaders have it, there has been a decided change of sentiment for the measure, and in spite of the opposition, traceable to the foreign shipowners and those who are constitutionally against government ownership, the President's pet scheme will have pleasant, if not absolutely successful, sailing in Congressional waters.

George W. Norris, former director of wharves at Philadelphia, made a statement here the other day which was issued by the Democratic committee as part of the propaganda for the shipping bill. "The conditions which exist in ocean transportation," said Mr. Norris, "and the theory upon which government intervention must be justified, are so wholly different from the railroad situation that there can be neither analogy nor comparison between the two. Moreover, as the government intervention would probably be temporary—ultimately yielding the field to private capital—and would probably show a balance on the wrong side of the ledger, the opponents of government ownership of railroads should rather welcome the experiment as likely to prove an illuminating object-lesson."

Interesting comments on the proposed shipping bill from a New England railroad man, E. D. Codman, former president of the Fitchburg Railroad, are contained in an interview, which is here presented for the first time. Mr. Codman believes that the government merchant marine line offers the only means of overcoming the discrimination enforced by the "shipping pool" against Atlantic seaboard ports.

His statement follows:

"Because I see no other way of relieving Boston of the burden of discrimination laid upon her commerce by the foreign-owned shipping pool, I feel I can endorse the idea of placing in commission a government-owned merchant marine. This government-owned service would seem to be able to deal with the present situation by establishing a fair transportation rate between here and Europe. At the same time it would give ports such as Boston a chance to enter on equitable terms the competition for the trade of South America.

"Take, for example, the rates from this port to Liverpool. We are so much nearer Liverpool than is New York to that English port, that a vessel can make a little better than eleven trips from Boston to Liverpool and back while she would be making ten trips from New York to Liverpool and back. Applied to freight rates, that saving in time should make a difference in our favor, and applied to passengers it should amount to enough to pay a $5 fare from New York to Boston on a first-class passenger.

"Yet under the conditions established by the shipping combine on the Atlantic, the railroads carrying a shipment from Chicago to be sent to Liverpool are allowed practically only the same amount to deliver that shipment on the docks in Boston as to deliver it on the pier in New York. On both exports and imports the rates allowed the railroads are so low as to afford only a slight profit. The fact that there is less profit in bringing shipments by rail to Boston than to New York discourages the railroads from developing their service here. Boston is the victim of this discrimination. Only when her ocean rates to Europe are readjusted on a basis of the shorter distance can she hope to get a fair chance at the export business. The trouble lies in the fact that the foreign-controlled shipping pool has arbitrary control of the rates.

"If the United States government will build and operate, or control the operation of, a merchant marine that will enter upon the task of correcting this injustice, the whole country will be the gainer. The public loses whenever rates are fixed on any other basis than that of a fair price for the service rendered, as in the case of ocean freight transportation. Let the government put on a line of ships temporarily, and the shipping pool will have to meet the rates which a government board shall determine are fair for the distance from Boston to Liverpool.

"I do not believe in government ownership of shipping where private capital can and does render equal service for a fair price. But I do believe that where private capital is so combined, and under control so far removed from the action of public opinion, as is the case with our trans-Atlantic shipping, and where it fails so notably to render to the public a reasonable service at a fair price, the government should step in with its own corrective power. The corrective power in this instance is not the legal regulation of the rates to be charged by the privately owned lines, but the temporary establishing of a shipping line which will set the desired standard of service.

"Boston will be the gainer if this is done."

