bers will visit the experiment station of the Bureau of Mines at 40th and Butler streets, Pittsburg.

Senate Votes Investigation of New York Central Lines.

The United States senate passed, on July 10, a resolution introduced by Senator Norris, of Nebraska, calling for an investigation of the financial operations of the New York Central lines by the Interstate Commerce Commission. The resolution if concurred in by the house would direct the commission first to investigate and report upon the issue by the New York Central & Hudson River R. R. Co. of $167,102,400 worth of 4 per cent mortgage bonds for the purpose of taking up 3½ per cent Michigan Central bonds amounting to $19,336,000, 3½ per cent Lake Shore & Michigan Southern bonds amounting to $90,578,400, and New York Central 4 per cent debenture bonds amounting to $97,188,000. The commission would be asked to report whether the issue of the 4 per cent bonds for 3½ per cent would not be an unwarranted and illegal capitalization of the railroads concerned, whether the purpose of the consolidation of the New York Central, the Lake Shore, and the Michigan Central would not be unwarranted and unlawful, and whether the increase in interest is necessary even if the consolidation is unobjectionable. Senator Norris objects to the transactions on the ground that the exchange of 4 per cent bonds for 3½ per cent bonds, dollar for dollar would saddle on to the lines an additional permanent debt, equivalent to $46,713,620, upon which shippers must pay returns.

Montana Coal Interests Protest Rate Reduction.

Coal mining interests of Carbon county, Montana, made a showing before the Interstate Commerce Commission, at a hearing held at Omaha, Neb., this week, to the effect that should the recent order of the commission reducing coal rates between Sheridan, Wyo., and adjacent points a points in North Dakota, Montana, Washington an Idaho be put into effect the result would be the closing down of five of the principal coal mines in Carbon county. According to the evidence presented, it costs $1 per ton more to produce coal i Montana than in Wyoming because of labor c ditions and confiscation of Carbon county mines would be the practical result of the proposed rate being put into effect. At present the Montana coal mining interests concerned enjoy a differential of 65 cents per ton on coal rates. Representatives of these interests charge that Wyoming coal producers would be able to send coal into Montana competitive territory at a rate 10 cents less than their own local rates.

Revision of Central Passenger Fares.

The Central Passenger Association has undertaken a sweeping revision of passenger fares in its territory. This action is necessary to conform with the decision of the United States Supreme court in the Minnesota rate case, and the carriers have been advised by the Interstate Commerce Commission that the revision must be completed in time to make the new rates effective May 1, 1914. The long and short haul clause of the interstate commerce law which prohibits a higher charge for a through rate than the aggregate of the local fares, became effective July 1, 1910, but the commission has informally held in suspension the time for its enforcement. With the recent decision of the high court, the commission will construe the law stringently. The Central Passenger Association includes territory north of the Ohio river, east of the Mississippi, and extends as far east as western New York.

New Rules for Engineers, N. Y., N. H. & H. R. R.

Strict rules governing the assignment of engineers to passenger trains have been issued by Clinton L. Bardo, general manager of the New York, New Haven and Hartford R. R., as a result of the recommendations of the Interstate Commerce Commission and the Public Utilities Commission of Connecticut regarding the Stamford wreck, referred to on another page of this issue. The new rules provide that an engineer shall be permitted to operate passenger trains only under certain conditions. First, he must have two years' previous road experience for through trains and one year's previous road experience for local trains. He must have a certificate showing that he has passed all of the required examinations, a watch certificate and a certificate of competency based upon the personal observation and knowledge of the foreman of engines and master mechanic and approved by the division superintendent. An engineer may not be assigned to passenger trains without the prescribed service qualifications or certificate of competency unless he is accompanied by a road foreman of engines or other competent employee, who will remain with, and be responsible for him until his competency is established. The new rules also provide that no man is to be promoted to the position or employed as an engineer, or take rating as such, until he is furnished with the prescribed certificate of competency.

Erdman Act Amended; Strike Probably Averted.

Representatives of the conductors' and trainmen's unions and the eastern railroads involved in the ominous wage controversy participated in a conference with President Wilson, on July 14. As a result the railroads and unions received assurances that congress would promptly enact the Newlands bill, amending the Erdman act; and in turn both parties to the controversy expressed

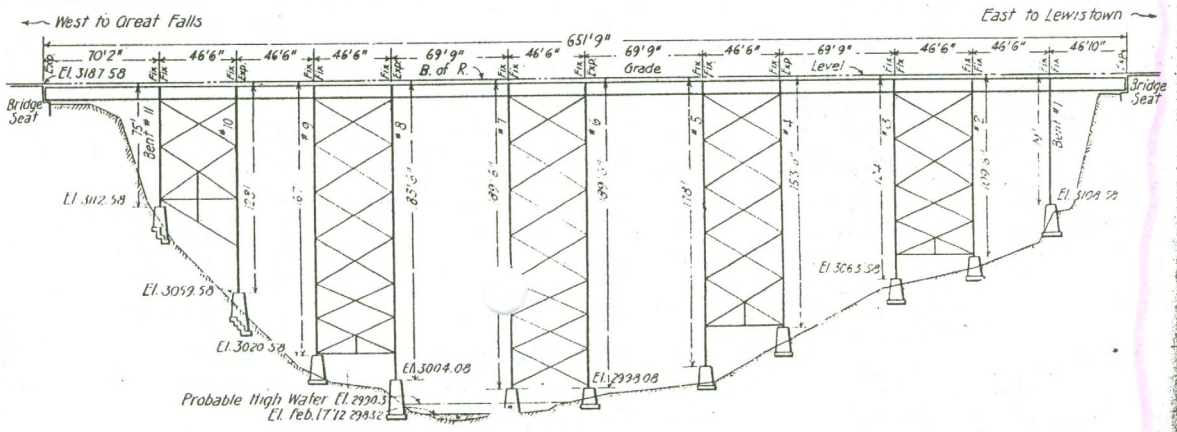

Fig. 15—General Elevation of Belt Creek Viaduct. Great Falls Line, C. M. & St. P. Ry.

willingness to submit their differences to arbitration by the permanent tribunal which will thus be created. On Tuesday, July 15, the house passed the Newlands bill, with two minor amendments presented by the judiciary committee, in which the senate concurred. The senate had passed the measure on June 26, so that after action by the house it went immediately to the President, who promptly affixed his signature.

The law in its present amended form establishes the "United States Board of Mediation and Conciliation," to consist of a federal "commissioner of mediation and conciliation" and two other officials of the government to be designated by the President. This board can be appealed to to intervene in a railroad labor dispute by either party and is to first use its best efforts, by mediation and conciliation, to bring the disputants to an agreement. Failure in this will be followed by an attempt on the part of the board to "induce the parties to submit their controversy to arbitration"; and in case arbitration is agreed to, special boards of six arbitrators will be chosen. Two members of this board are to be named by the labor organization interested, two by the railroads and two by the four arbitrators thus chosen. In the event, however, that the four are unable to agree on the two remaining members the board of mediation is authorized to select these two.

The conference committee of railway managers issued a statement on June 16, submitting a list of demands which they insist must be arbitrated together with the men's demands for increased wages. The inclusion of these demands with the wage question proper was apparently a surprise to the labor side of the dispute, and met with objections from that quarter. The letter containing the roads' demands reads:

"Referring to our letter of July 14 and to our conference this morning, we hand you herewith for your information a list of those questions concerning rates of pay and working conditions of conductors and trainmen which the railroads intend to have incorporated in the agreement to arbitrate:

"1. When a minimum day's wage is paid it shall entitle the road to the full mileage or hours of service paid for.

"2. In no case shall double compensation be paid.

"3. For fixing the basis of compensation—i. e., whether passenger, through or local freight, yard, etc.—the same classification shall be applied to all members of the train crew.

"4. All monthly guarantees shall be abolished.

"5. That consideration be given to a reduction of existing rates of pay on yard brakemen and of passenger conductors and trainmen on long, continuous runs where there is an opportunity to make excessive mileage in a limited number of hours.

"6. Employees in two or more classes of service on continuous duty or under continuous pay shall be paid the rates applicable to the different services performed, with a minimum equal to ten hours at the lowest paid service.

"7. On passenger and freight trains where, under extra crew laws, additional men are required, the rate of pay for all brakemen shall be 20 per cent below rates established for brakemen on trains not affected by such laws.

"8. The rates and rules awarded by this arbitration shall supersede rates and rules now in effect which are in conflict therewith."

The presidents of the conductors' and trainmen's brotherhoods issued a statement, on July 17, declaring that they would not, under any circumstances agree to the submission of other questions to the board along with the wage dispute.

President Wilson, on July 17, made the appointments necessary to put the provisions of the new act into effect. He appointed William L. Chambers of the District of Columbia to be commissioner of mediation and conciliation. The two other members of the new board will be Judge Martin A. Knapp of the United States Commerce court and Louis F. Post, assistant secretary of labor. G. W. W. Hanger is named as assistant to Judge Chambers. All the appointments will be sent to the senate and confirmation is expected at once.

Judge Chambers, chosen to head the board, was at one time chief justice of the international court at Samoa, and since 1901 has been a member of the Spanish treaty claims commission. He has had considerable experience in arbitrating labor disputes. In 1910 he was selected as a third arbitrator of the controversy between 49 railroads operating in the territory west of Chicago and the Brotherhood of Locomotive Firemen and Enginemen. He was selected for this task by Dr. Charles P. Neill, then commissioner of labor, and Martin A. Knapp, then chairman of the Interstate Commerce Commission, who were the other two mediators under the Erdman act.

Mr. Hanger, who is to be assistant to Judge Chambers, is chief statistician of the bureau of labor statistics and acting head of the bureau since the resignation of Dr. Neill. He has been chief statistician of the bureau since 1887.

Judge Knapp is presiding judge of the United States Commerce court, and for a long time has

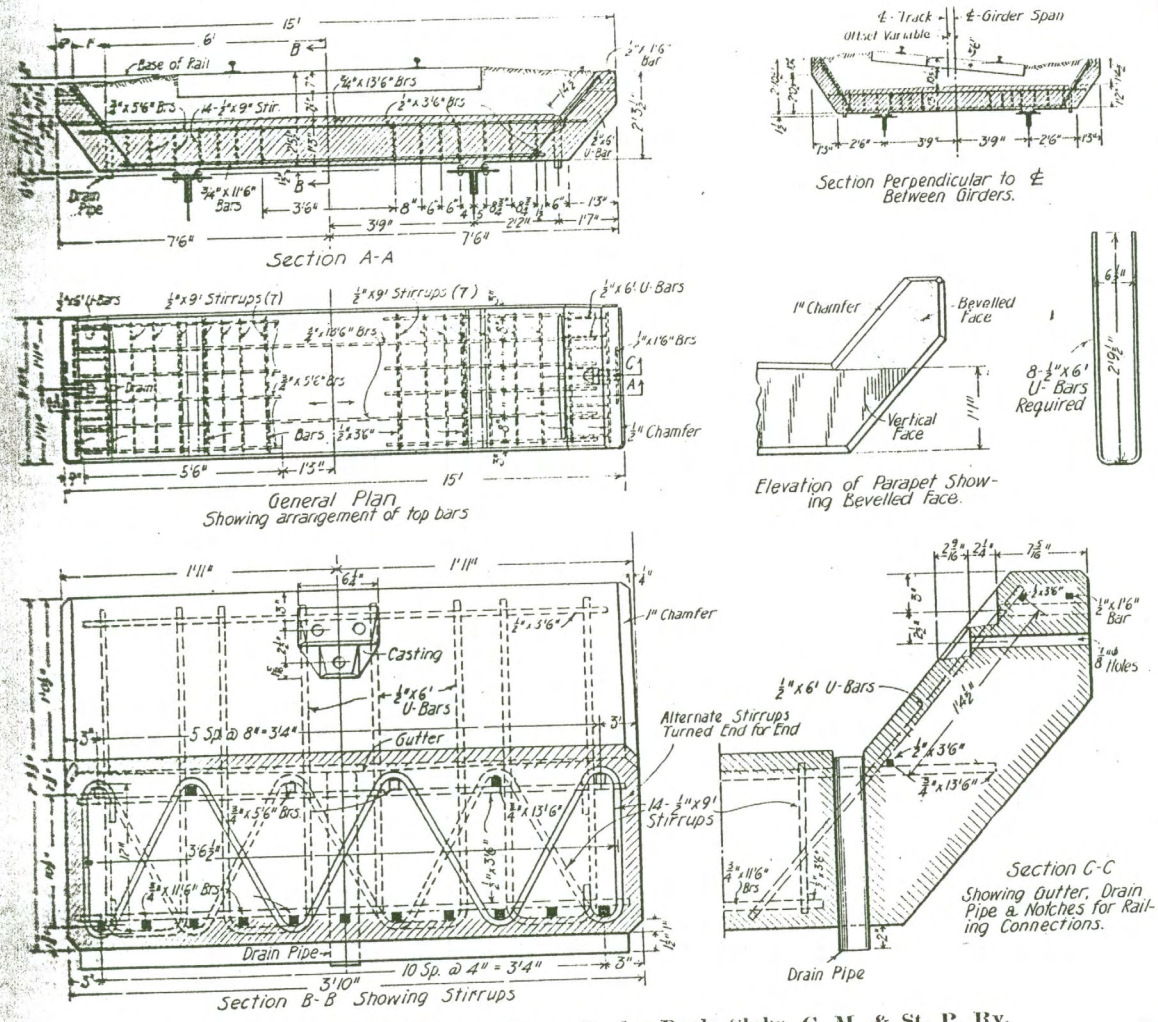

Fig. 16—Standard Reinforced Concrete B ge Deck Slabs, C. M. & St. P. Ry.

been identified with arbitration movements on the part of the government.

