

United States canal was 2,151,593, and the Canadian canal, 132,214; the number of bushels of wheat passing the United States canal was 3,651,025, and the Canadian canal, 638,081. In west-bound traffic there was 43,139 net tons of hard coal passing the United States canal, and 2400 net tons passing the Canadian canal; 412,833 net tons of soft coal passing the United States canal, and 62,321 net tons passing the Canadian canal. The number of passengers through the United States canal, west-bound, was 2715, and through the Canadian canal, 1201; passengers east-bound through the United States canal, 2495 and through the Canadian canal, 1869.

### Transportation Exhibit of the United States at the Paris Exposition of 1900.

#### II.

The Pressed Steel Car Co. also occupies a small space in the Palace of Civil Engineering and Transportation in the Champs de Mars, where it shows models and photographs of its cars and photographs of its works. Printed matter is distributed and visitors are referred to the main exhibit at Vincennes.

The J. G. Brill Co., of Philadelphia, makes an elaborate display at Vincennes, consisting of a convertible summer and winter car, a sweeper, and a large number of trucks of its various types. This company has furnished large numbers of street cars for tramways in Paris as well as in other parts of Europe. It is noticeable that their trucks are also found under a number of street cars exhibited by French manufacturers. It is not the purpose of this article to describe carefully the various appliances shown, because the mechanical details are already familiar to our readers. The convertible car is very ingenious and attracts much favorable comment. The company also shows its passenger car truck for steam railways, which has been heretofore illustrated in the Review. In the Palace of Civil Engineering and Transportation it has some superb models of trucks, which aid in directing attention to the main exhibit at Vincennes. The grand prix should be of considerable value to the company in maintaining and expanding its already large foreign business.

The Baldwin Locomotive Works, having exhibited at previous expositions in Paris, and established a large foreign business before other American builders had fully awoke to the possibilities, has done much to hold its ground by the exhibit made this year and the grand prix received. It originally intended to exhibit about ten locomotives, but the tremendous pressure for delivery of engines during the past year, which prevented other builders from exhibiting at all, prevented them from sending more than three. Of these, one which was built for the

The Richmond Locomotive Works, which had retained space, was delayed so much that it has finally abandoned exhibiting, although it has the parts of one locomotive on the grounds ready for erection. The locomotive, which is for a Finland railway, did not arrive until August. Unfortunately it is of five feet gage, and hence could not be erected at any locomotive shop and then sent on its own wheels to the exposition. At so late a date it was extremely difficult to arrange for apparatus and men for doing the work on the grounds, and the engine will therefore be forwarded to its destination without being exhibited.

The Standard Steel Works has a large and important exhibit of wheels and tires in connection with

Tower coupler has only recently been designed. Vice-President E. L. Whittemore and Mr. Sam'l Louis Smith are here. It is, of course, too late to have the exhibit passed upon by the jury, but it will come under the attention of the large number of railway men attending the Congress, the latter part of this month.

Mr. E. G. Fisher, representing the American Steel and Wire Co., which has taken a large number of high awards in other classes, has just arrived after an extended European tour; and is installing an exhibit of their railway fencing and gates.

It will be noticed that we have thus far noted only the establishments which have space of their