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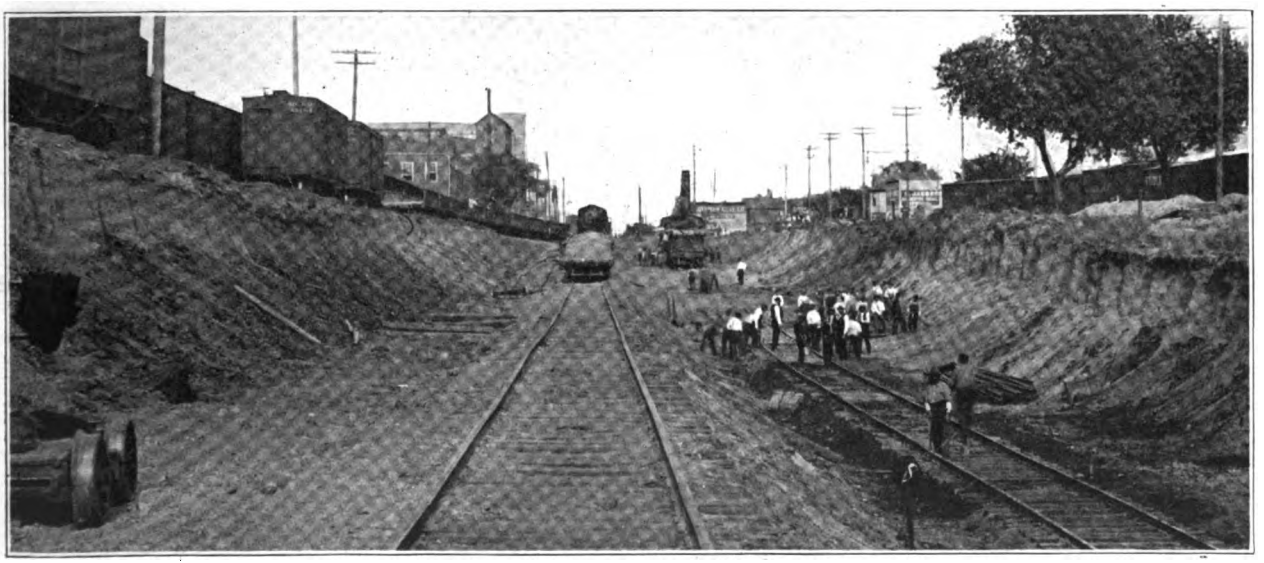
gation and suspension docket No. 414. The formal complaints filed in these proceedings raise no issue with respect to any particular rate or rates. They attack, in effect, the principles applied by the carriers in the cancellation of their arrangements with industrial lines. Carriers against which these complaints were filed will be expected to follow the same lines of action herein suggested for the carriers whose tariffs were suspended in this proceeding. We shall, therefore, enter an order dismissing the proceedings in docket No. 4181 without prejudice."

Track Depression Work of the C. M. & St. P. Ry. at Minneapolis

Extensive work of depressing main tracks in the city of Minneapolis. Some of the items are 37 street bridges over tracks and the underpinning of numerous manufacturing plants with permanent masonry. One of the complications is the handling of street car travel across the excavation in advance of the erection of the permanent bridges.

The Chicago Milwaukee & St. Paul Ry. has under way, in the city of Minneapolis, Minn., an extensive piece of track depression work which has been in progress for the past three years. The work consists in lowering the main tracks of the Hastings & Dakota division of the road over a distance of about three miles, through a built-up section of the city. These tracks lie parallel with and just north of 29th street, which thoroughfare is adjacent to the work throughout the whole distance except for a break of about seven blocks, where the street is not continuous. The western limit of the work is at Hennepin avenue, which is bridged over the tracks and is not disturbed. The work was started at this point in 1912, at moderate pace, but it was not until the next year that it was carried on with full organization.

C. M. & St. P. Ry. Track Depression in Minneapolis, Fig. 1—First Cut of Shovel, Looking East from Emerson Ave.



C. M. & St. P. Ry. Track Depression in Minneapolis, Fig. 2—Looking East on Temporary Main Track; Shovel in Third Cutting.

The object of the undertaking, which is in compliance with a city ordinance, is to eliminate numerous street crossings at grade. The ordinance requires that all of 39 streets except two be carried over the tracks at approximately the original street level, so that the plan of construction involves the erection of 37 bridges over the tracks, and of these six will carry street car traffic. Of the two exceptions above noted, one of the streets will be closed and the other street, which originally crossed in a subway under the tracks, will, after the tracks have been depressed, cross at grade.

The tracks are being lowered to permit clear head room of 18½ ft. under the bridges, and, the grade of the street being only slightly changed at the bridges, for drainage purposes, the cut required to permit this clearance has averaged about 22 ft. in depth. The excavation is in sand and gravel, and will amount, all told, to about 900,000 cubic yards. The excavation is being done with a steam shovel, and most of the material taken out has been hauled to Bass Lake yard, where it is being utilized for filling and enlarging the yard.

