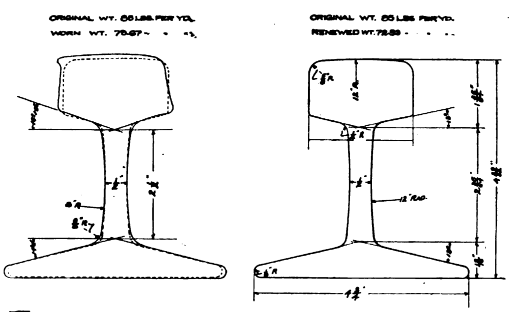
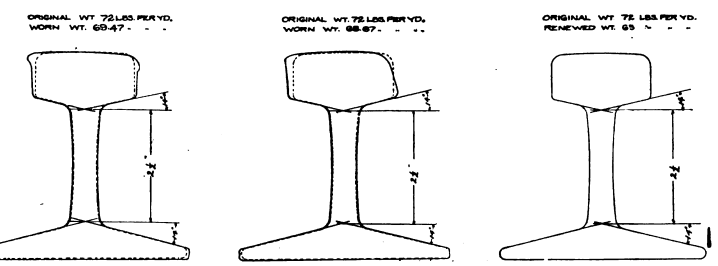
Re-Rolled Rails.

We have already described in considerable detail the McKenna re-rolling process for renewing old rails (Aug. 2 and 16, 1895, and March 14, 1902), and in the latter article one of the three plants of the company was also described—that at Tremley Point, N. J. The other plants are located at Kansas City, Kan., and at Joliet, Ill., and have been in operation for some time. Their combined output up to the present has been something like 200,000 tons. During last year the Joliet mill renewed about 35,000 tons of rails. The tonnage re-rolled by the company annually has increased steadily, as well as the number of roads using the renewed rails.

The Tremley Point, N. J., mill is now nearing completion and it is expected to be in operation in a few weeks. It will have 50 per cent. greater capacity than the Joliet mill, but it is expected that the demands of the eastern roads will fully justify the increase. Its situation on the Central Railroad of New Jersey, near the mouth of the Rahway River, will provide it with ample water transportation facilities. The buildings will have a floor space of about 77,000 sq. ft. and are of structural steel with galvanized steel roofs and sides. Most of the machinery is individual motor driven. The plant will start with one train of rolls, but room for another train is provided.



Rails Re-Rolled by the American, McKenna Process, Chicago, Burlington & Quincy.



Rails Re-Rolled by the American, McKenna Process, Chicago & North Western.

A new feature is a cambering machine for cambering the finished rail on its way to the hot bed.

There are three furnaces of the reverberatory type, each having an average capacity of 20 rails per charge. They are the design of Mr. D. H. Lentz, Superintendent of the company, developed after considerable study and experiment. To heat uniformly a 30-ft. rail was not a simple problem and the success of the process depended upon this being done. The furnaces now in use manage this with entire satisfaction. For re-rolling rails sent in by a railroad company a charge of from $5 to $6 a ton is made, and heretofore the work has been confined to that line only. With its increased capacity the company expects to buy in worn rails, treat them, and then sell them.

It has been maintained for the McKenna process that the re-rolling toughens the rails and makes them more elastic, increasing their durability. An inspection by Robt. W. Hunt & Co. of some new and renewed rails laid on the same division of the Atchison, Topeka & Santa Fe at the same time appears to verify this claim. A point to be noted in connection with the re-rolling of the old rails is that the height of the web is not changed; the old angle bars may therefore be used on the renewed rails.

A New Chicago-St. Louis Line.

When the St. Louis & San Francisco interests bought the Chicago & Eastern Illinois it followed as a logical result that every effort would be made to form a Chicago-St. Louis line. The importance to the "Frisco" people of such a connection was considerably enhanced when control of the Pere Marquette likewise passed to their hands. The plans for this line are now practically complete: in fact, work has already begun on parts of the new road and is expected to have it in operation in good time for the St. Louis Fair.