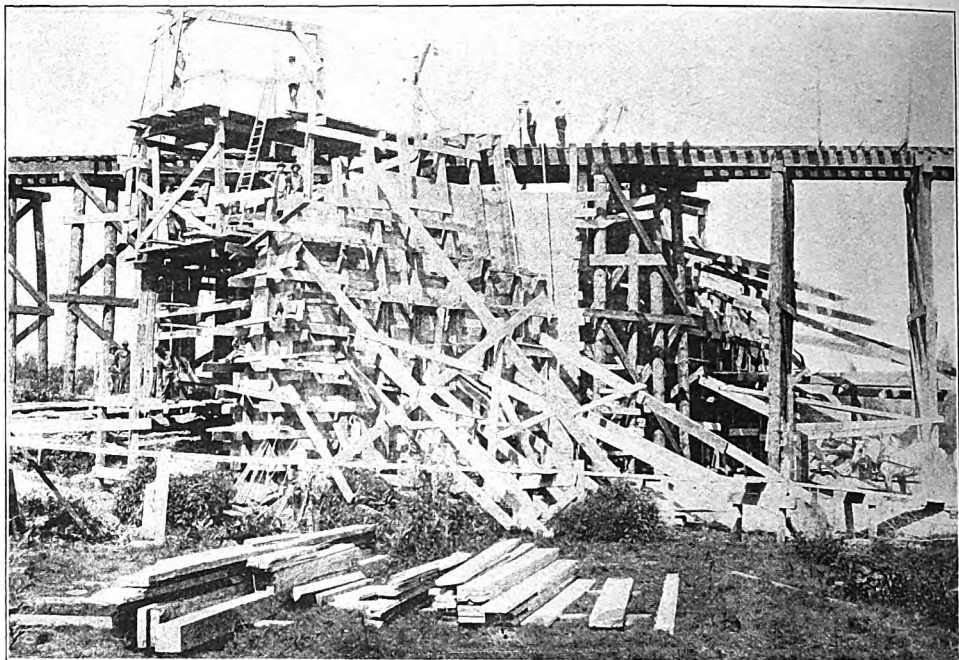


FIG. 2—FORM FOR CONSTRUCTING CONCRETE that of the Baldwin Co., for which it has received the award of a gold medal.

The Gould Coupler Co. is represented by its president, Mr. Charles Gould, who has been over here much for some years past, and is living in Paris this summer. The Gould coupler is in practical service on this side of the water, and is, of course, better known than any other American device of this nature. Large models of passenger and freight cars are shown—the former illustrating also the Gould vestibule. Full-size couplers are also exhibited and the method of application can be easily understood. Mr. Gould leaves the ordinary hook and chain in place, and applies his couplers beneath them, using steel channels running the whole

ABUTMENT, J. & S. E. RY., JANESVILLE, WIS.

own, while the list of awards shows still others. The main exhibit of the Westinghouse Air Brake Co. is in the British section and is located partly at Vincennes, where they show their fifty-car freight equipment and their train signal system; and partly at the Champs de Mars, where is shown their most recent equipment for high-speed trains. Their driver brakes on the Baldwin locomotive were entered as exhibits in the American section. On this account as well as on account of the American origin of the invention, it was early decided by the jury to give the same award to the British and American companies; which turned out to be the grand prix.

The Ashcroft steam gages, Crosby safety valves and United States metallic packing and the American locomotive sanders were parts of the Baldwin locomotives. A number of other exhibits, which were parts of the Richmond locomotives, failed to arrive in time as already stated. For this reason the American balance slide valve, the American brake, the Coale safety valves and mufflers, the Latrobe tires, the Leach sander, the National hollow brake beam, the Page, Newell & Co. steel tired wheels, and the Safety Car Heating and Lighting Co.'s gas lighting system, all of which were catalogued, failed to come before the jury.

Track appliances and materials are represented only by rail joints, tie plates, etc., which are with the engineering exhibit in the Champs de Mars. Railway technical literature is also shown in the library in the engineering section.

It may perhaps surprise some of the members of the American Railway Association, the Master Car-Builders' Association and the American Railway Master Mechanics' Association to learn that gold medals were awarded these organizations. The pound volumes of proceedings were, of course, not examined with care under the circumstances, but the high character of the work accomplished by them is known here through the American railway papers. While not considering them entitled to the grand prix (which was awarded to the American Society of Civil Engineers) the jury unanimously voted the gold medal.

[To be continued.]

A motor which, while it is of no practical value, is an exceedingly interesting exemplification of the ease with which energy may be transformed and re-transformed through the various forms of heat, electricity and motion, has been produced by an inventor in Germany. The machine is called a thermo-electric motor, and works on the familiar principle of the electric motor somewhat modified to meet the peculiar exigencies of the case. In action it is essentially an electric motor, but one deriving its electrical energy from heat applied to it through thermo-electric couples. A thermo-electric couple is composed of two dissim-