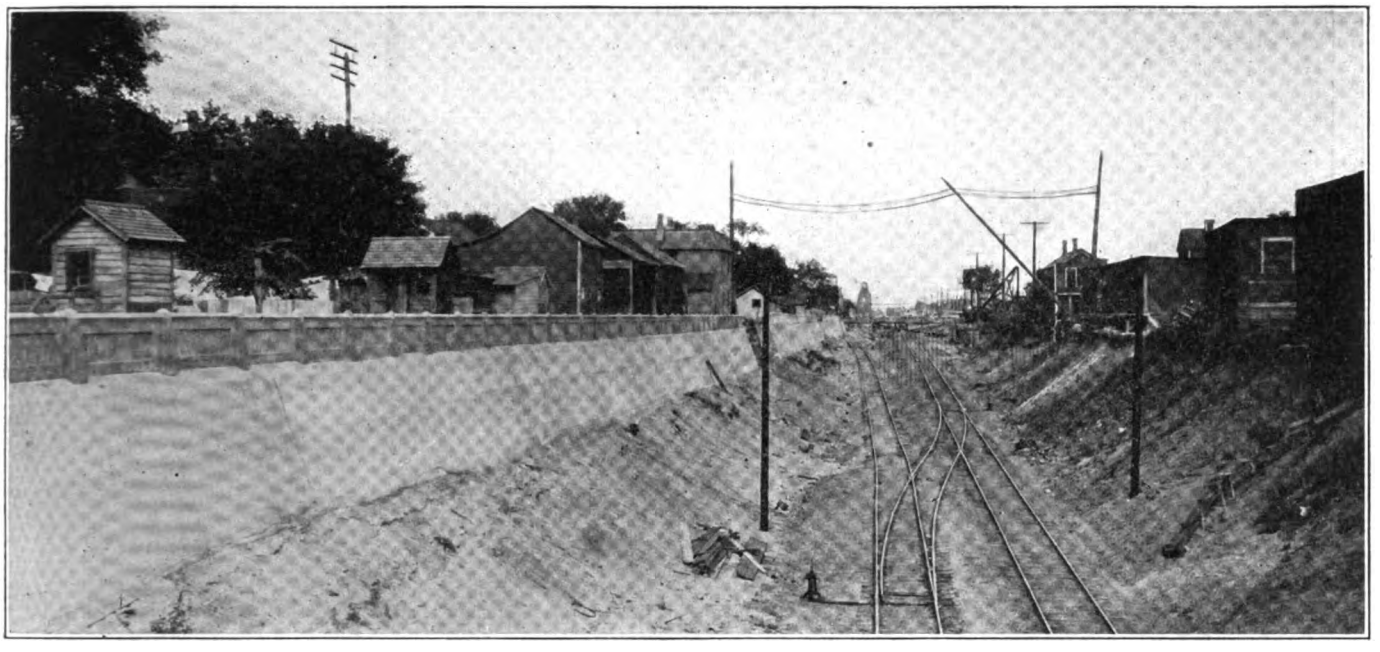
This work of depression is through a residence district, with numerous industries scattered along. The matter of taking care of the industry tracks while the work was in progress and the special problems of connecting them with the lowered tracks has been, throughout, an interesting feature of the undertaking. The accompanying illustrations show several views of the plants that have had to be remodeled in order to utilize lowered tracks. At first it was the intention of the railroad company to depress only two of its tracks, and for this the width of right of way was sufficient for slopes without retaining walls. The problem involved by the industry tracks, however, soon made it apparent that a third track would be desirable in the depression, to connect with the industry tracks and permit of necessary switching without occupying either of the two main tracks, and the work has been so planned, although the additional room for the third track has made necessary, in some cases, the acquirement of additional right of way.