Mr. Post as an editor and writer has long been an advocate of single tax and allied reforms. He has been a candidate for office several times on labor tickets.

New Public Utilities Law in Illinois.

The public utilities bill passed by the last legislature of the state of Illinois has received the approval of Governor Dunne, and the statute will go into effect January 1, next. The act substitutes for the railroad and warehouse commission which has heretofore exercised control of the carriers within the state, a public utilities commission consting of five members. These are to be appointed the governor, and not more than three ma affiliated with the same political party. The salary of each commissioner is to be $10,000 per year. The usual restrictions are placed upon all official connection with any corporation or person subject to regulation by the commission. The commission will have general supervision over all public utilities, and it must examine these and keep informed as to their franchises, capitalization, rates and management. The term "public utility" extends to all carriers, telegraph and telephone companies, companies furnishing heat, coal, light, power, electricity or water, gas and oil pipe lines, warehouses and dock companies. In the matter of stock and bond issues, the act states that the power of public utilities to issue evidences of indebtedness and to create liens on their property is a special privilege, the right of supervision, regulation, restriction and control of which is vested in the state, to be exercised by the commission. The act then makes thorough provision for the exercise of this control. The commission has no power to authorize the capitalization of the right to be, of any corporation, or to authorize the capitalization of any franchise, license, or permit in excess of the amount actually paid to the state as consideration therefor. The commission has full power of supervision and restriction of all the forms of intercorporate relations. The commission may ascertain the value of the property of any public utility in the state. Rates are required to be just and reasonable, and unless the commission otherwise orders, no change shall be made in any rate or classification except after thirty days' notice to the commission and to the public. The commission has power, upon a hearing upon its own motion or upon complaint, to investigate any single rate, classification, etc., or the entire schedule, and to establish new rates, classifications, etc., in lieu thereof. This provision, however, does not affect the act establishing maximum passenger fares. The power of establishing through routes and joint rates is covered. The latter portions of the act include provisions concerning control over car distribution, standards of service, safety appliances and the character of proceedings before the commission and in the courts.

Construction of the Lewistown-Great Falls Line of the C. M. & St. P. Ry.

II—Bridges.

(Continued from page 622.)

As the route of this line cuts directly across the watershed of the country, for most of its length, and the streams are numerous, the bridge work is correspondingly extensive, and there are a number of long and high structures. Among these are the following: The Judith River viaduct, at Mile Post 14 from the Lewistown end, is 1953 ft. 10 ins. long,

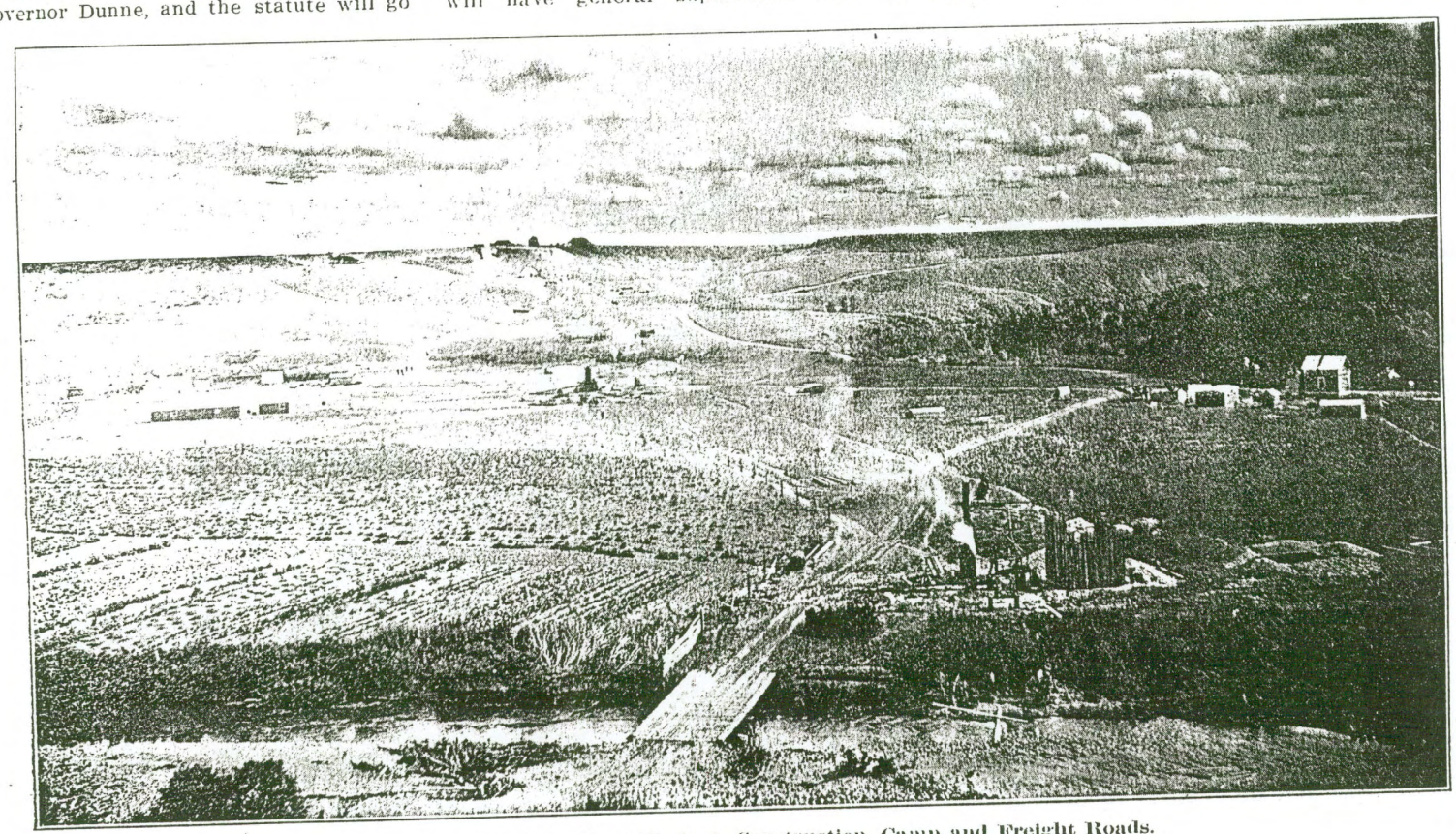

Fig. 17—Site of Judith River Viaduct, Construction Camp and Freight Roads.

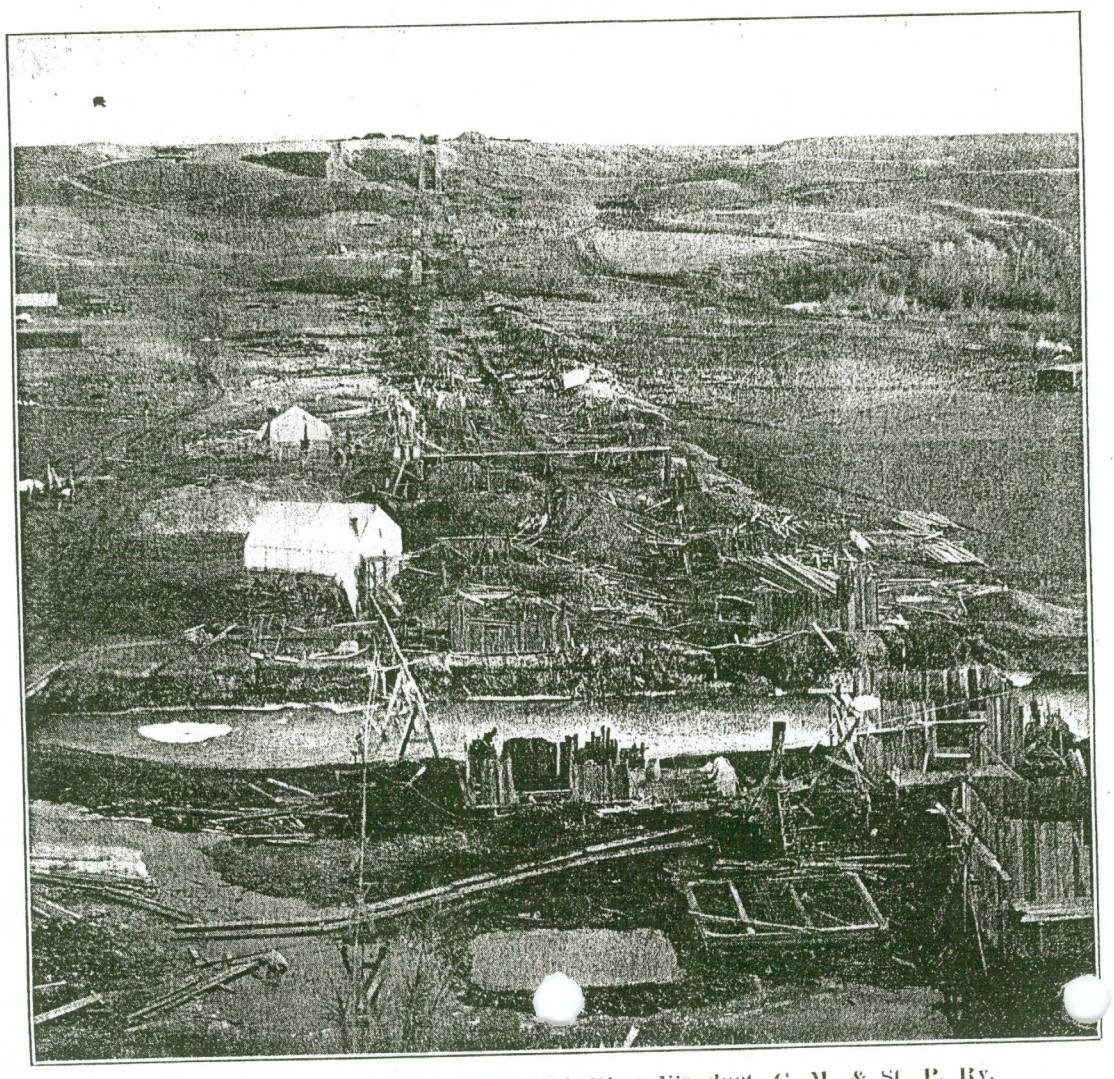

Fig. 18—Line of Foundations for Judith River Via duct, C. M. & St. P. Ry.

between abutments, and the steel work for about two-thirds of this length is 135 ft. high above the masonry. The weight of structural steel in the viaduct is 2829 tons. The Indian Creek viaduct, at Mile Post 18, is 1302 ft. 10 ins. long, between abutments, and 150½ ft. high from base of rail to top of the concrete piers supporting the towers. The weight of structural steel in this viaduct is 1803 tons. The Sage Creek viaduct, at Mile Post 22, is 1698 ft. 2 ins. long, between abutments, and 156½ ft. high above the tops of the piers supporting the towers. The weight of structural steel is 2735 tons. The Red Coulee viaduct, at Mile Post 119, is 675 ft. long and 137 ft. high above the masonry piers supporting the tower legs. The weight of steel is 916 tons. The Belt Creek viaduct, at Mile Post 118, is 651 ft. 10 ins. long between abutments, and 189½ ft. high from base of rail to tops of the piers supporting the towers. The total hight above the water in Belt Creek, at normal stage of flow, is 204 ft. The weight of structural steel in this viaduct is 1002 tons. In all of these viaducts, which are ballasted top, deck, plate girder and tower structures, the tower spans are 46½ ft. and the intermediate spans 69 ft. 9 ins.