The accompanying map shows the Chicago & Eastern Illinois lines in Illinois, the proposed line to St. Louis, and the present-existing Chicago-St. Louis lines, of which there are three, the Chicago & Alton, the Illinois Central and the Wabash.

The new line will be built partly by the Chicago & Eastern Illinois and partly by the Cleveland, Cincinnati, Chicago & St. Louis (Big Four). The work being done by the former is under the name of the Eastern Illinois & St. Louis.

Beginning at Woodland on its Chicago-Danville line a cut-off some 62.5 miles long is to be built, running southwest to junction with the Danville-Thebes line at Villa Grove. Then from Findlay a branch 18 miles long is to be built to Pana to connect with the Big Four. The latter will double-track its line from Pana to Hillsboro, for joint use of the two roads, and will build a cut-off from Hillsboro to Mitchell, reducing the distance by 12 miles. This will give the new line a total of approximately 290 miles, against 283.8 for the Alton, 286 for the Wabash, and 292.96 for the Illinois Central.

On the Woodland-Villa Grove cut-off topographical conditions are such that very nearly an air line was possible, and the survey has approximated as closely to this as was practicable. It will be noted that, though passing quite close to several towns, they were disregarded, directness of route being the primary consideration. At this writing, however, influence is being brought to bear to have the line diverted to Rankin, and it may possibly prevail.

Including the Cissna Park branch of the C. & E. I., five roads will be crossed, being, in order, after the branch mentioned, the Lake Erie & Western, the Illinois Central (Rantoul branch), the Big Four (Peoria division), and the Wabash. The Lake Erie & Western and the Illinois Central are to be crossed overhead. How the others will be crossed has not yet been fully settled, but it is probable that the Eastern Illinois & St. Louis will go under the Wabash, and will cross the Big Four at grade.

Double-tracking the Big Four between Pana and Hillsboro involves the building of some 27 miles of second track. The Hillsboro-Mitchell cut-off will leave the present line a little to the northeast of Hillsboro and deflect southward from the direct line in order to make the crossing of the Middle and West Forks of Shoal Creek with but one grade each way. The plan is to cross all intervening railroads either above or below present grade, except the Jacksonville & St. Louis, which is so located that a grade crossing will be necessary.

The ruling gradients will be 26 ft. per mile southbound and 21 ft. northbound for the Chicago & Eastern Illinois, and 26.4 ft. each way for the Big Four. The maximum curvature for the new sections will not exceed 1 deg. on the Eastern Illinois & St. Louis, and 1 deg. 15 min. on the Big Four. However, there will be on the entire line one curve of 3 deg., this being on the present line of the Chicago & Eastern Illinois; there are also some 2 deg. 30 min. curves.

On the Eastern Illinois & St. Louis the line will be graded, and all permanent structures are designed for double-track, although the second track will not be laid right away. It is expected to get to this within another year perhaps. The line will be laid with 80-lb. rails, it not being deemed advisable to lay new work with anything heavier than this. However, the recently-adopted standard for repairs for the C. & E. I. is 85 lbs., and this weight will eventually be substituted, as conditions make necessary.

Gravel ballast will be used throughout the Eastern Illinois & St. Louis. The C. & E. I. owns a large gravel pit on the Wabash River where it crosses in Indiana, from which large quantities of ballast are obtained. All bridge abutments and piers, and all large culverts will be built of concrete.

On the Woodland-Villa Grove line it has already been mentioned that none of the crossings would be at grade except possibly the Big Four, which latter is still unsettled. Should a grade crossing be agreed upon, an interlocking plant will doubtless be put in. Between Villa Grove and Pana there are three grade crossings, one of which Tuscola, is already interlocked. Arrangements are about completed for a plant at Arthur, and Sullivan will probably be arranged for in the near future.

The Eastern Illinois operates its trains by the telegraph block system, and this will doubtless be continued. Positive blocking is the practice for passenger trains, permissive blocking being allowed for freight trains.