The bridges are all of reinforced concrete, and, for the most part, similar in design. Examples of the structures are shown in several of the illustrations. In general the bridges are in three spans, the center span covering the two main tracks and the end spans the slopes of the cut or industry tracks, as occasion requires. Where the end span covers a slope there is a small bank abutment at the top, but where it covers a third track or an industry track the abutment is made full height, from the bottom of the excavation. Two exceptions to the three-span arrangement may be noted, one at Fourth avenue, where there are ten spans, and the other at Clinton avenue, where there are six spans, to carry the streets named across a series of depressed team tracks located about midway of the depression. The street bridges generally provide full width of roadway, to conform to the original street widths, and are paved with wood blocks. On each side of the bridge there are sidewalks 8 ft. in width and hand rails of reinforced concrete are built along the outer edge of the walks.

C. M. & St. P. Ry. Track Depression in Minneapolis, Fig. 3—Looking East from Center of Block Between Dupont and Emerson; Shovel in Final Cutting.

The manner of excavation is that of cut and shift. The steam shovel makes a cut as deep as is permissible with loading of cars on main track, in some place to a depth of 8 ft. A new track is laid in the cut so made (see Fig. 1), to which traffic is then diverted, and the steam shovel is shifted to the other side and is put to cutting down under the old track. In this manner the work progresses, cutting and shifting from side to side until the desired level is reached, the entire excavation in different places being made in from five to seven cuts and shifts. For a usual thing the tracks have been depressed to full depth covering a stretch of about eight blocks at a time.

An interesting part of the work has been the method of handling street traffic across the tracks during construction. For the first cut of the steam shovel the usual arrangement has been

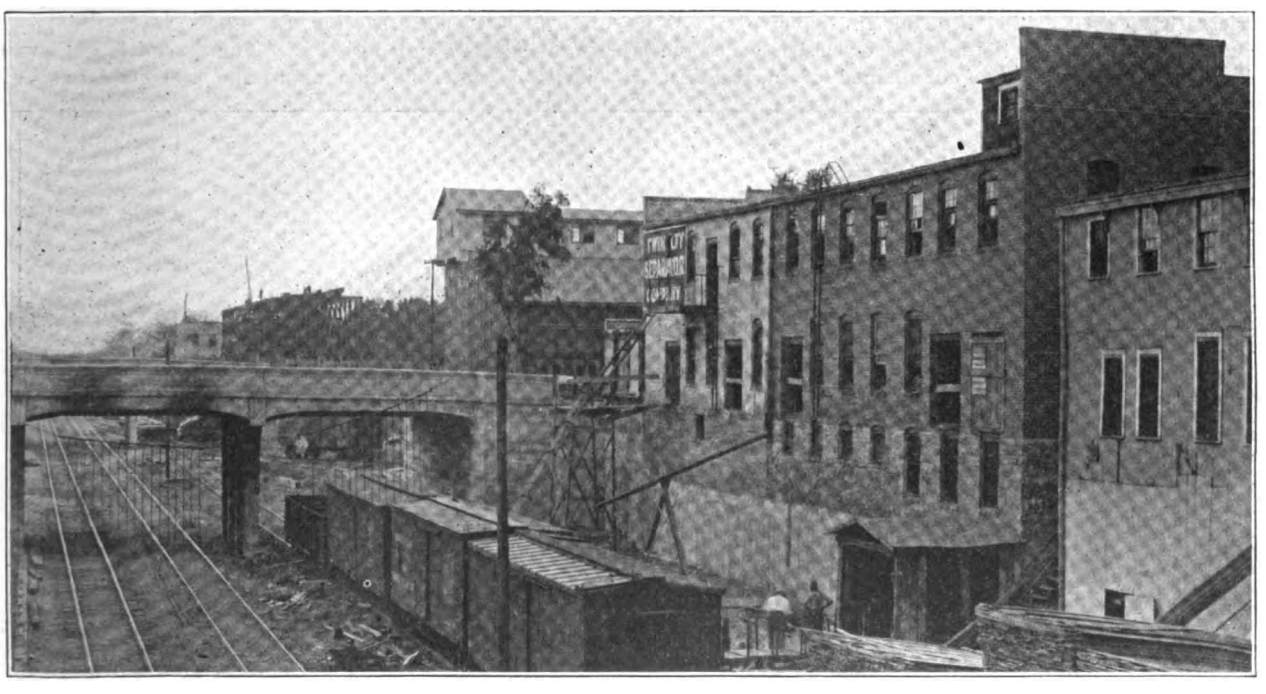


C. M. & St. P. Ry. Track Depression in Minneapolis, Fig. 4—Retaining Wall on North Right of Way Line Between Pleasant and Nicollet.