The bridge crossing the Missouri river at Great Falls is a plate girder structure, in 13 deck spans of 65 ft. each, two deck spans of 45 ft. each, and one through girder span of 40 ft. length, over a road crossing. At the east of this structure there is a spiraled 8-deg. curve covering five of the 65-ft. spans and the three shorter spans above mentioned.

All of the viaducts carry ballasted track, on a floor consisting of reinforced concrete slabs, with hand railing and hand-car refuges every 250 ft. Figure 16 shows the details of the design. The slabs are 15 ft. wide, over all, including the curbs or parapets, which are 14½ ins. high for tangent track, 16½ ins. high on the inside and 20½ ins. high on the outside, for curved track. The slab length, measured longitudinally with the bridge, is 3 ft. 10 ins. The detail drawing shows with sufficient clearness the disposition of the reinforcing bars.

The masonry for abutments, piers and pedestals for the viaduct towers is of concrete, the mixture for mass work being 1:3:6 and for reinforced work 1:2:4. In all of the concrete masonry gravel was used, and no crushed stone. This gravel was found in abundant quantities, generally within convenient hauling distance, and the natural material was usually satisfactory as to quality. In some cases, however, where the tendency was to coarseness, the larger stones were pulled out with garden rakes. On the Lewistown end the gravel pits were quite convenient to the work, the maximum haul being only about ½ mile. On the Great Falls end pits of suitable material were not found so near together. The haul for the Box Elder culvert was ¾ mile; for that at Whittemore coulee 3½ miles; for Rogers coulee 3¾ miles; for Johnson coulee 5 miles; for the Belt Creek viaduct 5 miles; for the Red Coulee viaduct 3½ miles. Practically all of the cement used was of local manufacture, most of it coming from the Portland cement works at Trident, Mont., near Three Forks.

For the most part the foundations for the bridges were obtained at easy depths. With the exception of the Sage Creek viaduct the foundations were either on hard shale or cemented gravel; at Sage Creek piling was driven to support foundations. The foundations for the Missouri river bridge stand on rock. The abutments are of the wing type, and both these and the piers are of concrete mass construction. The work at this point involves the use of 2000 cu. yds. of concrete, the most of the work being done in very swift current.

In general, the concrete was machine mixed, the only exception to this rule being with material used in the small arch culverts of 4 ft. span, containing 100 cu. yds. or less. In such instances, to save the work of moving plant, and other expense, the material was hand mixed. Batch machines, chain-belt driven by gasoline engines, were used exclusively, mixing 18 cu. ft. to the batch. The use of gasoline engines was particularly advantageous in the matter of saving of transportation of fuel. The engines used for driving these mixers were generally of the 4-cylinder automobile type and they gave very good satisfaction; in fact, much better than did engines of the old single-cylinder type. Except where otherwise mentioned, the concrete was placed by means of cars running on track of industrial type.

It will be interesting to take, as an example, one of the viaducts and describe the manner of constructing the masonry. The site of the Judith River viaduct, the construction camp and the freighting roads are shown in Fig. 17. In Fig. 1

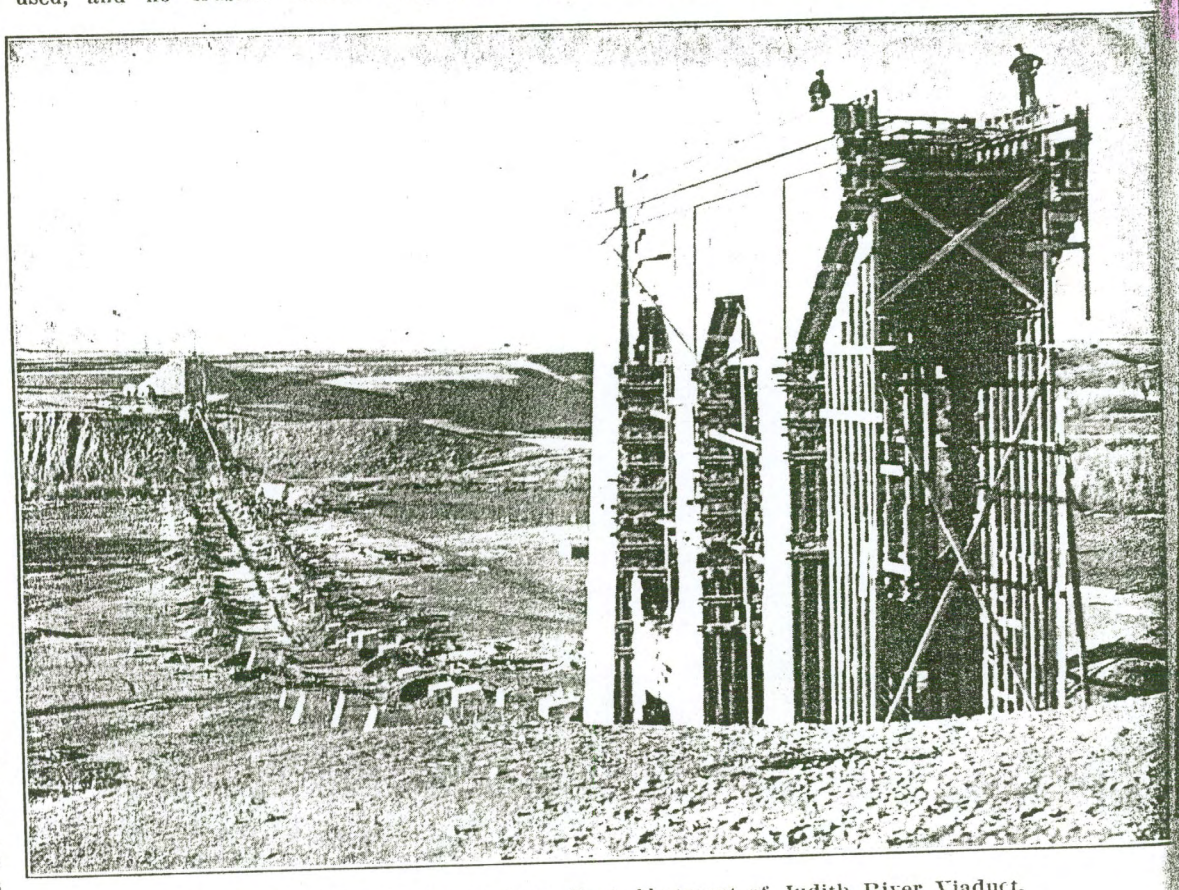

Fig. 19—Looking Northwest from East Abutment of Judith River Viaduct.

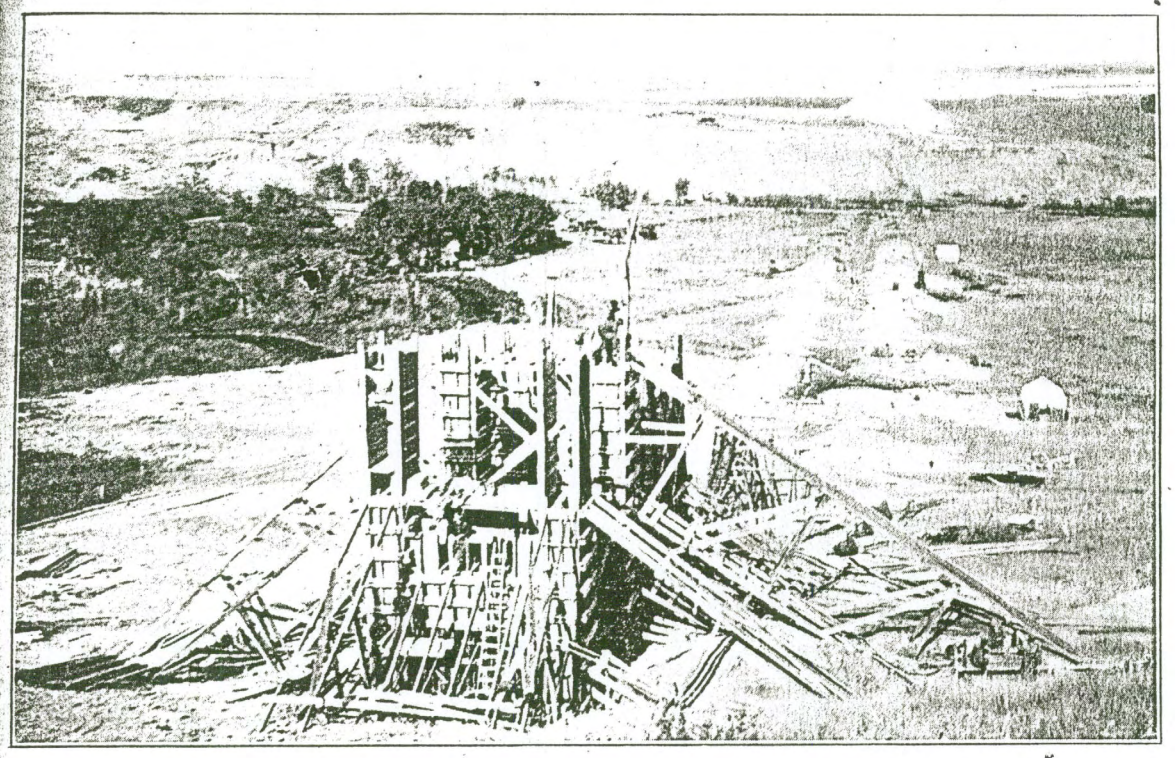

Fig. 20—Forms for East Abutment of Judith River Viaduct.

work on the foundations is seen in progress, with the long line of piers across the valley, or the forms for the same, and the east abutment in the distance. Figure 19 is a view from the east abutment looking in the other direction, or toward the northwest. In this view the foundations for the entire structure appear. Figures 20 and 21 show the forms for the east abutment, and Fig. 24 shows this same abutment before all of the form lumber was removed.

The mixer at this point was first set up for the footings of the east abutment. For constructing the abutment a trestle was run out from the hillside, level with the top of it, and the mixed material was carried out in cars on this trestle and dumped into spouts. For the west abutment it worked out that this plan of handling the material would not be economical, by reason of the length of trestle which would have to be built, and it was found to be cheaper to build an elevator, which is shown in Fig. 25. The body of a dump car was used for the elevator bucket, which, when it arrived at the top, was dumped automatically into a spout which held one batch. From this spout the concrete was dropped, by gate, into a car, in which it was pushed to any point desired and dumped into a spout for distribution about the forms. The car was handled on a double tram track built at the top of the abutment. The spouts used were of galvanized iron, 12 ins. in diameter. The manner of procedure was to allow the spout to fill up with concrete and then work it out at the bottom as material was dumped in at the top. Sections of the spout 2½ ft. in length were taken off as the work progressed upward.

The chutes for carrying the material into the footings for the east pier are shown in operation in Fig. 22. On the east slope the concrete was supplied to all the pedestals from two positions of the mixer, the work in one of these positions being shown in Fig. 23. The mixed concrete for the piers across the valley was carried in cars running

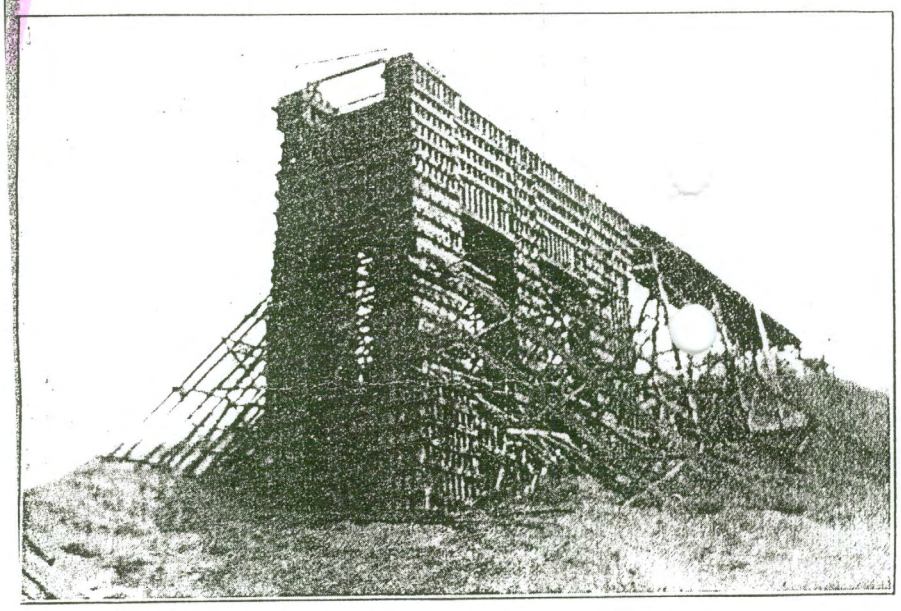

Fig. 21—Forms and Concrete Dumping Trestle for East Abutment of Judith River Viaduct.