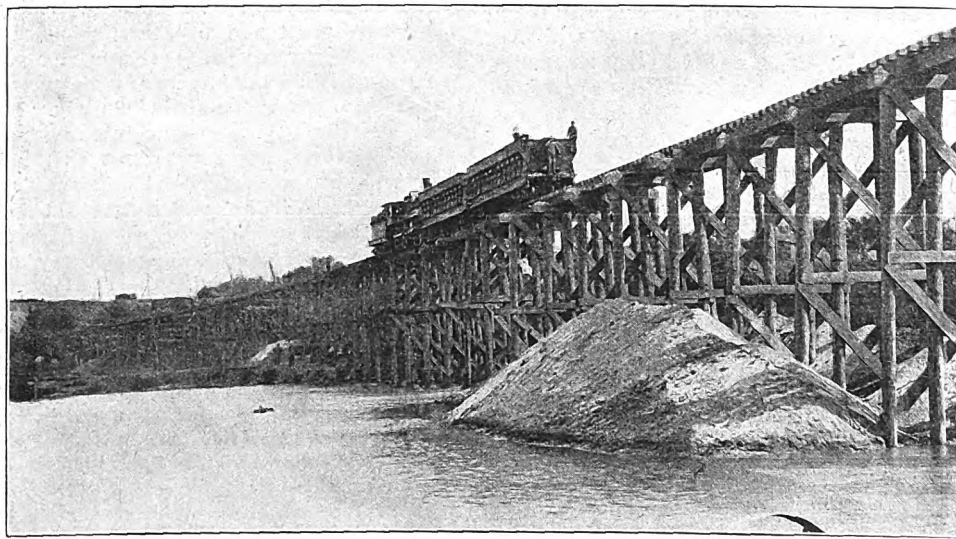


FIG. 1—TEMPORARY TRESTLE AND WORK OF FILLING Chemin de Fer d'Etat, stands in the French section as representing the best motive power of the State Railway of France. No higher compliment could have been paid and it attracted so much attention as to be the subject of an interpellation in the Chamber of Deputies, and some acrimonious discussion. Of the two locomotives shown in the American section, one is for the Chemin de Fer d'Etat and the other (painted in pea green) is for the Great Northern Railway of England. The wheels are slightly lifted from the floor and turned by compressed air, making it the only live exhibit in the building and hence the center of attraction. Judging from the large number of railway men and engineers from all parts of the world who daily climb into the cab and examine everything with care, other American locomotive builders have neglected a great opportunity.

EMBANKMENT, J. & S. E. RY., JANESVILLE, WIS.

length of the car. Provision is made for lateral play, and the system seems to be simple and not unduly expensive. It received the gold medal.

The International Pneumatic Signal Co. has a large working model of its system which shows its operations very satisfactorily. Its simplicity and effectiveness seem to be very generally recognized by experts and its prospects in Europe look very favorable. It was thoroughly studied by the International jury, which had a large number of signalling systems to pass upon, and their appreciation was shown by the gold medal award. The use of air only and the repetition of the signal are features very generally commended.

At the present writing the National Malleable Castings Co. is installing two specially built English cars for exhibiting their "Combined Automatic Coupler and Center Buffer." This adaptation of the

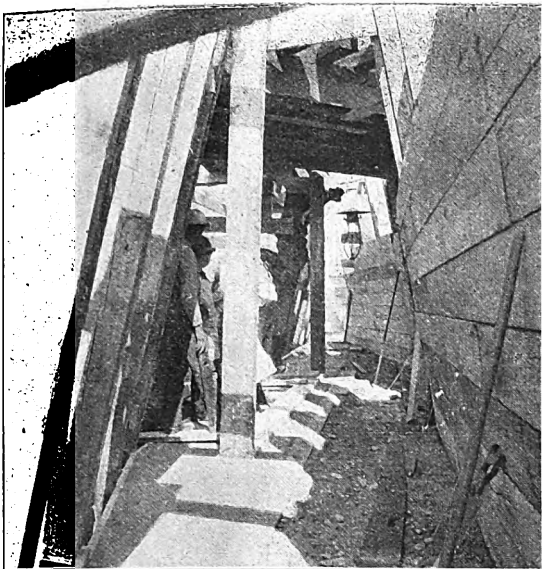


FIG. 3—INTERIOR OF FORM FOR CONCRETE ABUTMENT. ilar metals, such as iron or copper. Any complete circuit made of two metals must necessarily have two junctions of the two in it. If one of these junctions is heated more than the other an electric current will flow in the circuit, its amount and direction depending on the nature of the two metals, the difference in temperature between the two junctions and the resistance it encounters in its path. On the motor machine the couples are made of iron and nickel, firmly brazed together. They are arranged like the windings of the ordinary electric motor, with one set of junctions brought conveniently to the surface, where gas jets play upon them. The other set are cooled by a rapid circulation of air about them, engendered by the rotation of the machine.