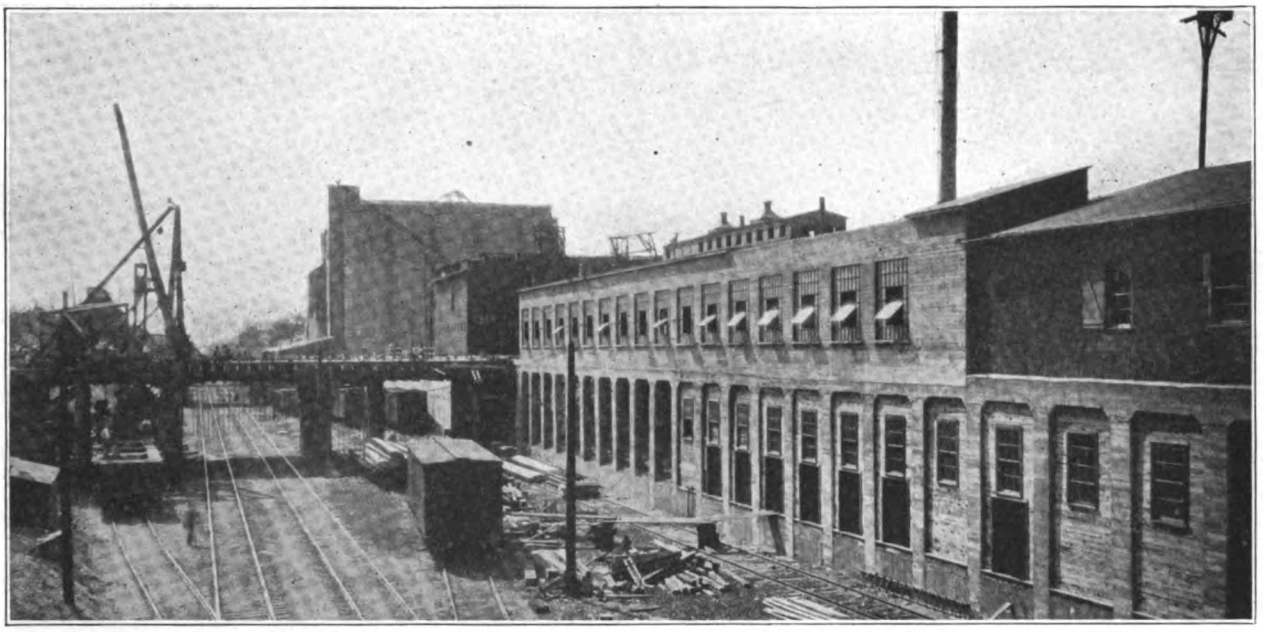
to lay stringers across the cut and plank them over for a temporary bridge after the shovel has passed. As successive cuts were made all of the streets would be temporarily closed except one, at about the center of the work in progress, and at this street a temporary bridge was used to carry the usual street traffic or to transfer passengers from street cars on stub-ended tracks at either side. As soon as the depression reached full depth, a temporary wooden bridge was erected over the depression, across one of the streets, to carry the traffic, and this bridge would serve until the permanent structures were erected. An engineer connected with the work has described the manner of handling street car passengers across the work as follows:

"People using the street car lines intersecting 29th street have not been sure from day to day just how they were to cross the cut or what route they would have to travel to do so. One day they have been required to transfer, then they have been shunted through a subway that carried them under the tracks on which the dirt trains load. This, for a day or two only, then they would find they must use the other side of the street and go down and across the first cut of the shovel, by means of a temporary stairway. This sufficed until the shovel came back on its second cut, when the public would have to climb stairs to a level 14 ft. above the street, and cross on a wooden truss span to the opposite side of the cut. The third cut of the steam shovel finds this same truss in a slightly different and lowered position and the weary strap-hangers have reached the last stage in the transferring process. Shortly after this last move the cut is completed and street cars can go on without further interruption."