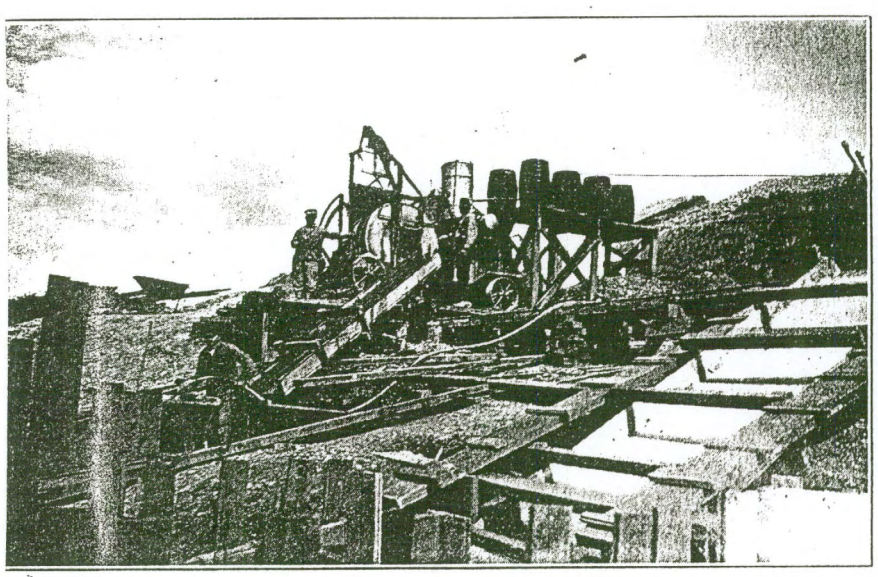

Fig. 22—First Set-up of Mixer for Footings of East Abutment of Judith River Viaduct.

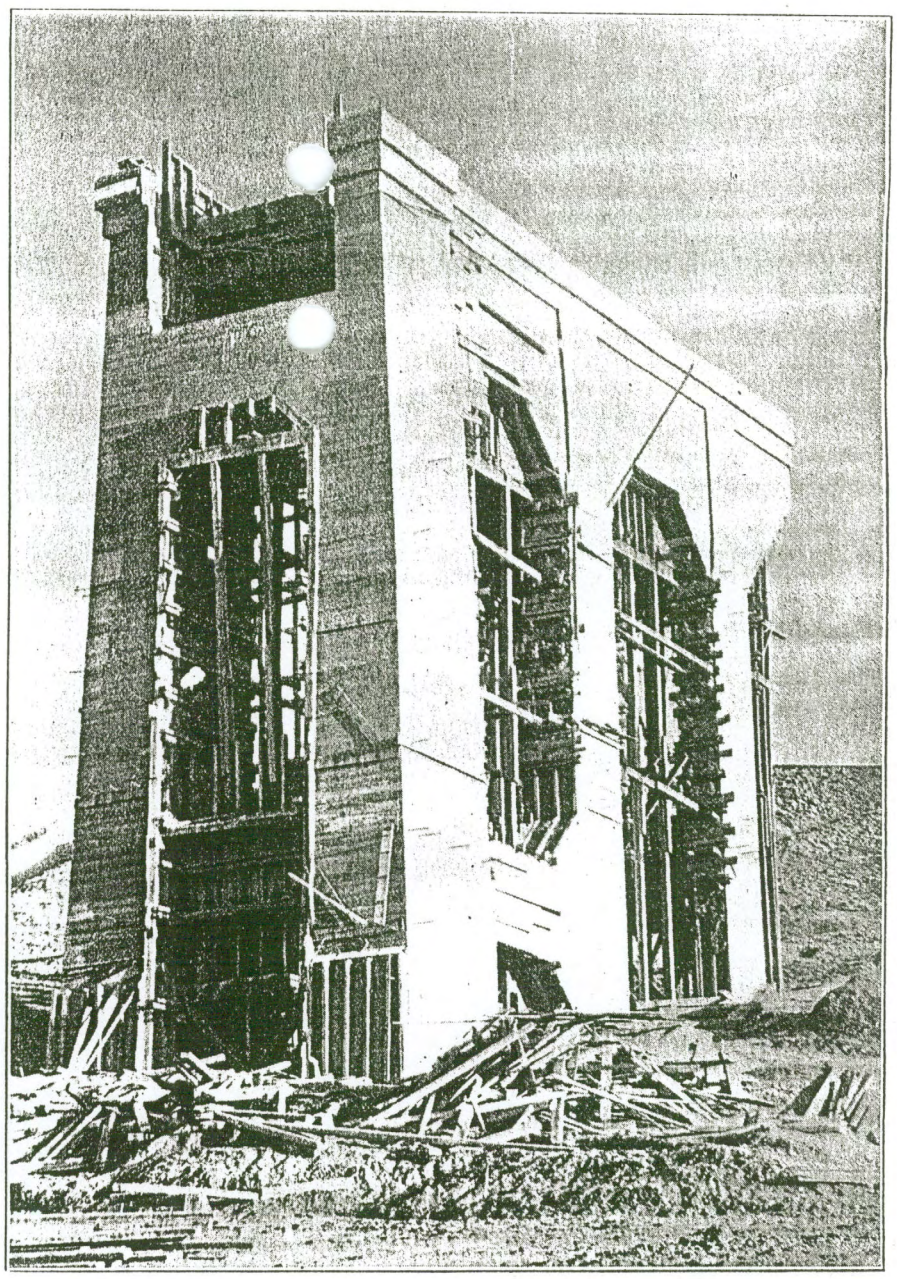

Fig. 24—East Abutment of Judith River Viaduct Before all of the Form Lumber was Removed.

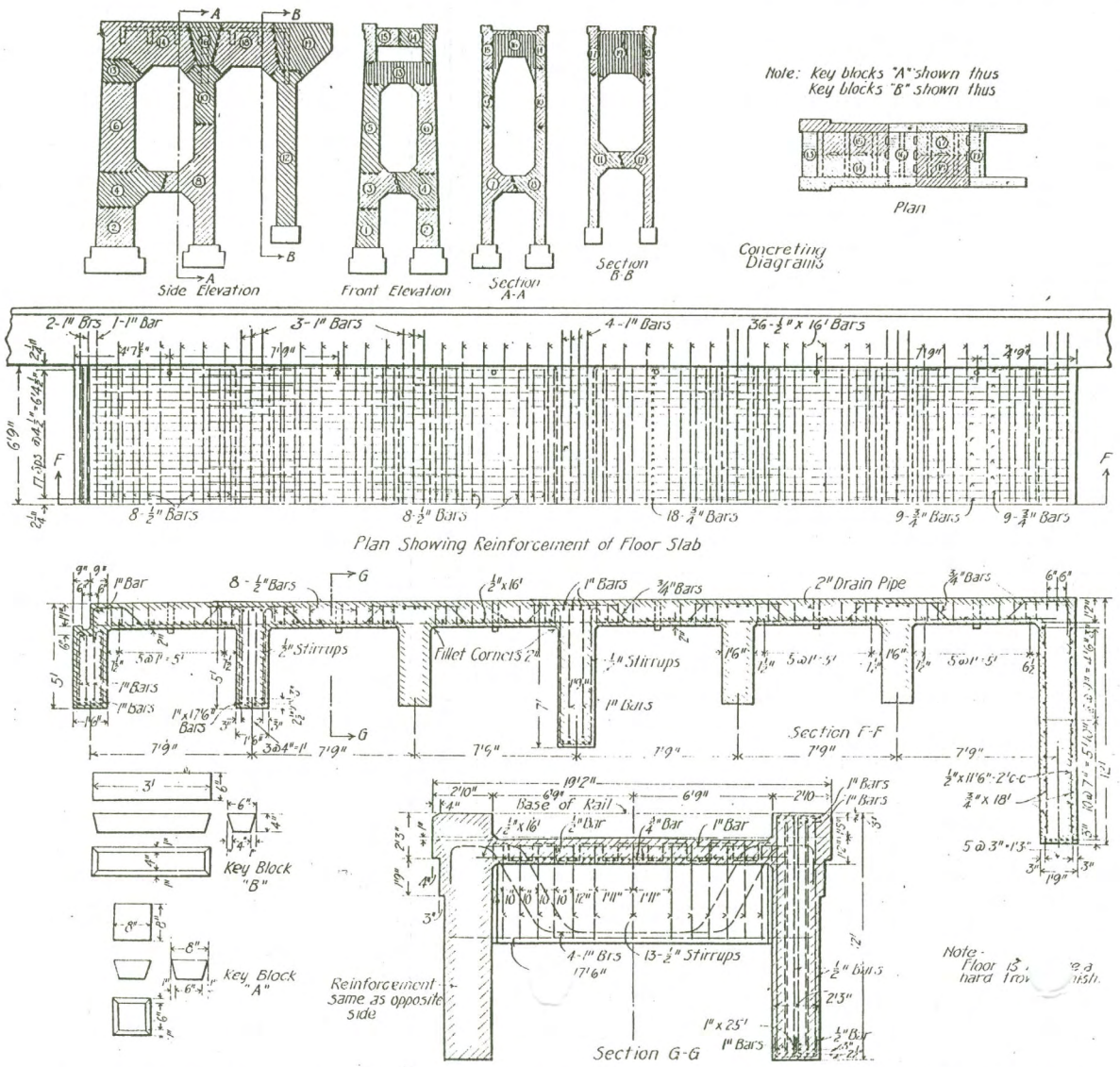

Fig. 26—Concreting Diagrams and Details of Design of East Abutment of Judith River Viaduct.

on a portable trestle, from which it was dumped directly into the forms for the near piers, and into other cars for the far piers, these secondary cars running on portable trestles consisting of timber and horses that were carried along.

The massive character of some of the abutment construction is seen in the drawings and photographic reproductions. The hight of the east abutment of the Judith River viaduct is 65 ft. above the footing course, which is 8 ft. deep. The concreting diagrams and method of bonding new deposits to set material, with key blocks, are shown in Fig. 26. Some of the runs amounted to 118 cu. yds. of concrete, deposited in one day, the average being about 80 cu. yds. per 10-hour day.

There are several reinforced concrete single and double-arch culverts, in spans up to 16 ft. Work in progress on the one at 12-Mile coulee is shown in Fig. 31. This culvert is under a fill 102 ft. high, and, owing to its great length, and to expedite the work and save in form lumber, it was built in sections, with portable forms pushed to position on rollers. In setting up, the forms for the arch section, both inside and outside, were wedged up to proper hight and bulkheads were quickly bolted on. As soon as the concrete deposited for one of the sections had set sufficiently the forms were let down and run ahead to a new position. The concrete mixer was worked in one position, with dump car and tram track, from which the material was chuted into the forms.

We should not omit to mention that this work of construction has been done by the railway company's own forces, the bridge work being under the immediate supervision of Mr. F. J. Herlihy, assistant engineer. Generally speaking, the work has progressed at full speed the whole length of the line, and regardless of weather conditions. In grading for the roadbed, also, the work was kept going, and only in shallow cuts where the ground froze solid to sub-grade was the team work stopped for cold weather. The excavation for the culverts, except the trenches, was done with teams and slips. At the west abutment of the Belt Creek viaduct, at the point indicated by the arrow in Fig. 29, a quantity of about 5000 cu. yds. of loose rock had to be shot off, to remove possibility of future trouble by falling rock.

The method of concreting steadily during the past winter, not shutting down, even when the temperature was well below zero, Fahrenheit, is interesting. This continuity of the work was made possible by steam-heating the gravel and water. For heating the gravel steam boxes or troughs, made of 3x12-in. plank, in 16-ft. sections, were used. These were laid down 4 ft. apart and parallel, and through the top of each box ⅜-in. holes were bored, 24 ins. c. to c., and staggered.