#### Concrete Masonry on the Janesville & South-eastern.

The construction of the Janesville & Southeastern Ry., and the Cook, Lake & McHenry Co's. Ry., from Fox Lake, Ill., to connect with the Mineral Point division of the Chicago, Milwaukee & St. Paul Ry., at Janesville, Wis., involves a considerable amount of bridge work at Richmond, Ill., and at Janesville, Wis., which presents some interesting features of engineering in the way of heavy concrete masonry. At the former point there is a long stretch of high fill which crosses over the Chicago & Northwestern

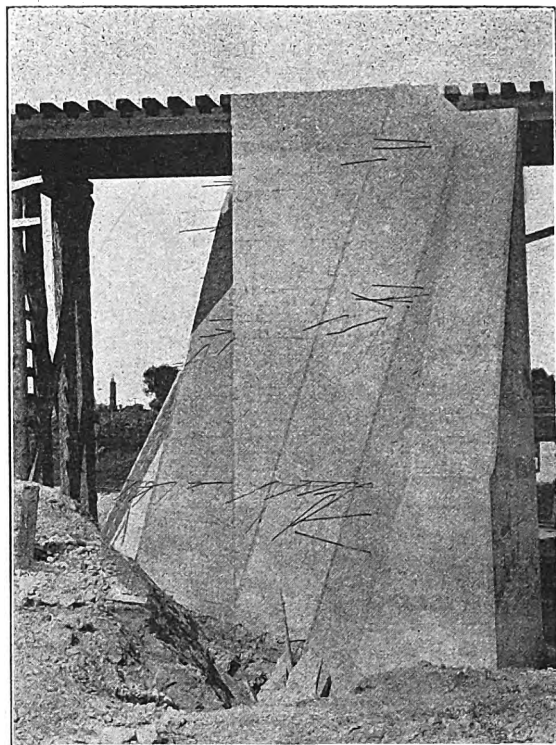
& St. Paul Ry., on a 51-ft. plate-girder span. All of the spans, including those over the Rock river, will be deck spans, except the two crossings over the C. & N.-W. Ry.—which will be through spans—and will stand at a skew.

The masonry and bridges of the road are being constructed by the bridges and buildings department forces of the Chicago, Milwaukee & St. Paul Ry., under Mr. Onward Bates, engineer and superintendent. The masonry work is in charge of Mr. W. A. Rogers, engineer of permanent construction, of that road, with Mr. Irving Hitz, assistant engineer, in immediate charge on the ground, Mr. Hitz being also in charge of masonry work on the middle district of the Chicago, Milwaukee & St. Paul Ry.

The work which we have selected for description and for illustration is that at Janesville. On the east side of the Rock river there is a concrete abutment and concrete pier, followed by four cut-stone piers on concrete footings in the river and a concrete abutment on the west bank. In the mill race referred to there is a stone pier on a concrete footing, with a concrete abutment on each bank. The abutment walls for the bridges over the streets and railroads crossed have all been built of concrete. Altogether the masonry work in Janesville comprises 650 cu. yds. of cut stone masonry and 10,000 cu. yds. of concrete masonry. The largest structure is the concrete abutment on the west side of the river, the solid contents being 1030 cu. yds.

To carry on the work of filling in the embankment and to facilitate the handling of materials for the masonry work, a temporary trestle was constructed at the start. At parts of the trestle where filling is to be made the structure is of the ordinary class of braced piling for temporary work, but over the street and other crossings the trestle was made heavy enough to carry the traffic as soon as the work of filling is completed, thus avoiding any possibility of delay to the traffic should the delivery of the bridge material be delayed. Figure 1 of the accompanying illustrations shows this trestle, looking eastward across the mill race and Rock river, the former appearing in the foreground. The farther end of the trestle is at the point where the road crosses under the Wisconsin division of the Chicago & Northwestern Ry., as previously referred to. Since this photograph was taken the opening under the C. & N. W. track has been made and at present the latter is being carried on a temporary trestle.

The height of the abutments and piers constructed varies from 28 to 39 ft., from the base of the rail to the bottom of the footing course, the concrete back walls extending in some cases as high as the



CONCRETE MASONRY, J. & S. E. RY., JANESVILLE, Wis.—FIG. 5.

a form for constructing one of the abutments, and Fig. 3 is an interior view of the same form taken when the work of depositing the concrete had been carried up nearly to the track.

Before taking up the work of handling the concrete a temporary storehouse was built on the grounds and 2000 barrels of cement were stored to provide against the contingency of shortage in the market. The concrete used throughout the work was mixed in the proportion of 1 part cement to 2 parts sand and 5 parts of broken limestone. The cement used was of the Atlas and Vulcanite brands. Gravel consisting of a mixture of about six-tenths sand and four-tenths pebbles was used in place of sand, the pebbles in the gravel being considered as stone. The sand contained in the gravel being sharp and of good quality answered every purpose for such work. The limestone was broken to the size of a 2-in. ring. In constructing the abutments for two of the overhead crossings the work was convenient to a pit of good gravel, from which the ma-