About 500 men are employed on the work. The excavation is being made with one steam shovel. Three work trains of twenty-five 12-yard air dump cars each are employed. Of the number of men stated, 250 to 300 are employed on the work of bridge construction. At the beginning of the present season it



C. M. & St. P. Ry. Track Depression in Minneapolis, Fig. 5— Work at the Twin City Separator Co.

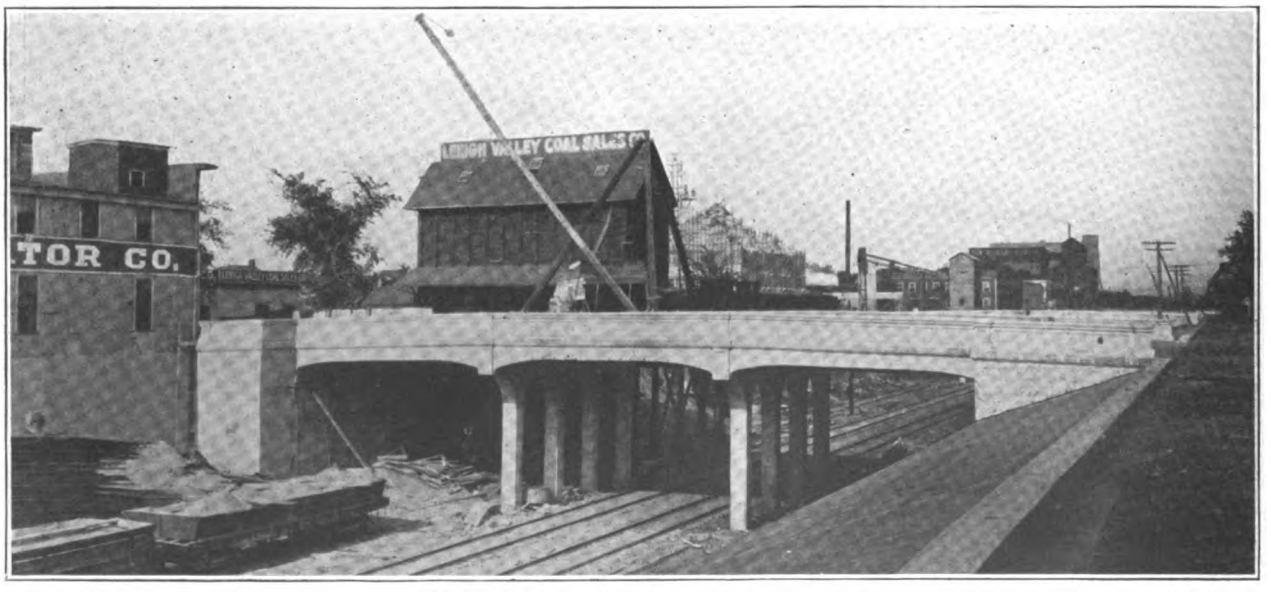


C. M. & St. P. Ry. Track Depression in Minneapolis, Fig. 6—Grand Ave. Bridge Under Construction; Concrete Underpinning of Plant of Western Crucible Steel Castings Co.