On short hauls the gravel was brought to the mixer piles with Fresnos and teams, and on long hauls with dump wagons, which were loaded under traps with Fresnos and teams, with some storage capacity on the traps. In either case the gravel at the mixer pile was dumped directly on or over the steam boxes, in a big heap. Steam was piped into the boxes, and after about 48 hours the pile was thoroughly heated up—the material sometimes being too hot for the men to handle comfortably. At night a tarpaulin would be thrown over the pile, to prevent escape of the heat. The water tanks at the mixers had a capacity of 12 bbls. each, and by steam pipes led directly into the tanks the water was made boiling hot.

After the concrete had been deposited in the forms it was sometimes the practice, in very cold

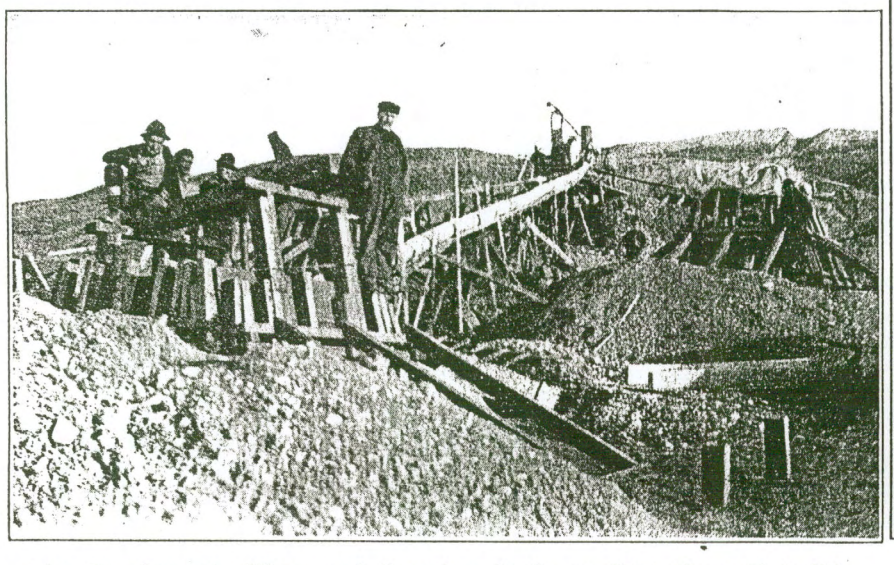

Fig. 23—Concrete Mixer and Spouting Outfit on East Slope of Judith River Viaduct.

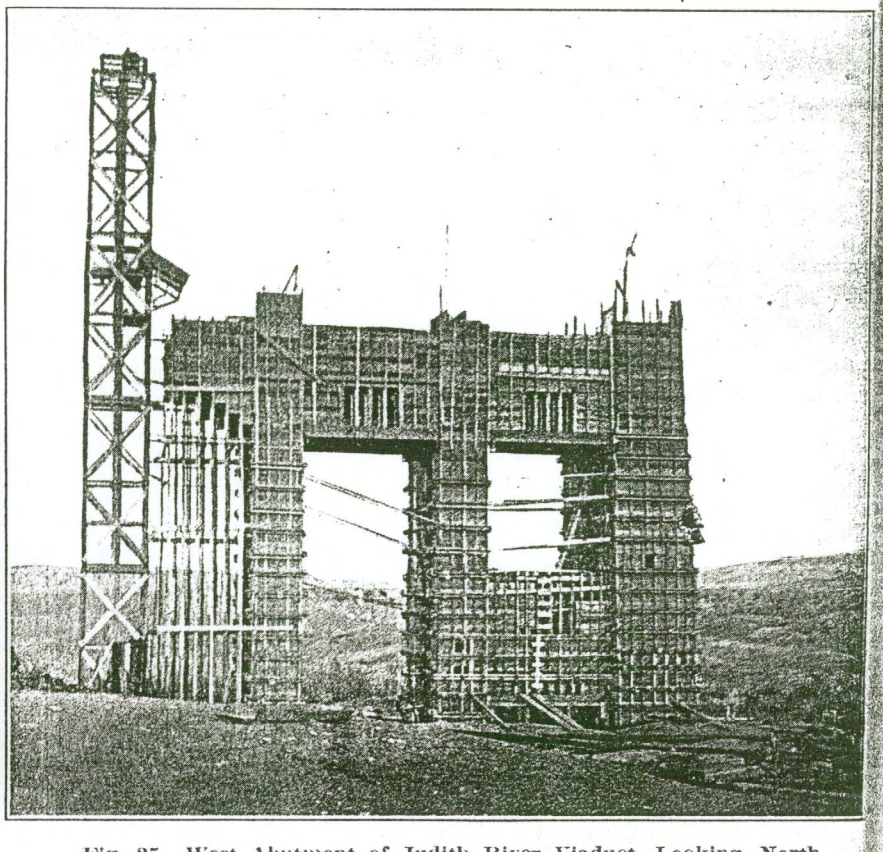

Fig. 25—West Abutment of Judith River Viaduct, Looking North.

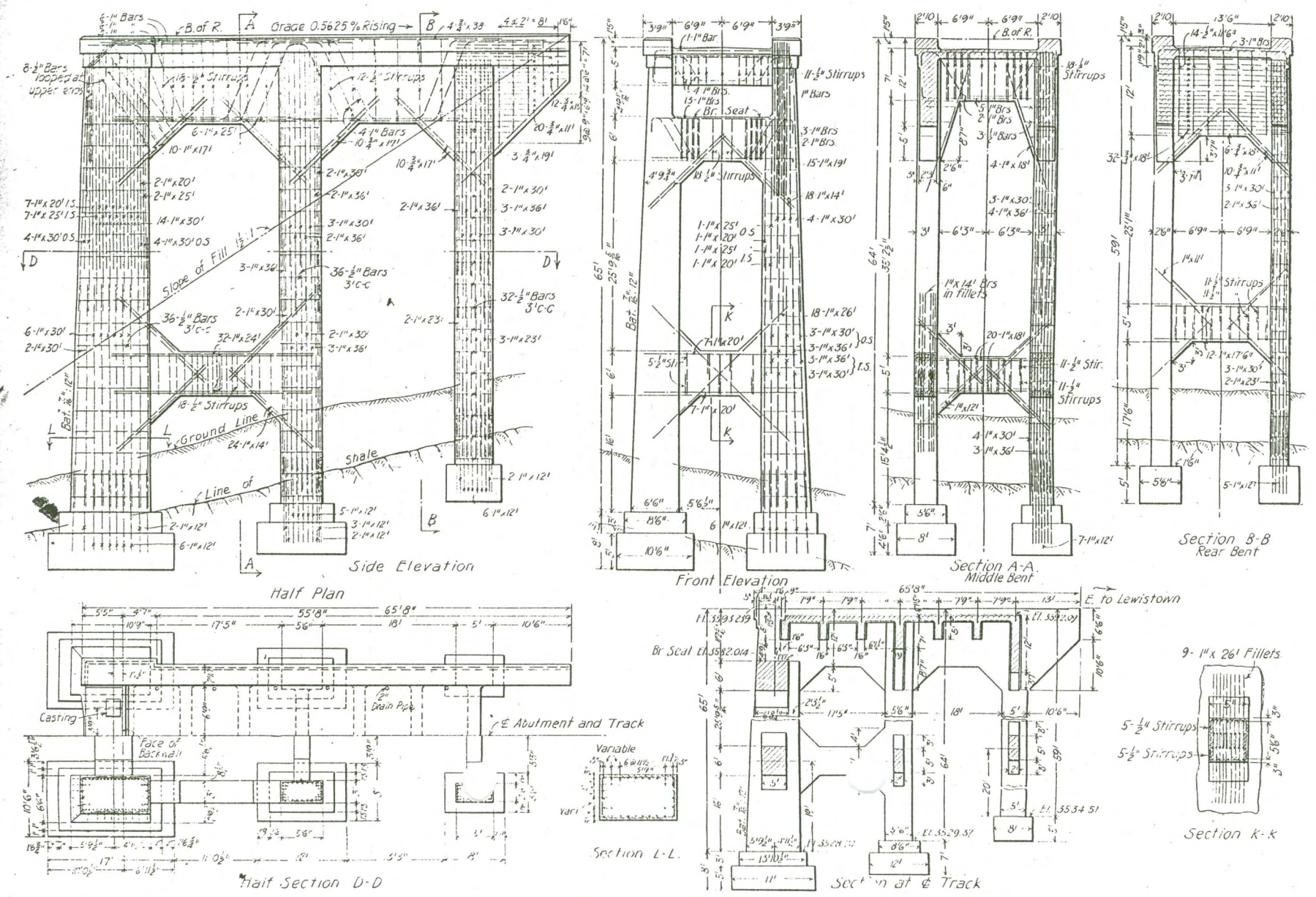

Fig. 27—Details of Design of East Abutment of Judith River Viaduct.

weather, to pack wheat straw about the forms, a foot thick, with an occasional board nailed on to keep the straw from being blown away. In massive work the concrete was sometimes found to be still warm after standing as long as four days in the coldest weather. All forms were left on the material four weeks. The additional cost for heating the materials and protecting the concrete, in the manner explained, was found to be about 60 cents per cubic yard.

In order to carry on the extensive operations herein described, and widely distributed over a large territory, a good deal of heavy teaming was necessary, and this constituted an interesting feature of the work. A typical outfit is seen in Fig. 32. Here there were six two-horse or two-mule teams (12 animals) hauling a load of 20,000 lbs. of reinforcing bars, on a 25-mile trip. On this particular job the teams were loaded out one day, returning empty the next. The multiple teams were massed on two or three wagons, and the loads were usually figured at 1000 lbs. of load per horse. Up steep hills the loads were handled by their own teams by dropping the trail wagon or wagons and doubling. In the case of some of the heaviest loads, or where the hauling was bad, as many as 20 horses, driven by jerk line, were hitched in one team. The summer season of 1912, being very wet, there was serious difficulty in hauling over some of the gumbo roads. At one time 250 head of horses, in teams of four to twenty, were employed hauling material from Twohy's spur.

Traction engines were also used in hauling out material. In such cases each engine pulled two Buffalo-Pitts 20-ton-capacity wagons. On two such wagons the load was usually 75,000 lbs. In making the hills one of the trails was dropped and one wagon was hauled up at a time, as in the practice with the animal teams.

The large amount of teaming may be inferred somewhat from the quantities of material used, which included 1½ million feet, B. M., of form lumber, 7400 tons of cement, 935 tons of reinforcing bars, 700 tons of tools and hardware, and 815 tons of coal. The hauling of material used between Lewistown and Sage Creek was from Twohy's spur, on the C. M. & St. P. Ry., 2½ miles east of Glengary. The distances over which hauling was done from this point varied from 9 miles, at the 12-Mile culvert, to 22 miles at the Sage Creek viaduct. The hauling for the structures at Whittemore, Box Elder, Rogers No. 1 and Rogers No. 2, was from Swift, on the Billings & Northern line (Great Northern Ry.). Here the length of haul varied from 5 to 8 miles. The hauling for the structures at Belt Creek, Red Coulee and at Mile Post 113 was from Wayne, on the same road, and the distances varied from 9 to 14 miles. All hauling was done over roads constructed by the railway company.

Hardly less of an undertaking was the task of forwarding steam shovels to various points along the route. These were sent out under their own steam, by laying down ties and rails ahead, teams being used to transfer the track materials from rear to front. By this method of transportation the shovels averaged about a mile a day, although in one case a shovel traveled four miles in one day by picking up its track and laying down ahead. In this manner one of the steam shovels was transported a distance of 25 miles.

Report on the Stamford Wreck.

The Interstate Commerce Commission has returned a report on its investigation of the wreck on the New York, New Haven & Hartford R. R., at Stamford, Conn., on June 2, 1913. In relating this matter briefly in these columns last week we summarized the verdict of the commission in characterizing as negligent the action of the road in placing an inexperienced engineman in charge of the train, and quoted the general conclusions of the report. A considerable part of the report is made up of a discussion of the condition of the brakes and mechanical equipment of the train and the evidence disclosed by the investigation in this respect. Following this the report recites the fact that Clinton L. Bardo, general manager of the railroad, stated that when he came with the property, Feb. 15, 1913, "the forces were in many respects disorganized; the train service was bad, and things generally were out of gear." Mr. Bardo at once took up with employees and with division superintendents safety conditions and the question of safety in train operation; and on the Monday before this accident he had a conference with the general committee of enginemen and "discussed practically that whole afternoon the whole question of safety, in an effort to find what had crept into our engineers and some of our forces employed on trains." While describing slack conditions generally, Mr. Bardo deprecated, quoting now the report, "'this milk-and-water investigation that we get' and 'the newspaper articles which have been published in connection with this investigation,' and sought by general reference to organizations of employees to palliate conditions and to relieve the management from its responsibility for existing conditions."