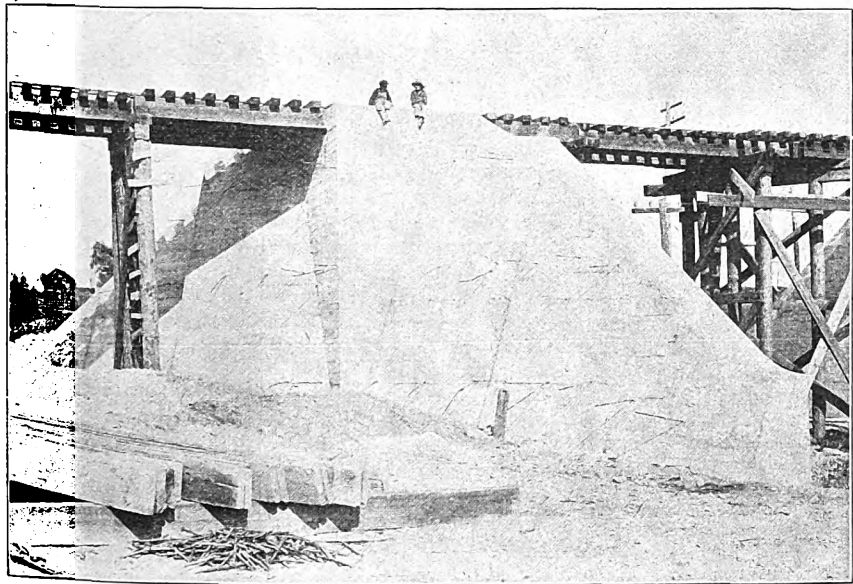
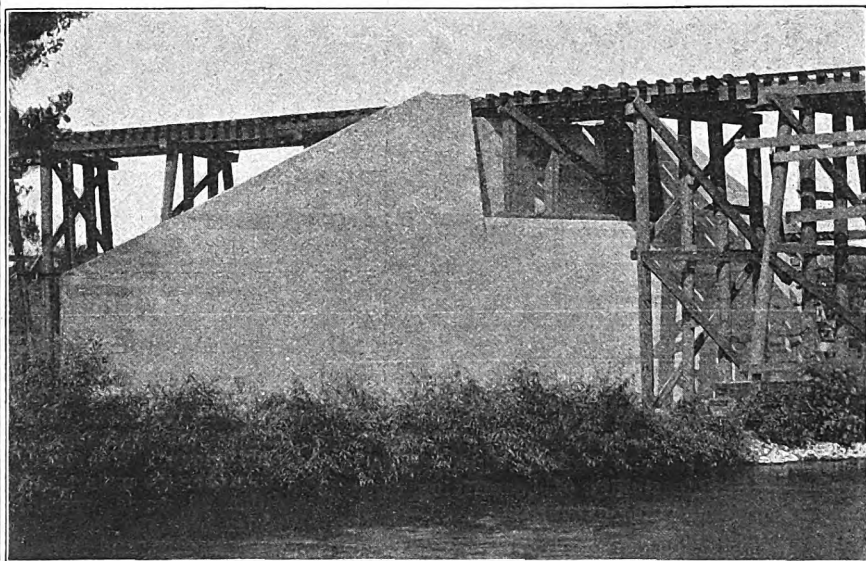


FIG. 4—

Ry. and a public highway. The track is constructed on a temporary trestle, which is being filled in, and the bridges over the highway and Chicago & Northwestern tracks will consist of plate-girder spans on concrete abutments. Entering Janesville the road crosses under the track of the Wisconsin division of the Chicago & Northwestern Ry., on the east side of the Rock river, which it will cross on one 60-ft. one 65-ft., four 85-ft. plate-girder spans and continue on a 2-deg. 24-min. curve over a fill 30 to 35 ft. high and about ½ mile in length. After crossing the Rock river the road passes over a mill race on two 114-ft. plate-girder spans; then two streets on spans of 41 and 45 ft., beyond which it crosses over the Afton branch of the Chicago & Northwestern Ry. on a 63-ft. plate-girder span, and over the Beloit branch of the Chicago, Milwaukee



CONCRETE MASONRY, J. & S. E. RY., JANESVILLE, Wis.—

bottoms of the ties. In general it may be stated that the width of the abutments at the bottom of the neat work is about 4-10 of the height, and the footing courses project some distance in front of the face of the neat work. In concrete masonry of this magnitude it will be of interest to consider the work of building the forms. For the highest forms 8x8-in. and two 3x12-in. plank bolted together with a 1-in. block between them, were used as posts, and in the shorter forms 6x8-in. and 4x6-in. pieces, were used for the same purpose. The posts were held together with bolts at from two to four points and the faces of the forms were made with 2x10-in. plank surfaced on one side and two edges. The bolts holding the forms together remained in the concrete and the projecting ends were cut off after the forms were taken down. Figure 2 is a view of