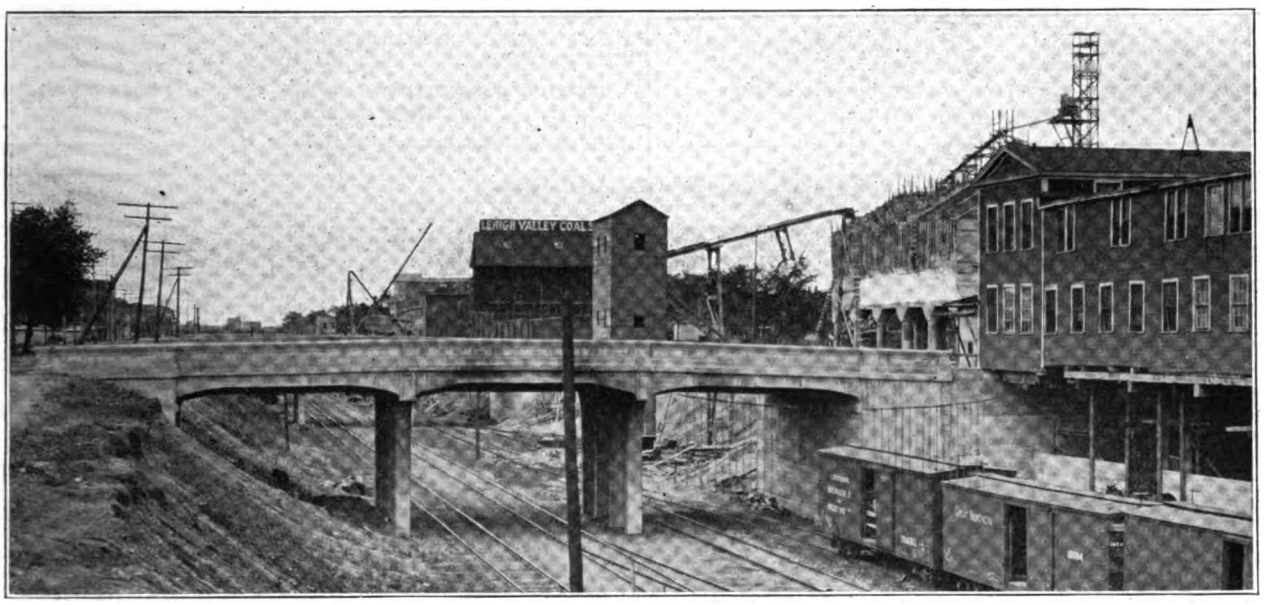
was estimated that about 50 per cent of the work was completed, including 17 of the bridges, on which traffic has been restored It is planned to complete all of the excavation this year and all but four of the bridges. The work is being done by company forces under the general direction of Chief Engineer Mr. C. F. Loweth, Mr. W. R. Powrie being the engineer in direct charge.

Commission Equalizes St. Louis Grain Rates.

The Interstate Commerce Commission has returned a decision in two cases in which the Merchants Exchange of St. Louis, Mo., and the Southwestern Missouri Millers' Club were complainants against the Baltimore & Ohio, the Chicago & Alton and other railroads. The situation complained of is that intrastate rates from interior Missouri points to St. Louis, Mo., are lower than the interstate rates for the same movement applicable on through shipments. A requirement enforced by Central Freight Association and trunk line carriers that expense bills showing the payment of interstate rates inbound be surrendered in order to secure the reshipping rates outbound, was complained of in the first case is unreasonable. The complainant in the second case alleged unjust discrimination, because the combination of intrastate rates to St. Louis and outbound rates to Central Freight Association, trunk line, southeastern, Mississippi Valley, and southwestern territories of which St. Louis shippers are able to avail themselves is lower than the rate for the through movement from interior Missouri points. The commission held on the several points as follows: "1. In the absence of local or flat rates from St. Louis proper, shipments of grain and grain products are entitled to move out on reshipping rates, 'regardless of the point of origin of the grain, and regardless of the rate paid on the inbound shipment,' because 'we must so construe the tariffs as to permit the traffic to move, if that be possible.' 2. By maintaining interstate rates higher than the intrastate rates from interior Missouri points to St. Louis an unlawful and undue prejudice and advantage is given to St. Louis, and an unjust and unlawful discrimination is effected against the interior Missouri and southern Illinois points and East St. Louis, from which carriers serving St. Louis from the west are ordered to cease and desist. 3. The record is not sufficient to justify a determination as to the reasonableness of the