Continuing, we quote the report:

As to the effort to place blame for this accident upon the enginemen's working agreement with this railroad, attention is called to the rules laid down in that agreement:

"Rule 1 of article 9: Spare engineers shall be run first in and first out so far as it is possible with the requirements of the service, and when engineers are assigned to temporary vacancies they

shall remain on same, provided they are competent, until the regular engineer returns. They shall receive rates of regular engineers while on the road.

"Rule 1, as amended, exception C: No engineer who has less than one year's roster rating as an engineer shall be allowed to run through passenger trains."

This rule has two plain and definite exceptions:

(1) "So far as it is possible with the requirements of the service," and

(2) "Provided they are competent."

Primarily the determination of (1) "the requirements of the service" and (2) "competency" of engineers is for the management of the railroad. The most important requirement of the service is the safety requirement. In this case it is shown that no reliable or effective system was in operation for the determination of the safety requirements of the service in the selection of an engineman for a particular service or for the determination of the competency of an engineman when he was first given a high-speed passenger train.

The neglect of precautions for safety was here a neglect upon points which the enginemen's agreement left open to the management. The mere absence of demerit marks while in freight service was considered a good record, sufficiently determined, to justify employment on fast passenger trains, a class of service requiring the highest degree of qualification. No determination of special qualification for higher grade of service was made.

The agreement with the enginemen in no manner restricts examination or competency tests on the part of the management. The absence of all competency tests of this engineman is a matter for which the management is solely responsible.

His good judgment in bringing an express passenger train to a stop ought not to have been tried out at the risk of passengers' lives. When, in handling a first-class passenger train, this engineman on his first trip went by a station and reported that it was due to the brakes being no good, it is strange that no one in authority then saw any necessity for a test, either of the man or the brakes, before he was again sent out in the same line of service.

The general manager, however, reached the conclusion that "there was no suspicion that he was not in all respects capable" when this engineman was assigned to this high-class train. This conclusion was in no respect justified by the facts. Even though Dougherty's work in other grades of service was satisfactory, the absence of any supervision or tests for a work in which his failure was so complete and disastrous can not be evaded by the officials of this railroad. The safety of the public requires that these officials shall take all reasonable precautions by test and supervision to know that such men have the positive qualifications of good judgment and knowledge of their duty. Other railroads have rules providing safeguards in this respect, as was shown by the testimony of the railroad experts.

The general manager said that the judgment of the engineman "was bad, unjustifiably bad;" and after describing his version of Dougherty's handling of this train, he said: "I can not conceive of any man in his right mind doing a thing of that kind." He then stated in general terms his belief that the trouble arose from the employees' organizations and the attitude of the public, and said that "it is true of the New England railroads to-day; they have not much left but their corporate identity."

No organization but that of the New York, New Haven & Hartford Railroad Co. is responsible for placing a man in charge of this locomotive without tests or supervision by traveling engineers of his qualifications and judgment for this special work. The determination of the ability, fitness, or qualifications of an engineman is the duty of the railroad itself. It was not delegated to any other organization, nor could it be so delegated. It was neither delegated nor performed. It was neglected. It was unwarrantably assumed that a man at the head of the list of spare enginemen was qualified, without any special consideration of the character of the service in which he had experience.

Something is "out of gear" on a railroad where high-class trains may be given over to an uninstructed engineman. And this is true even [illegible] he is sent out on a run with the caution of his superior, "Don't let it get away from you." Here was doubt from the man who ought to know. It was Carroll's duty to know Dougherty's capacity, and if he had any doubt he, as traveling engineer, should have gone with him on the engine until all doubt was dispelled. The general tone of Carroll's warning to Dougherty as he started out on this trip is a confirmation of the general manager's statement that "the forces were in many respects disorganized."

The responsibility for having a competent man with positive qualifications at a post of duty is a corporate responsibility. The fault for placing an untested man in a position fraught with danger to life is the fault of the company and its officials. "Man failure" can only excuse the railroad and its officials where the man has been properly tested and found to possess the positive qualifications required. No automatic working of names from a list of men who may or may not have the requisite qualifications can excuse from the duty of making reasonable effort to ascertain that the man selected is qualified.

There is no evidence which raises any doubt that for the work he had previously been engaged upon Dougherty was competent, reliable, and trustworthy. His reputation and record were good. But when he was placed in charge of a new engine attached to one of the fast passenger trains, some one in authority signally failed in duty in entrusting such an engine and train to his charge without any test of his capacity for this grave responsibility. It seems hard to realize that no practical tests were applied to such a situation on this railroad, and that there was no supervision by traveling engineers over an engineman called upon for the first time to take up a class of work calling for the highest qualifications.

This investigation discloses that there was no rule upon this subject. Mr. Bardo stated that he presumed it was a rule; that he didn't know until this investigation that it was not a hard-and-fast rule; that the rule was made by the previous general manager; that the responsibility for rules of that kind is finally with him; that he thought it was in existence in unwritten form; and when asked if he intended to make such a rule for the future he responded that he did.

It is but fair, however, to say of the present general manager that his connection with this railroad is recent and that his efforts in the promotion of safety during the short time he has been in

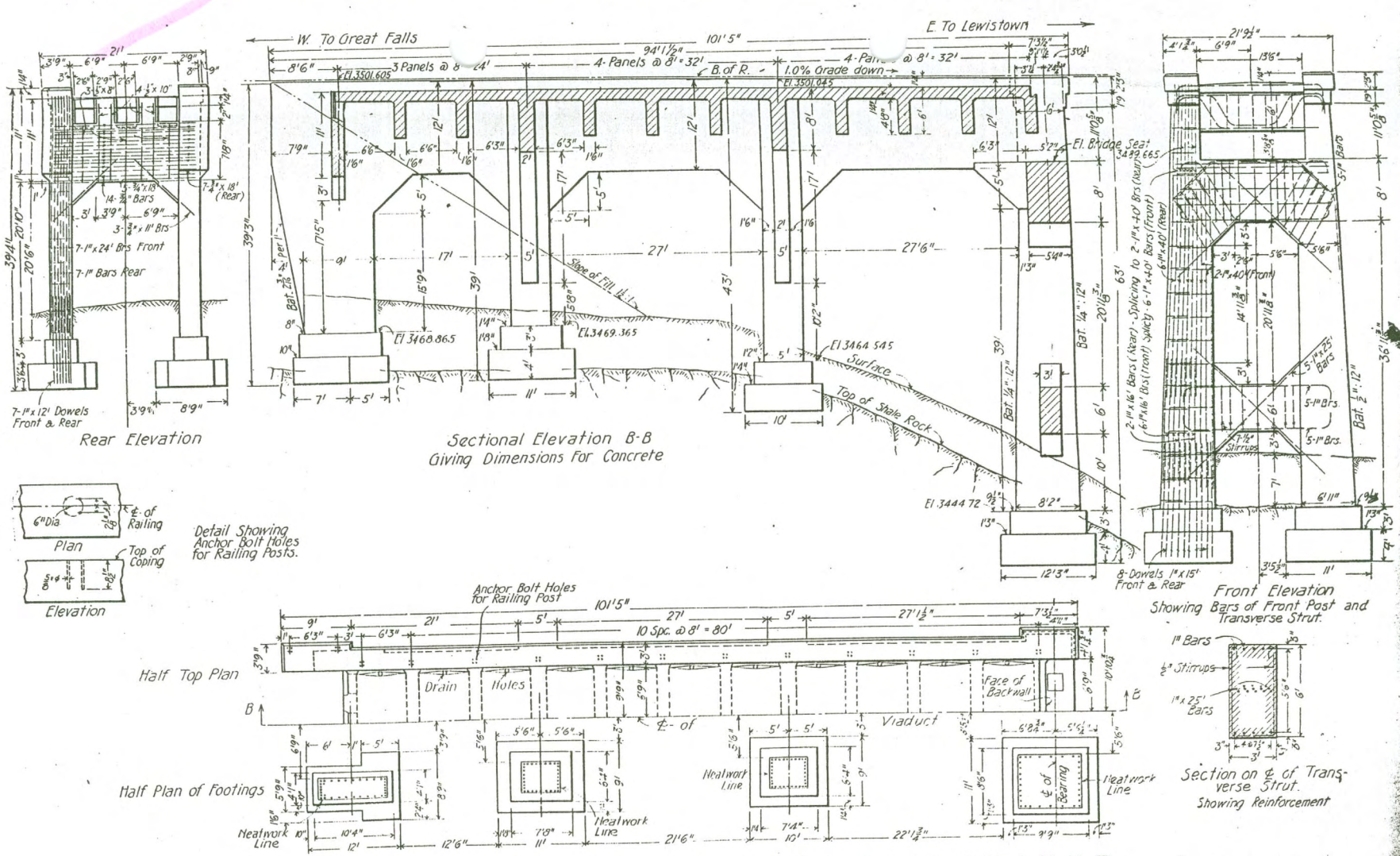

Fig. 28—Plan and Elevations of West Abutment for Sage Creek Viaduct, C. M. & St. P. Ry.

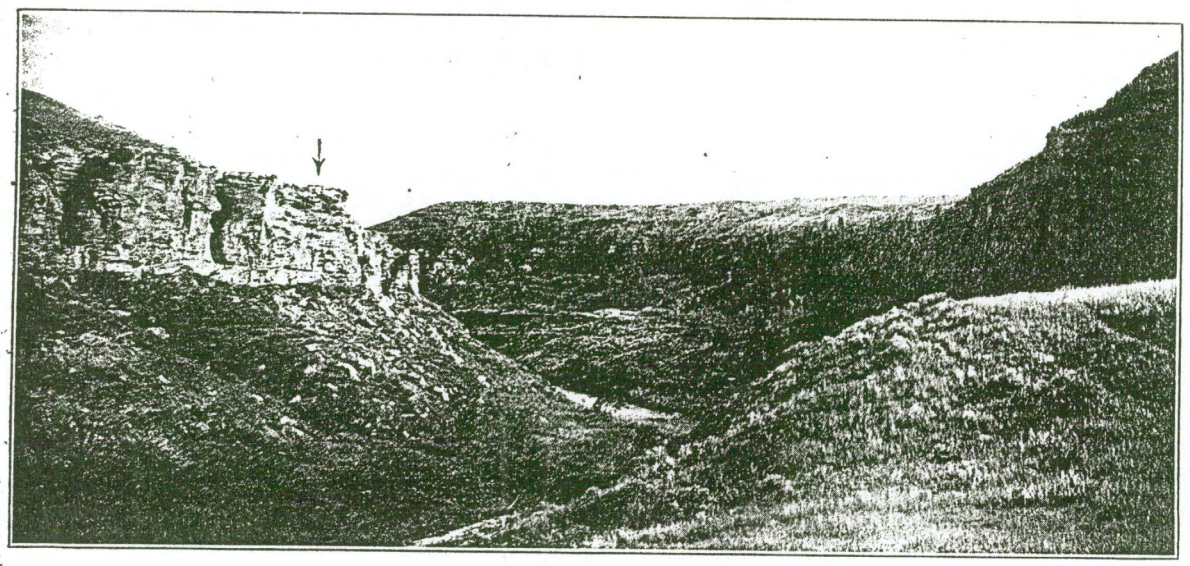

Fig. 29—Belt Creek Coulee, at Site of Viaduct, C. M. & St. P. Ry.

charge encourages the hope that he may succeed in placing it on a safer operating basis.

A. R. A. Report on Automatic Train Stops.*

Under a resolution of the executive committee, the duty of defining the essential requisites for the installation of automatic train stops and the general subject of automatic train stops was assumed by the committee on transportation and the committee on maintenance acting jointly. The joint committee held meetings in New York on March 25 and April 16, 1913. Mr. E. C. Carter was elected chairman.

The subject has been carefully considered, but requires more time for its satisfactory completion. The joint committee has formulated, however, certain tentative propositions, which are herewith presented. It asks that these propositions be criticised and discussed by the association for the benefit of the joint committee, and then referred back to the joint committee for further consideration and report. Pending the final consideration of the subject, it is recommended that in any experimental installation of such devices these requisites of installation be adhered to, in order to develop their advantages or deficiencies. These suggestions are as follows:

Definitions.