The Big Four will also lay its new line with 80-lb. rails, and will ballast with chatts. On the line between Pana and Hillsboro there are a number of small stone arches to provide for existing waterways and cattle passes, the largest of which is 20 ft. in diameter. These will, of course, be extended for the second track. On the cut-off the bridges and culverts will be of concrete arch masonry in most cases, there being but two streams of importance to be crossed. There will be steel bridges at the crossings of the intervening railroads, but the details for these have not yet been decided upon. The grade crossing with the Jacksonville & St. Louis will be protected by an interlocking plant.

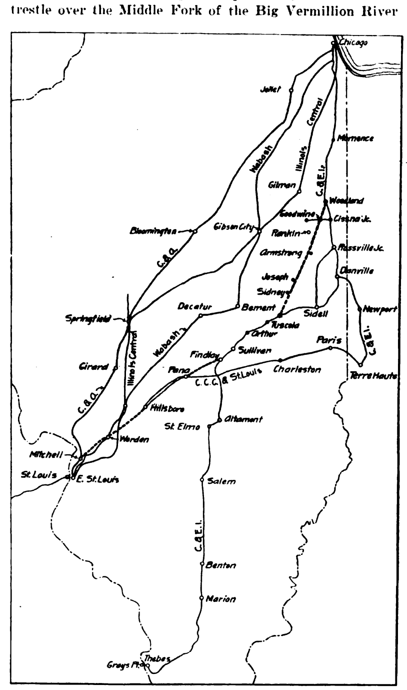
The steel bridges for the Eastern Illinois & St. Louis have been proportioned for a live load of two 177½-ton consolidation engines, followed by a uniform trainload of 5,000 lbs. per lineal fot of track, being "Cooper's Class E-50" loading. The unit stresses adopted were 16,000 lbs. per sq. in. for tension, and the same stress reduced by a column formula for compression. The live-load stresses were increased by the impact formula of $\frac{300}{300 + \text{length of load}}$. The fixed wind load has been taken at 30 lbs. per sq. ft. and the moving wind load at 300 lbs. per lineal foot; or for the unloaded structure, a wind load of 50 lbs. per sq. ft. of exposed surface of structure.

The specifications for material require open-hearth steel, with a maximum phosphorus of .04 per cent. for basic, or .08 per cent. for acid steel; and a tensile strength of 62,000 per sq. in., with an elongation of 25 per cent. in 8 in. This steel must stand bending cold 180 deg. flat. A variation of 4,000 lbs. above or below the desired tensile strength is permitted.

The specifications for shop work require the planing of sheared edges, and the reaming of punched holes, except for lateral connections and minor details. In reamed work, the diameter of the punch must be at least $^3/_{16}$ in.; and the diameter of the die at least ⅛ in., less than the diameter of the rivet; or for most of the work the holes will be punched $^{11}/_{16}$ in. and reamed to $^{15}/_{16}$ in. diameter. The flanges of I-beams used in the floors of the bridges will have all connection holes drilled from the solid.

The specifications for painting call for the work to be oiled in the shop, except that all parts not accessible for painting after the erection, including tops of stringers, ends of posts, and chords shall have a good coat of approved paint before leaving the shop.

All of the deck plate girder spans have been designed so as to avoid the use of cover plates and give a smooth, uniform surface to the top flanges for the ties to rest upon. The flange sections for the 60 and 65-ft. girder spans are shown in the general plan of the double-track trestle over the Middle Fork of the Big Vermillion River and the Illinois Central R. R., presented herewith. Stiff bracing has been used for laterals and tower bracing.



Chicago-St. Louis Lines, Present and Proposed.