C. M. & St. P. Ry. Track Depression in Minneapolis, Fig. 7—Colfax Avenue Bridge.



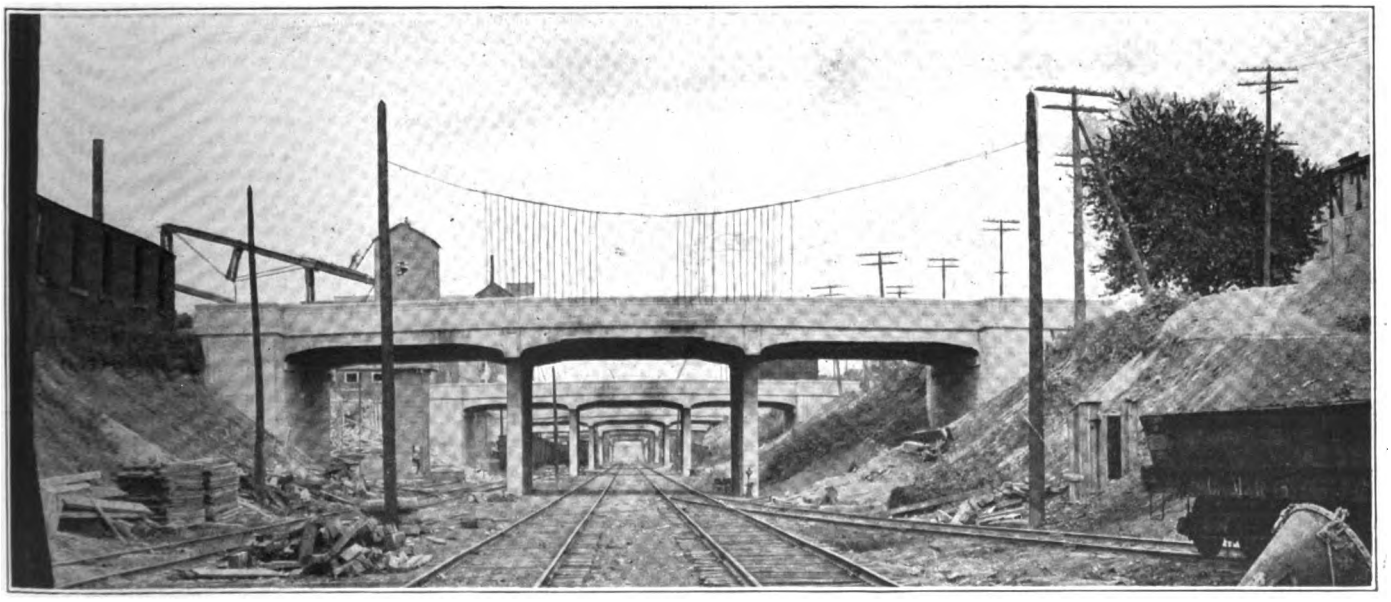
C. M. & St. P. Ry. Track Depression in Minneapolis, Fig. 8—Aldrich Avenue Bridge and Bruer Bros. Woodworking Plant.

present interstate rates from interior Missouri points to St. Louis. No change should be made without due consideration of the relation of the rates to and from St. Louis with the rates to and from Memphis. 4. While reshipping or proportional rates are applicable to part of a through but suspended movement from point of origin to ultimate destination, outbound local rates, although they may likewise apply to part of a through movement, cannot be limited according to the point of origin of the shipment or the rates which were paid inbound. So long as there are intrastate rates published to St. Louis, shippers cannot be denied the right to avail themselves of these rates for movements which are clearly intrastate, and so long as there are flat rates published out of St. Louis shippers must be permitted, in proper cases, to ship outbound under these rates, irrespective of the rates paid inbound. It is plain that the intrastate movement to St. Louis must be considered as a separate movement which cannot be tied up to the outbound movement in such a manner as to constitute the two one through movement, provided the consignee has in good faith taken possession. 5. Absorption of elevation charges is made upon the theory that the inbound and outbound movements comprise a through movement and that the grain has been elevated in transit. Whenever the absorption is made the grain cannot lawfully move forward except at the balance of the through rate."

Rapid Growth of Hawaiian Railway.

The railroad system on the island of Oahu, Hawaiian Islands, provides a romantic story of a financial undertaking that at first almost ruined its backers, but is now one of the best-paying investments in the Hawaiian Archipelago. A. P. Taylor, a correspondent of the United States Department of Commerce, has sent in a report which describes the growth of the road. "Twenty years ago," Mr. Taylor writes, "the system boasted 23½ miles of track; today the company maintains 127 miles of road (a portion of which is plantation trackage); owns 22 locomotives, 44 passenger cars, and 520 freight cars; has 36,000 feet of wharfage, and can store 20,000 tons of sugar.

"Taxes on property from Ewa to Kahuku plantation, which are tapped by this railway, amounted at the time the road started to $28,853; in 1914 the taxes on the same property totaled $310,000. This is one example how the land along the line has increased in value in the last 20 years.



C. M. & St. P. Ry. Track Depression in Minneapolis, Fig. 9—View Looking Under a Series of Bridges from Colfax Ave.