Automatic Stop.—An apparatus for stopping trains by a device actuated from outside the train.

Cab Signal.—A signal located in the engine cab indicating a condition affecting the movement of the train.

Trip.—The bar, lever, or other device, fixed along the roadway, which, when in a certain position, actuates the apparatus on the train, by which an application of the brakes is effected.

Requisites of Installation.

1. The apparatus so constructed that the failure or displacement of any essential part
   (a) along the roadway will cause the display of the "stop" indication by the fixed signal and also the application of the brakes.
   (b) on the train will cause the application of the brakes.

2. The apparatus so constructed that proper operative relation between those parts along the roadway and those on the train will be assured under all conditions of speed, weather, wear, oscillation and shock.

3. The train apparatus so constructed as to prevent the release of the brakes after automatic application has been made until the train has been brought to a stop or the speed of the train has been reduced to a predetermined rate.

4. The apparatus so constructed that a train may pass an automatic stop in the tripping position without brakes being applied, provided the train speed is less than a predetermined rate and the fixed signal indicates proceed.

5. The apparatus so constructed that when actuated it will first make a service application of the brakes, then if the engineman does not perform certain predetermined operations it shall go to emergency application.

6. The trip shall be located at such a distance from the home signal that any train can be brought to a stop by the application of the brakes before it reaches the home signal.

7. The apparatus so constructed as not to interfere with the application of the brakes by the engineman's brake valve.

8. The apparatus so constructed as to be operative when the engine is running forward or backward.

9. The apparatus so constructed that when two or more engines are coupled together or a pusher is being used the apparatus can be made effective on the engine only from which the brakes are controlled.

10. The apparatus so constructed as to be operative on trains moving only with the current of traffic.

11. The apparatus so constructed that the control through the ordinary means used for giving the fixed signal indications.

Note.—When track circuit is used it should be so designed as to be non-inductive.

12. The apparatus so constructed as to conform to The American Railway Association standard of clearances of rolling equipment and structures.

13. The apparatus so constructed and installed as not to constitute a source of danger to employees, or passengers.

Adjuncts.

The following may be used:

(A) Cab Signal; to be located in front of the engineman and at the same time visible to the fireman, and to be so constructed

(1) that the failure of any part directly controlling the signal will cause it to display the "stop" indication.

(2) that when no cause for stopping the train exists a definite "proceed" indication will be given at every point where a "stop" indication would be given if the automatic stop had been set to apply the brakes; or it will display indications continuously in districts of congested traffic.

(B) Recording Device; so constructed as to make a record of the number of times the automatic stop has operated the brakes.

(C) Speed Indicator.

Mr. Delano: Mr. President, before that motion is put, the suggestion has been made to me, and I think it might be well to call the attention of the joint committee to it before we get this word "automatic" stop adopted: "Automatic stop" ought to mean something that will work from the train, it seems to me, and not from without. One other point, and Mr. Nixon called my attention to this: Is it possible with the air brake at present to make a service stop and then immediately make an emergency stop?

The President: Have we some air brake expert here who can answer that question?

Mr. Carter: I will ask Mr. Crawford to answer the question for the committee.

Mr. Crawford: Yes, sir; it is possible, particularly with the later designs of air brakes.

The President: I think, Mr. Delano, that was your question?

Mr. Delano: Yes, that was the question. It must be something very late, then.

Mr. Peck: It would be important to understand what is included in the device we are talking about.

Mr. Carter: Well, that is the great difficulty that the committee labors under. There is, as yet, so far as we know, no completed device which would meet all of the requirements which are indicated under the "requisites of installation." It was considered by the members of the committee that it was desirable that each of these points should be covered, if it was possible to do it. Further study of the question will necessarily develop, in connection with any particular system, the relations that must exist between the different elements of a system—those on the train and those on the ground and those connected with the block signal system.

Mr. Schoyer: Mr. Chairman, I would suggest, as a member of that committee, if any of the members of the association have a suggestion to make in regard to this matter, which is entirely new, that they will forward it to the general secretary, to be submitted to the committee, and that will greatly help in the consideration of the subject.

Mr. Carter: Mr. President, I wish to supplement that by an earnest request that the members who are studying this question will kindly forward any criticisms and any suggestions that they may have. It is a comparatively new subject. The devices have none of them been developed so as to cover all of those elements which would be necessary for the final safe operation of trains. It is a question whether it is possible that such a device can be gotten up that would be practicable, so that we would be very much pleased if the members would forward all of the suggestions that they may have on this question.

*Presented at the spring meeting of the American Railway Association, discussed and referred back to the joint committee for further consideration and report.

Through Routes Ordered Among Interurban Lines.

In a case in which the Louisville Board of Trade was the complainant, the Interstate Commerce Commission has ordered the establishment of through routes and joint rates over interurban electric railways between Louisville, Ky., and points in Indiana,

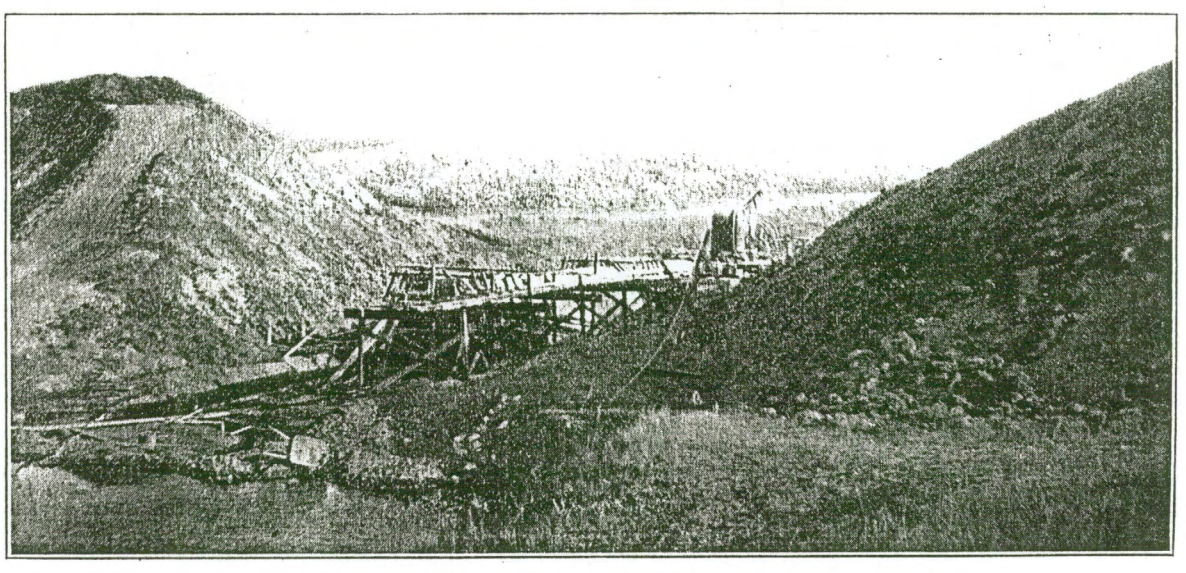

Fig. 30—Construction of 16-ft. Arch Culvert at Squaw Coulee.

including Indianapolis. The commission holds that a reasonable necessity for these rates was shown. The principal defendant was the Indianapolis, Columbus & Southern Traction Co. The report of the commission, which was written by Commissioner Harlan, reads in part, as follows:

The reported decisions of this commission embrace many cases in which relief was asked at our hand because the carriers themselves had failed or for some reason had refused to "establish through routes and just and reasonable rates applicable thereto" in accordance with the general mandate of section 1 of the act. In some of these proceedings all the parties in interests were steam railroad companies; in others the proposed routes comprised boat lines as well as steam railroads; and in several cases electric railroads have sought through routes in connection with steam railroads. In one case at least a through route has been established by the commission over an electric railway operating in connection with a boat line. This is the first case of that character involving only electrically operated railways, or what is familiarly known as interurban lines. The objections interposed by the principal defendants to the granting of the prayer of the complaint are novel, but the principles decisive of the issues raised are well established.

From Louisville, on the south bank of the Ohio river in the state of Kentucky, to Indianapolis, in the state of Indiana, the direct standard steam railroad of the Pennsylvania lines is paralleled through its entire distance of about 117 miles by a physical through route composed of the following traction or interurban electric railways: The Louisville & Southern Indiana Traction Co. operates across the river between Louisville and Jeffersonville, a distance of 3 miles. At the latter point it connects with the Louisville & Northern Railway & Lighting Co., the lines of which extend a distance of 11 miles to Sellersburg; from this point the lines of the Indianapolis & Louisville Traction Co. extend some 41 miles to Seymour, where they connect with the Indianapolis, Columbus & Southern Traction Co. The rails of that line extend from Seymour to Indianapolis, a distance of 61 miles. The last named line is now operated by the Interstate Public Service Co. under a 999-year lease. The latter company, together with the two lines first above mentioned that form the route running northward out of Louisville to Sellersburg, are owned or controlled by the Middle West Utilities Co., which seems to be a holding company embracing many lines of traction railway in the state of Indiana and elsewhere that are commonly referred to as the Insull lines. The Indianapolis & Louisville Traction Ry. Co. from Sellersburg to Seymour, however, is a wholly independent company. In other words, the two lines running north out of Louisville and the line extending south from Indianapolis are under a common control, while the connecting link between them is independently owned, a fact that will be referred to more fully hereafter.

From the city of Indianapolis a great network of interurban lines extends in every direction, with an aggregate, as is said, of nearly 2000 miles of track, reaching practically all the western, northern, and eastern portion of Indiana, as well as southern Michigan and western Ohio. Some twenty of these companies, with lines in the states of Indiana and Ohio, are named as co-defendants herein. All of them, including the lines from Louisville to Indianapolis, while primarily carriers of passengers, also participate in varying degrees of activity in the handling of less-than-carload freight business; and many, if not all, of them have tariffs on file with this commission naming their local freight or express rates and in some cases showing also joint rates with connecting electric lines.

The Louisville commercial interests in this proceeding ask for an order establishing through routes for less-than-carload traffic to points north of Seymour, and more particularly to Indianapolis and interurban railway points reached through Indianapolis. Over such through routes, when established, they ask for joint rates that shall not exceed the present rates of the steam railways on the same articles to the same points. In this connection it may be noted here that the local rates of the various defendants now in effect are in a general way the same as the rates of the competing steam roads between the same points.

The complainants frankly admit that almost every point of commercial importance in this territory may be reached from Louisville over the existing routes of the steam railroads. But their demand for relief is based upon the fact that the service of the interurban lines is or would be more expeditious, enabling the package shipments of the complainants to reach their destination with greater dispatch. They contend that the traction lines can deliver less-than-carload freight at points in this territory in from two to six days less time than is taken by the steam railroads. Closely related to that important reason for asking such relief is the further contention that the usefulness of the proposed through routes to the complainants will be greatly impaired if the rates shall exceed those of the steam carriers. This is not controverted by the defendants but on the contrary is distinctly conceded.

The testimony of jobbers, merchants, and manufacturers at Louisville indicates that in the sale of their merchandise at local points in Indiana and western Ohio, where they meet the competition of Indianapolis, the need of a package freight service over the through routes here demanded is keenly felt; and that Indianapolis, with such an expeditious and efficient service at its command and with such routes in effect, over which the rates are the same as or less than the freight rates of the steam railroads, has a distinct advantage in soliciting the business of retailers and consumers in that territory. The testimony also fairly establsihes the contention of the complainants that a schedule of express rates for this service, as distinguished from freight rates, would practically prevent the use of the proposed through routes. It is shown also, as indicated above, that in proportion as the rates over these routes may exceed the rates of the steam roads the value of the routes will be reduced.

The lines beyond Indianapolis took no active part in the hearing, and, so far as their position is developed of record, they seem not to be opposed to the establishment of through routes if they are allowed a satisfactory division out of the rates. Some of them ask for their full locals.

Of the four lines south of Indianapolis, only the Indianapolis & Louisville Traction Ry. Co., which, as heretofore stated, is independent of the "Insull interests," desires the opening of the through routes. It also asks that the divisions be fixed. It, indeed, goes further. It charges its connections on either side with the desire of so embarrassing it, by limiting its earnings and otherwise, as to bring about conditions that will enable the Insull interests to acquire the ownership of its railway. It shows that the territory through which it runs from Sellersburg to Seymour is more sparsely settled than the territory of the lines north and south of it; and that as a consequence its passenger traffic is light as compared with that of its connections on either side. It is therefore naturally to the interest of the Indianapolis & Louisville to develop as heavy a freight movement as possible, and with that end in view through routes to Indianapolis and joint rates with its connections are very earnestly demanded by it.