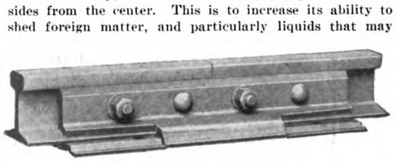
The trestle mentioned consists of five 60-ft. spans, one 65-ft. span, and five 30-ft. tower spans. The girders for these spans have a uniform depth of 6 ft. back to back of flange angles. The 30-ft. girders are rigidly connected to the towers. There is one fixed end, and one expansion end on each tower for the 60 and 65-ft. spans. The towers are 23 ft. 2 in. high from top of masonry to base of girders, or 30 ft. from top of masonry to base of rail. These towers being comparatively low, it was unnecessary to give the posts any batter. Each bent consists of one cross girder, 6 ft. deep, and two plumb posts made up of one 15 in. 50-lb. I-beam and two 15 in. 40-lb. channels. The tracks are 14 ft. center to center, and the girders for each track are 7 ft. center to center.

Where the fixed ends of the 60-ft. spans join the 30-ft. tower spans, single-end cross frames are used. At the expansion ends separate cross frames are provided for the 30-ft. and 60-ft. spans.

In addition to this trestle there will be a number of deck-girder spans, from 30 ft. to 80 ft. long, and one 54-ft. through plate-girder skew span, having a shallow floor, where the road crosses the Lake Erie & Western. All of the bridges have been designed under the direction of Mr. W. S. Dawley, Chief Engineer, by Mr. T. L. Condron, M. A., Soc. C. E., Consulting Engineer. The contract for the steel work has been let to the American Bridge Co. The structures will be made at the Detroit plant of that company and erected by the railroad company.

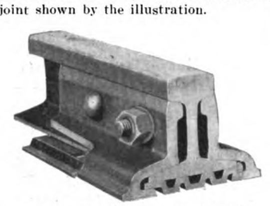
Tie-Plates and Rail-Joints.

Mr. Wolhaupter has improved his tie-plate (shown in the *Railroad Gazette*, Jan. 23, 1903, p. 65) by changing the form of top, which is now made to slope toward the sides from the center. This is to increase its ability to shed foreign matter, and particularly liquids that may



The Wolhaupter Rail-Joint.

drop upon it, such as brine from passing refrigerator cars. The rail seat has not been changed, the tops of the bosses being on a level across the plate. He has also developed the rail-joint shown by the illustration.



Section, Wolhaupter Rail-Joint.

The joint is composed of a corrugated base-plate extending under the rail ends for the full length of the joint, and two angle-bars having the flanges formed to clamp the base-plate and hold it firmly against the base of the

Improved Chicago Tie-Plate.

rail. By this means the bearing surface of the joint on the rail and ties is increased.

The corrugations of the base-plate are to give additional strength; also the plate has on its outer edge a shoulder against which the outer rail-flange abuts. As the inside spikes pass through the holes in the base-plate the track alignment is established and is not affected by adjustment of the bolts, while the amount of spike area available for resisting lateral thrust is almost doubled. It is considered that this feature should prove especially valuable on curves.

The upper part of the angle-bars does not differ in design from usual practice, having bearings under the rail head and on top of the rail flange; but the form of the angle-bar flange gives greater depth and therefore greater stiffness. The inside angle-bar is interlocked with the base-plate, concentrating the metal under the rail ends.

The joints are being rolled by the Illinois Steel Company. Like the tie-plate, they are controlled and sold by the Independent Railroad Supply Co., Chicago, of which Mr. Wolhaupter is Manager.

The conviction that the country is going ahead too fast is at the root of much of the serious opposition with which the Japanese Government is now meeting. The Kure dock-yard, for example, is on a scale fitted for the building of line-of-battle ships, and yet there is absolutely no chance of its getting any but very small vessels for a long time to come. The great iron foundry in Wakamatsu, also, which has already cost the Government 20,000,000 *yen* ($10,000,000) and is sure to cost more, is a dismal failure and is consequently about to be sold to private capitalists. There is also a reaction against the present craze for building enormous fortifications along the seacoast and fitting them with costly pieces of artillery. It is recognized that this money had very much better be spent on ships.

Scherzer Rolling Lift Bridges.

Some of the more interesting undertakings of the Scherzer Rolling Lift Bridge Company, of Chicago, are as follows: A railroad and highway bridge across the Swale River near London, England, for the South-Eastern & Chatham Railway, Sir Benjamin Baker being the consulting engineer in charge for the railroad company. The new Scherzer bridge replaces a trunnion bascule bridge and is being built without interfering with or diverting either the railroad or highway traffic; also maintaining the necessary clearances under the bridge required by the British Admiralty.