FIG. 6.

material was run to the mixer in wheelbarrows, thus saving a good deal of handling of material. In another instance gravel was wheeled out of one foundation into the concrete mixer working at another foundation. Thus in various details of this kind advantage was taken of natural facilities on the site of the work for economizing in material and in the work of handling the same. Gravel not obtained in the manner stated was hauled from a pit at Rockton, 17 miles distant. The crushed stone was brought in drop-bottom cars and dumped through the trestle into heaps convenient to the work on each of the piers or abutments.

The concrete was mixed in a Ransome mixer, described and illustrated in the Railway and Engineering Review of Nov. 19, 1898, page 648. The material deposited in the footings, and in the neat



work for a height of 8 ft. above the footings, was run to place with wheelbarrows. The balance of the material was hoisted in the wheelbarrows, on a specially constructed elevator, the hoisting machinery consisting of a 4-h. p. gasoline engine with a 15-in. niggerhead around which a rope was wrapped for hoisting. Water for mixing purposes was piped to the mixer from the city hydrants.

The work was carried on both night and day, with a mixing crew in each case of 33 men, an unloading crew of 25 men, and a foundation crew of 25 men in excavation. In building the forms a carpenter's crew of 20 men was engaged. For work at night four arc lights were used, taking current from a commercial circuit, besides one Wells and one Buckeye light. One of the arc lights was used for lowering into the forms, and as such it was found very convenient of manipulation. The average quantity of concrete deposited each day was 175 cu. yds.

An interesting feature of this concrete work was the facility with which structures of complicated form were built. As the piers and abutments stood on a skew with the track, the buttresses for the support of the bridge seats introduced a variety of faces and corners, best appreciated by a reference to the illustrations herewith presented, as, for instance, Figs. 4 and 5, which are side and end views of the same abutment. The ease with which such work could be constructed also permitted an econ-

the steamship, the greyhound of the sea; we received the frigate Constitution, we bequeath the battleship Oregon; we received the beacon signal fire, we bequeath the telephone and wireless telegraphy; we received wood and stone for structures, we bequeath 20-storied sky-scrapers of steel. Such are a few of the bequests of the nineteenth century to the twentieth."—Age of Steel.

#### Paint on Structures Exposed to Locomotive Exhaust.\*

In view of the large number of bridges over railways in the city, it was desired to find the best preservatives to be applied on metal exposed to the fumes from locomotives. Paint manufacturers were invited to submit samples. Fifty-four sample plates were received, which represented the makes of 22 manufacturers. Forty-four of these plates were in duplicate, representing 22 kinds. Twenty-two were put up over the northbound main track of the Philadelphia & Reading Ry., under the Columbia avenue bridge, and the other 22 were put over an adjoining side track. The Columbia avenue bridge was selected as a typical structure with low head-room (about 16 ft.). The plates were 12x24 ins. in size, coated on both sides with such preparations as the manufacturers preferred to use, and which they recommended as being best adapted for such service. Two wooden frames were made, each containing 18 compartments, the plates resting flat on their edges, so that both the upper and lower surfaces were exposed. The first lot of plates was put up in August, 1897, and after 35 days' exposure, on being

built in 1894, on the line of Girard avenue, over the Reading Ry. tracks on Pennsylvania avenue, where travel is almost incessant, and where engines are standing a great deal of the time, a sheathing of white pine was placed when the bridge was first built. The sheathing completely covered the whole under-side of the bridge. The metal-work of the bridge was painted with red lead, with a small admixture of lamp-black. The sheathing was painted with two coats of asbestos paint when first put up, and three months afterward with two additional coats of the same paint. The sheathing was suspended from 2-in. by 8-in. joists, and was nailed up close in place. After five years' service, in the summer of 1899, it was found that the paint was extremely well preserved. Inside the sheathing there was very little evidence of any deterioration. It was sound and without sign of rust, excepting along the corners of certain plates, where the paint had been brushed out thin. Wood was selected for the service because it was thought that it would better resist the abrasion of cinders than metal sheathing, and the results have been very satisfactory. The sheathing was found to be sound and in excellent condition.

#### International Railway Congress.

Paris, Sept. 20, 1900.