The Insull lines, on the other hand, are against the granting of the prayer of the complaint because they do not care to develop a through freight business. But their attitude is not altogether free from ambiguity. On the brief they express a willingness, "to join in a through route and joint rates from Louisville to Indianapolis and intermediate points, provided they receive their full locals and are allowed to haul the freight in the cars now operated by them, but are unwilling to join in through routes to points beyond Indianapolis."

This may be read as a partial acquiscence in the prayer of the complaint, but it seems later to be explained away by the statement that the

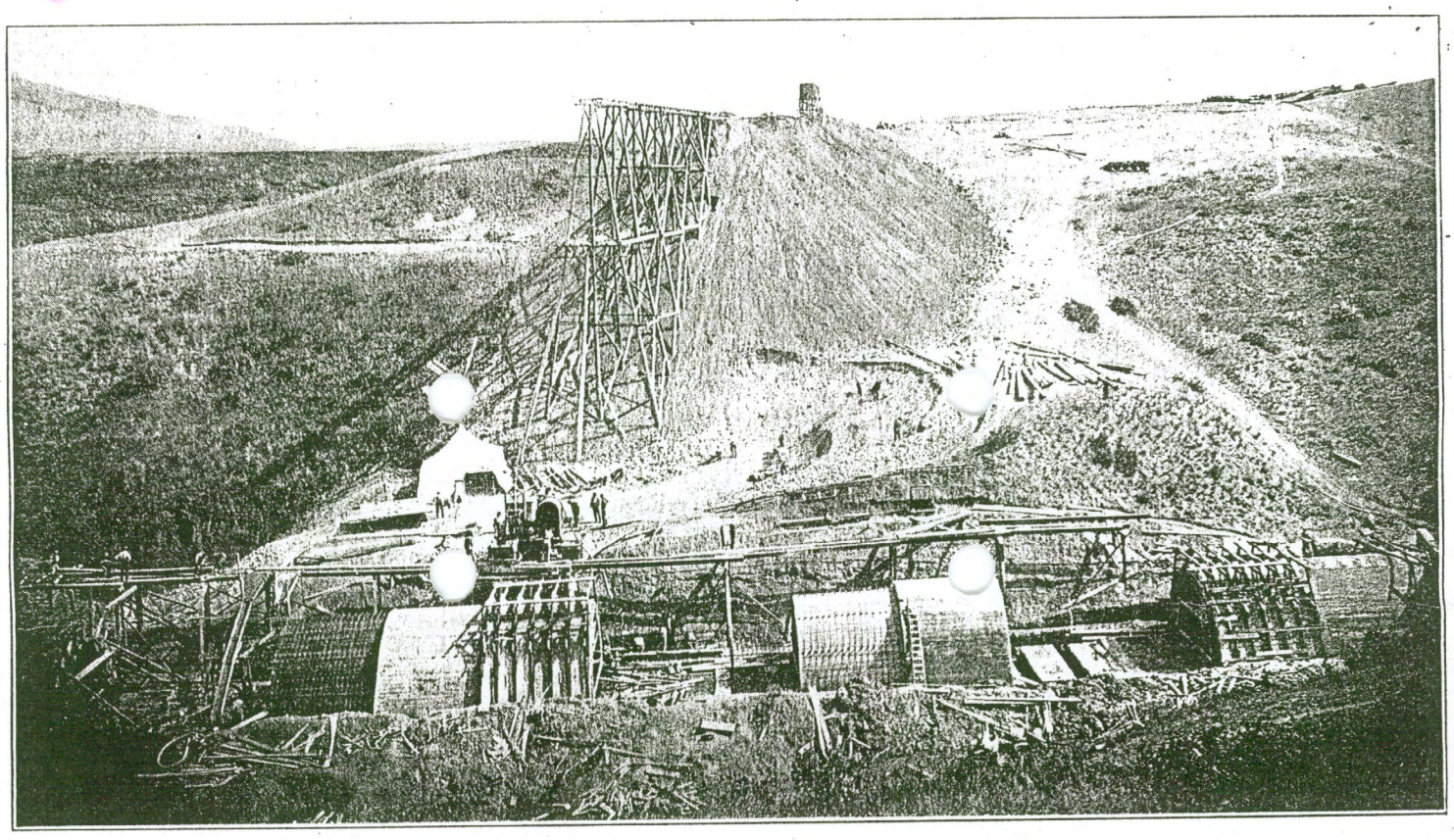

Fig. 31—Progress View of Construction of Culvert at 12-Mile Coulee.

officials of those lines do not believe that joint rates, equivalent to the sum of the locals, would develop a substantial traffic in competition with the service rendered by the Pennsylvania at lower rates.

The various objections of the principal defendants, as gathered from the pleadings, testimony, and argument, * * * may be summarized in the general statement that the points involved are said to be reasonably well served from a freight standpoint by the steam roads, which enter practically all the points of destination in question; that the facilities are or would be inadequate for an additional freight service; and that the development of an additional freight traffic, as the result of the establishment of through routes and joint rates, would seriously impede the passenger service for which these lines were primarily built and would impair its value to their passengers.

Upon the record we find that there is neither impossibility nor impracticability in the situation before us. Physical through routes already exist and are in actual use. The four defendants operating the route between Louisville and Indianapolis now conduct a through passenger service on six limited trains, running daily in each direction, for which through tickets are sold. The northern link in the route conducts a local package freight service between Indianapolis and Seymour. The three lines forming the other three links in the route not only conduct a local freight service over their respective rails but join in through rates from Louisville as far north as Seymour. For a short time in 1908 there were joint through class rates in effect all the way from Louisville or from New Albany, just across the river, to Indianapolis. They were canceled at the instance of the Indianapolis, Columbus & Southern, and it is this company that objects to their restoration. Traffic now moves between Seymour and Indianapolis, a one-line haul, and moves on through rates between Seymour and Louisville, a three-line haul. Certain perishable freight, such as berries, moves all the way from Jeffersonville to Indianapolis on joint through rates. All that is necessary to satisfy this complaint with respect to general traffic is the withdrawal by that line of its insistence upon a transfer of traffic at Seymour. As a matter of fact, the lines north of Indianapolis apparently stand ready to participate in through movements from Louisville. Shall the principal defendants be allowed to prevent the establishment of through routes into that territory as well as to Indianapolis?

Upon consideration of the whole record we think the complainants have established their case, and that they are entitled to the benefit of through routes on package freight both to Indianapolis and to the territory beyond. It is true, as is conceded by the complainants, that most of the points named on the record are already served from Louisville over the steam lines; nevertheless a reasonable necessity for these additional through routes over the lines of the defendants is clearly shown by the record. Besides affording the additional service and reaching some points not reached directly by the steam lines, it is shown that the service over the defendant lines will be superior in regularity and despatch. The fact that some slight additions to their equipment will be required for the through service is not of importance and is certainly not a valid ground upon which we may decline the relief sought. These companies are common carriers and are engaged in interstate traffic; it is therefore their duty, under express and affirmative provisions in the act, to provide cars and all other reasonable facilities necessary properly to serve the public."

The Living Wage and the Living Rate.*

Recently certain railway men petitioned the Interstate Commerce Commission to be allowed to raise rates. It is announced that the Interstate Commerce Commission is to look into the case. This makes it opportune to say a word or two on the subject; for the ability of the honestly managed railways of the country to render good service to the public and pay good wages to their employees ultimately depends upon there being a reasonable return to the honest investors, which means that the railways must possess a good earning power, which largely depends on the rates. The very big investor, like the very big shipper and the very high grade wage-worker, can usually get along somehow even under adverse conditions; but for the sake of the small or ordinary investor there is need of a living rate just as there is need of a living wage for the average workingman. The living wage and the living rate are interdependent.

There are railroads which have been so foolishly or so corruptly organized and managed that it is impossible for investors in them to get adequate return for their investments; just as it would be impossible for them to do if they had acted foolishly, or had been the victims of swindling, in connection with a dry goods store, or any other business enterprise. The public must not be expected to sacrifice its own interests and the interests of wage-workers in order to pay dividends on watered stock, or to secure promoters and managers against the consequences of their own folly. What I have to say does not concern railways of this stamp.

But it must be a cardinal principle in dealing with honestly built and wisely managed railways that the investor, the shareholder, is just as much entitled to protection as is the wage-worker, the shipper, or the representatives of the general public. Unless the investor finds that he is to get a fair return on his money, he will not invest, and in such case not only will no new railways be built but existing railways will not be able to repair the waste, the wear and tear, to which they are subject, and will not be able to make needed improvements. All governmental action, whether by the legislature or the executive, should be conditioned upon keeping in view this fact.

By actual experience it has been found that it is unsafe to leave the wage-worker, the shipper, and the general public, and furthermore, that it is unsafe to leave the small investor himself at the mercy of the big men who manage railways. But on certain points the interests are identical. On certain other points the interests of both of them are identical with those of the wage-worker. On all points the only way of securing permanent justice to each class is by giving permanent justice to all classes. The public can be well served, and the wage-workers can be well paid, only if the railway is successful, that is, if there is such certainty of reasonable dividends as to make investors content, and therefore willing and desirous to invest in further developments and enterprises.

This is a sufficiently obvious fact, but it is a fact often in practice forgotten. In certain cases workmen's compensation laws and full crew bills are passed by legislatures at the same time that rates are reduced by commissions, or indeed sometimes by legislative enactment, until the property ceases to pay. Now a cardinal point made by all enlightened advocates of such laws as workmen's compensation and the like has always been that the burden is to be distributed through the corporation upon the public. Public Service Commissions are created for the very purpose of supervising, controlling, and regulating the activities of the railways so that they shall not only be obliged to treat their employees, the shareholders, and the general public fairly, but shall be guaranteed fair treatment themselves in return. Some railways are so remunerative that it is fair to reduce their rates at the same time that we increase their burdens. There are other railways as to which the only effective way to distribute the burden of payment for extra safety to employees and the public, and extra compensation to and care of the workers, is by rendering the service more remunerative; and this may of necessity mean raising rates. It is just as much the duty of the commission to permit rates to be raised when the raise is justifiable as to require them to be lowered if the lowering is justifiable. The commission is created precisely because this is the kind of work it can and ought to do, and the kind of work that no legislative body could with wisdom perform. The commission is no true servant of the public unless it unhesitatingly raises the rates when justice in the public interest requires such action, and unhesitatingly lowers the rates when this is the course which will ultimately best meet the public needs.

This is merely part of the general doctrine of administrative control of big corporations. The control should not be hostile to the corporation; it should merely be hostile to any misconduct on the part of the corporation, and it should protect the corporation against misconduct aimed at it exactly as it protects others from misconduct committed by it. Unless the corporation makes money —that is, unless business men are prosperous—there will be no money to give in proper wages for the wage-worker, there will be no money with which to provide for his protection and to insure him against loss and damage, and no money wherewith to render proper service to the customers and to the public as a whole. Whether the reward comes in the way of big salary to the big manager who makes the business a success, or of dividends to the big or small man who invests money in it, the principle is the same. Our purpose is to see that there is a proper division of prosperity. But there can be no division unless the prosperity is there to divide. One of the methods by which the prosperity will certainly be abolished is to draw the line against size and efficiency instead of against misconduct. Another way to destroy it is to impose burdens, however necessary and proper, without facing the fact that some one must pay for the burdens, and that if the investor cannot pay for them and at the same time get a reasonable return on his investment, then either the business will close or the public must share the burden with the investor.

In the concrete case before us it is for the commission to determine with strict justice to all parties how the relative and often conflicting demands of the shareholders, the wage-workers, the shippers, and the general public can properly be met. I am not discussing—I have not the knowledge which would warrant my discussing—whether the rates should be raised. If the facts do not warrant a raise, then the raise should not be permitted; but if justice and the interest of our people as a whole demand a raise in rates, then that raise in rates should unhesitatingly be authorized.

*By Theodore Roosevelt, in the Outlook, July 5, 1913.

Fig. 32—Typical Freighting Outfit for Forwarding Materials on Construction of Great Falls Line, C. M. & St. P. Ry.

Saskatoon, Sask., shows a commercial activity that puts it in the first rank among Canada's young northwestern cities. Its bank clearings for the first three months of 1913 were $1,500,000 greater than for the same period last year.