Two double-track railroad bridges across Newark Bay for the Central Railroad of New Jersey, Mr. Joseph O. Osgood, Chief Engineer. These two bridges are placed back to back. The base of rail is only 4½ ft. above high water, but the bridges are so designed that all structural parts are kept above high water at all times. Railroad traffic and navigation are both maintained during the construction of the bridge without diverting the railroad tracks. It is the intention of the railroad company ultimately to carry two additional tracks across Newark Bay, and the bridges were designed with a view to adding two similar double-track bridges along the existing structures later on. The span of each of these bridges is 120 ft.

A double-track railroad bridge across Crystal Cove, Mass., for the Boston, Revere Beach & Lynn Railroad, Mr. G. M. Thompson, Chief Engineer. This bridge is a plate girder structure and is designed to carry heavy engine loadings, the tracks being standard gage. The substructure is composed of timber resting on piles.

The four-track bridge across the Pequonnock River at Bridgeport, Conn., for the New York, New Haven & Hartford, Mr. C. M. Ingersoll, Jr., Chief Engineer, is rapidly nearing completion. This bridge is composed of two double-track bridges placed side by side, to be operated either jointly or separately, as desired. They are deck plate-girder structures.

The double-track, 275 ft. span Scherzer bridge across the Chicago River at the entrance to the Grand Central Station, is giving very satisfactory service. The base of rail of this bridge is very close to the water so that the bridge is opened very frequently for the passage of tugs and other small craft, yet it is considered that much time is saved to railroad traffic because with this type of bridge a partial opening is sufficient for small vessels. The bridge has shown itself to be extremely rigid under the heaviest loadings; this may probably be accounted for by the absence of the end lifts and rail lifts required by swing bridges. The counterweight also adds to the rigidity of the structure.

The railroad bridges of the Scherzer type in operation for a number of years at Cleveland, Ohio, and other points are giving successful and satisfactory service.

The American Trackbarrow.

The accompanying cut shows a somewhat new type of trackbarrow, used for running earth, ballast and other materials short distances on the rail. The patent covers the wheel and its application to a barrow. The wheel is 17½ in. diameter and weighs 16 lbs.; the tire is steel,

five in. wide. The cut shows the wheel fitted with an axle which revolves in a U-shaped box attached to the under side of the frame; it has been decided to change this form of construction and allow the wheel to revolve on an axle run through the center of the frame and fastened on both sides by nuts. The novel feature is the angle at which the wheel is set in the frame, allowing the user to walk alongside instead of astride the rail. It is claimed that because of its usefulness on and off the track and the ease with which it can be handled, the barrow is for some work more serviceable than a push car. The maker is The American Trackbarrow, Lowell, Mass.

Goodwin Cars at Work.

The illustrations show the methods of using Goodwin cars in handling different materials about furnace yards.

Fig. 2 shows a train of Goodwin cars loading at the mine with bituminous coal. Fig. 8 shows the handling of this coal into the chutes at the loading dock. The train is pushed on to the dock and is unloaded by two men in less than ten minutes, the cars being unloaded one at a time into a single chute and the train pulled off from the trestle without having uncoupled either the cars or the locomotive.

Fig. 5 shows a train of Goodwin cars being unloaded, one compartment at a time, into a plate mill boiler house coal pocket. In this case the coal is pulverized and is discharged through the restricted opening. This is the same train shown in Fig. 2, and after discharging its load of coal from the dock it was run under the ballasting crusher and loaded, as shown in Fig. 18; proceeding on its way for another load of coal and at the same time distributing the ballast as the train passed over the road, running at the rate of about four miles per hour, and placing the ballast as required, either at one side of the track or the other or between the rails. The operation of discharging broken stone at one side of the track while running, is shown in Fig. 1. The entire train may be discharged from any car in the train or from the roof of the instruction caboose by using the air dumping pressure, opening the air valve by the use of the air-dumping lever. Fig. 9 shows the operator on the roof of the caboose with the air dumping valve in his hand, ready to discharge the entire train.