According to the published program, the International Railway Congress was opened in full session to-day at 3 o'clock. The Congress halls in the Palais du Congrès of the exposition were for the first time, given to one organization. The great outer hall is the meeting place where credentials are pre-

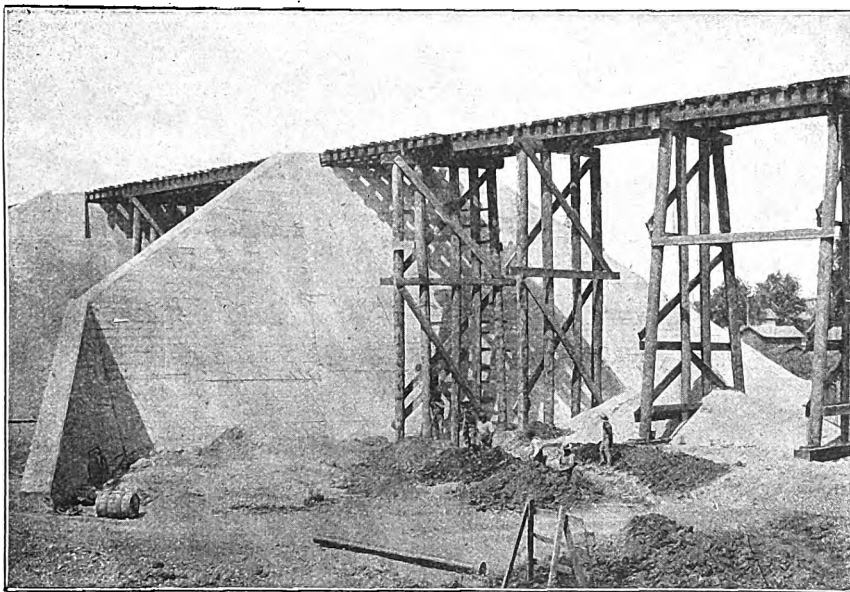


FIG. 7—

omy of material hardly practicable in the case of stone masonry, where every extra corner also adds largely to the expense of the work. In work of the character here considered, the shaping of the masonry to the best advantage for strength and economy of material was merely a matter of carpentry, or the work of constructing the forms.

Figures 6, 7 and 8 show other views illustrating the variety of shapes given to the work, the varying angle of the skew at the several crossings imposing the condition that no two abutments were shaped exactly alike. One general feature of the designing of this masonry is that part of the batter is made on the face of the wall, as well as on the back, thus assisting in the stability. It will be noticed that all the wing walls are sloping instead of stepped. Another feature introduced on the abutments (Figs. 4 and 8) is the curving of the wing-wall slope next the end corners, which shows in a small way the feasibility of beautifying concrete masonry without extra expense.

The filling of the several sections of embankment embracing this masonry work will require something like 120,000 cu. yds. of material. This material is being obtained in a heavy through cutting on the approach to the C., M. & St. P. station, contiguous to the embankment. The work of filling is being done by McIntosh Bros., contractors, of Milwaukee, who have a steam shovel and two locomotives, with four Goodwin dump cars, constantly employed.

At a recent gathering in Boston one of the speakers made the following impressive statement: "The century received from its predecessors the horse; we bequeath the bicycle, the locomotive and the automobile. We received the goose quill, and bequeath the typewriter; we received the scythe, we bequeath the mowing machine; we received the sickle, we bequeath the harvester; we received the hand printing press, we bequeath the Hoe cylinder press; we received Johnson's Dictionary, we bequeath the Century Dictionary; we received gunpowder, we bequeath nitroglycerine; we received the tallow dip, we bequeath the arc light; we received the galvanic battery, we bequeath the dynamo; we received the flint lock, we bequeath automatic firing Maxim guns; we received the sailing ship, we bequeath

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removed for examination, it was found that the coatings on the lower surfaces had been in many cases entirely destroyed. It appeared as if the severe action of the cinders coming from the locomotive stacks and the heat had destroyed the vehicle, and the abrasion had been so severe that out of 18 plates 14 were much pitted, with very little covering left.