Fig. 14 shows a train of Goodwin cars being loaded with coke at the ovens. The instantaneous discharge of coke from the car and the large percentage in the saving of the breakage are the main features of advantage in the handling of this material. Where coke is handled exclusively the cars are fitted with coke racks.

Fig. 12 is a view looking down into the train of Goodwin cars loaded with pig iron; about 140,000 lbs. of pig iron in each car.

Fig. 13 is an instantaneous view of a load of pig iron being discharged, the photograph being taken before the load of pig iron reaches the ground, as it is sliding from the side discharge aprons clear of the trestle.

Fig. 11 is a view from the top of the pig iron trestle and shows the pig iron on the ground as discharged from the same train, shown in Fig. 13. This entire load of pig iron was discharged one car at a time in less than 15 minutes, by two men. There is very little shock received by the trestle or the car in discharging this enormously heavy load. This is explained by the construction of the car, which allows the load to start in its outward movement from its most centrally located position in the car without any shock or jar; this method instantly lowers the center of gravity without producing tipping or careening tendency. The fact that the pig iron is thrown clear of the footings of the trestle as shown in Fig. 11 is an advantage where light trestles are in use. Pig iron, as it is generally cast to-day in molds secured to continuous linked belts, is conveniently handled where the Goodwin car is used as the pigs may be dropped from the molds directly into the cars and the V-shaped section of the floor of the car renders the stacking and handling of the pig iron unnecessary. Since each piece finds its own location and although the pigs are hot when tipped into the car there is no buckling, binding or interference with the discharge of the load through the heating of the car. Comparing these methods of unloading with the usual method as shown in Fig. 22 the amount of time and labor saved in the operation will be appreciated.

Fig. 3 shows the rail end loading pit at the rail mill. There are two Goodwin cars located in the pit, one at each of the arched openings opposite the two rail saws. These saws cut off the ragged ends of the red hot rails. The ends vary from one to four feet in length and immediately upon being sawed from the rail they are thrown into the cars. A hose secured to the side of the building plays into the car while loading. Fig. 6 shows a load of hot rail ends in a Goodwin car on their way to the converter bin. In Fig. 7 this same car is shown in the act of discharging the rail ends into the converter bin; the operator using the hand power discharging apparatus.

Fig. 21 shows a train of ordinary gondola cars loaded with rail ends which are being thrown from the cars, one piece at a time, with about eight men in each car. This is the old method employed for unloading rail ends about furnace yards. In comparing the two methods of handling, it will readily be seen that there is much time and labor saved by the more modern method. Where it is necessary to throw the rail ends from the car by hand, one piece at a time, they have to be cooled sufficiently to allow a man to pick them up. This cooling is unnecessary where the Goodwin car is used.

Fig. 10 shows a load of 95,000 lbs. of mold scrap discharged out of a Goodwin car from the converter trestle, each piece weighing from a pound to 5,000 lbs. One man unloaded this 95,000 lbs. of mold scrap in less than two minutes time. Ordinarily, this material is pried off from flat bottom cars with crowbars, eight to ten men working on a car, taking several hours to unload each car.

In Fig. 16 can be seen the top of a train of Goodwin cars located in the converter cinder pit; red hot converter cinder is being loaded. Fig. 4 shows a train of cars filling in an embankment with converter cinder, the cinder being hot when it is discharged from the cars. Fig. 15 shows a car discharging granulated mill cinder for widening roadbeds, the granulated cinder being mixed with water, being loaded hot into the cars. A carload of this cinder clears a car in a few seconds and can be placed on either side of the tracks or between the rails while the train is standing or running, either on level ground or from a trestle.

In order to compare the methods of unloading coal from the Goodwin car with the usual method of unloading from the hopper car, attention is called to Figs. 17 and 19, showing eight men at work, and to Fig. 20, showing four men at work.