As it was understood with the manufacturers that the information derived from these tests was solely for the use of the bureau of surveys, and not to be made public, I cannot give particulars; but it may be interesting to the Club to know, in a general way, what the results were. One of the plates of this lot which stood best, both on top and on bottom, was primed with red lead, and had one additional coat of a proprietary composition. The bottom, or most exposed surface, was well preserved over about four-fifths of its area. The upper surfaces of three plates of this lot were in excellent condition. The plates were exposed in six groups, the conditions being practically the same in each group. We found, after removing the plates from over the main track, that none was in such condition as would warrant it being re-exposed. The plates over the side track remained in place nearly eight months, and in most cases the coatings on their lower sides, exposed to the exhaust of the locomotives, were so seriously affected that they were, in about one-half of the specimens, practically destroyed, and the others were seriously injured. The worst specimens were full of blisters, pitted with rust, and presented a pock-marked appearance. The upper surfaces of the plates over the side track were nearly all in good condition. A careful record was made of the behavior of each plate—of its location, time of exposure, and all the conditions affecting it, maintaining as far as possible an equality of conditions for the various specimens.

There are quite a number of structures in town in which the head-room is low, and from inspection of these, and the tests made, we came to the conclusion that for ordinary head-rooms—not exceeding about 20 ft.—it is improbable that any paint is to be found which will remain, without some protection between it and the locomotive exhaust, to prevent the mechanical effect of the impact of the cinders. Under new bridges the bureau is placing wooden sheathing attached to the overhead structure, over the tracks. I would state in this connection that under the bridge

\*Extracts from a discussion at a meeting of the Engineers' Club of Philadelphia, by Mr. C. M. Mills.

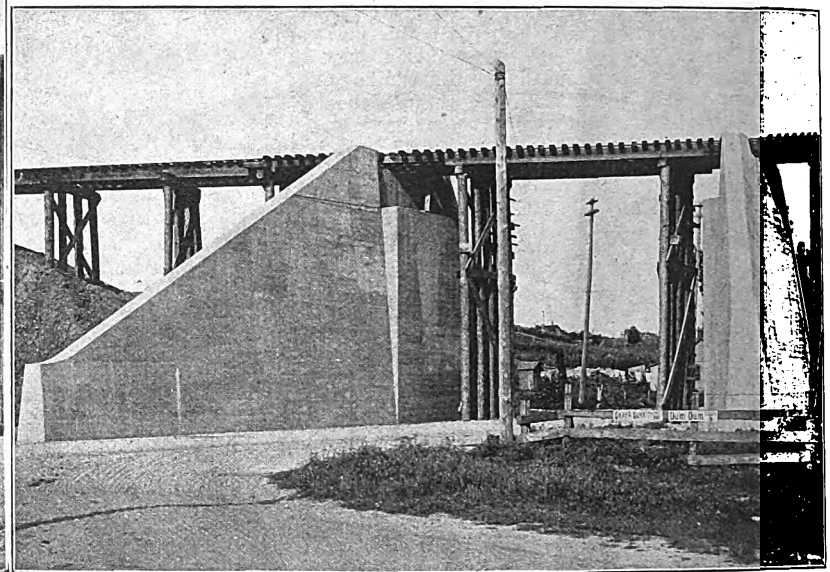


FIG. 8.

sented. Boxes are provided for each member for receiving mail and printed matter. The largest meeting room was well filled, over 750 members being present. The meeting was called to order by the Minister of Public Works of France, Mr. Pierre Baudin, who made an excellent address of welcome in behalf of the government. Among other things he dwelt upon the necessity of decreasing the cost of transportation, especially by means of reducing the proportion of dead weight to paying load; and praised the bold and radical revolution in this respect in the United States. While recognizing the fact that Europe is hindered in such matters by les charges de l'héritage, he claimed that it is making some progress, as in France freight cars of 15, 18, and even 20 tons capacity, are now in use. He commended the recent progress in speed, comfort and safety of express and limited trains; and expressed the hope that these improvements might be extended so as to become available to the poor and people of moderate means, who cannot pay the prices demanded for travel de luxe, as it is called.

He was followed by Mr. Dubois, president of the International Commission, who gave a brief resume of the history of the congress and the work laid out for this session, as shown in the program. In 1880 the membership included 219 railway administrations, or companies, representing 185,000 kilometres of road. The membership is now twice as great, and the mileage three times. At the session of 1889 there were 647 delegates; this year there are nearly twice as many. He ended by nominating as president of the session Mr. Alfred Picard, director general of the Paris Exposition of 1900, who was also president of the congress at its session in Paris in 1889. The choice was unanimous.

Mr. Picard, in taking the chair, made an address which is worthy of publication in full, both on account of its eloquence and practical value. Among other things he invited attention to the opportunity for study offered by the railway exhibits at the exposition, to which 23 countries have contributed. There are on exhibition 75 locomotives, 91 passenger cars, 40 freight cars, and 31 street or tram cars.

At the close of this address, the assembly divided