high on account of the waste in the negro quarters.

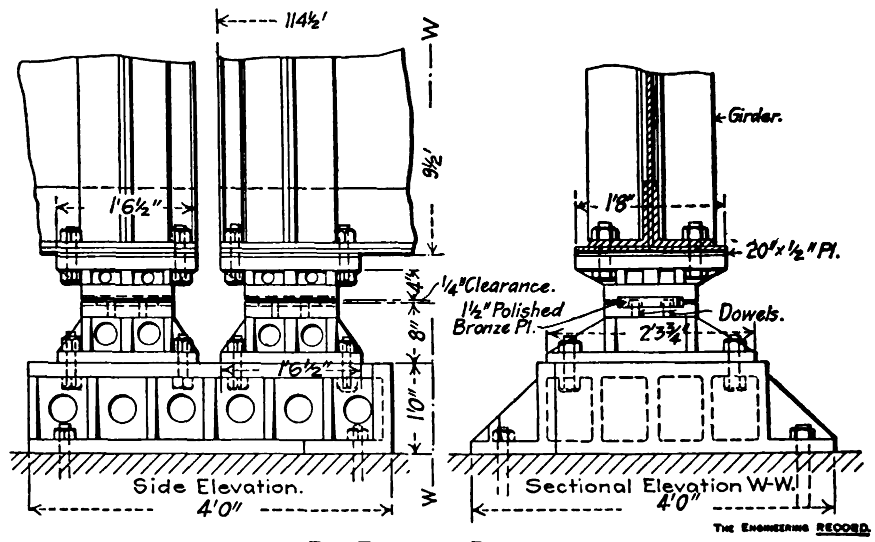
The discussion was closed by President Croes, who summarized a number of his studies of water supply which have already appeared at greater length in this journal. These studies showed in a general way that whenever the responsible head of the water department was an engineer or a man willing to follow sound engineering advice, the consumption per capita was cut down, otherwise it increased rapidly.

Heavy Street Railway Track laid in 1900 on Thirty-Fourth Street, New York, for the use of storage battery cars, is described in the report for that year of Mr. Wisner B. Martin, engineer of subsurface construction of the Department of Highways. The 9-inch rails are spiked to 5 x 7-inch long-leaf yellow pine ties 6 feet long spaced 5 feet apart. Combined tie-plates and rail braces are placed on alternate ties and the track brought to line and grade. The earth is then removed below and around the ties on which the tie-plates have been placed, so as to leave a trench of a uniform depth of 8 inches below the rail base and a width of 10 inches under the ties and 15 inches under the rails. The track is carried by the alternate ties after this excavation is finished, but it remains in line. The trenches under the rails and ties are then filled with concrete which forms a firm bearing for them; no wooden forms are used. The concrete for the asphalt pavement is then laid 6 inches thick in the track and outside, and adjacent to the web of the rails. The asphalt pavement is laid without any toothing stones. A special mixture of the asphalt is prepared to be placed under the head and lip of the rail. This mixture will stand much more heat without softening than the ordinary asphalt mixture. This construction is very durable, gives an excellent appearance to the highway, and there has been no trouble nor unusual expense in maintaining the pavement. The roadbed is firm, the cars ride easily and the construction seems to be satisfactory, the report states.

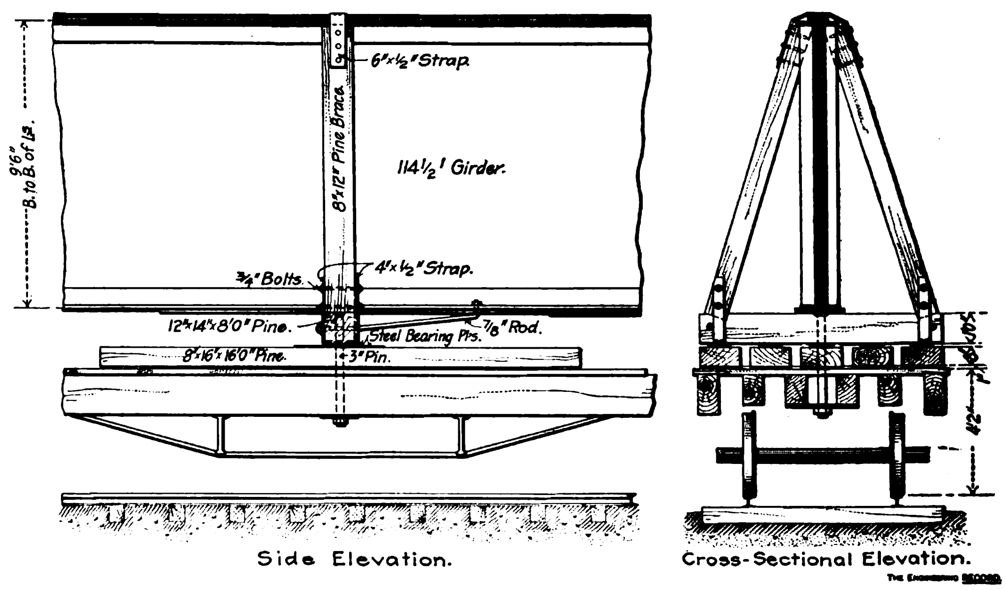
The Reservoir Construction now being carried on by the Croton Aqueduct Commissioners of New York was the subject of an important resolution passed on June 21, which reads as follows: "Whereas, In the prosecution of the work upon the New Croton Dam, on Croton River, at Cornell site, in the Town of Cortlandt, Westchester County, N. Y., and of the Jerome Park Reservoir, near Kingsbridge, in the 24th Ward of the City of New York, certain conditions and circumstances have developed which suggest that a change or modification may be desirable in the plans for the construction of that portion of the dam designed to be constructed of earth with a masonry core-wall, and of the core-wall and embankment of the reservoir of somewhat similar construction; and, whereas, it has been suggested by the Chief Engineer that, before any final determination is arrived at, advice should be sought from engineers of recognized ability and experience not connected with the present plans or the work of construction thereunder; therefore, resolved, that the President of the Aqueduct Commissioners be and hereby is authorized to employ Mr. J. J. R. Croes, Mr. Edwin F. Smith and Mr. Elnathan Sweet to examine the present plans for the construction of said dam, and the work of construction thereof so far as the same has proceeded, and also of the core-wall and embankment of the Jerome Park Reservoir of somewhat similar construction, and to report to the Aqueduct Commissioners what changes or modifications, if any, should be made in the plans for the construction of said dam and reservoir."

The Janesville Bridge.

The Janesville & Southeastern branch of the Chicago, Milwaukee & St. Paul Railway crosses a mill race at Janesville, Wis., on a single-track deck bridge of two 114½-foot spans of plate girders 9½ feet deep and 9 feet apart on centers, which weigh 42 tons each. The web of each girder is made in six lengths from ⅝-inch to ½-inch thickness, and is spliced with four vertical rows of rivets at each joint. The 8 x 8 x ¾-inch chord angles are made in three lengths and spliced with cover angles. There are two rows of rivets in each horizontal flange and three rows in each vertical flange. The top chord has one full-length and three part-length 20 x ½-inch cover plates, and in the middle of it there is an 8½ x ⅞-inch bearing plate from end to end, filiered up to the top of the middle reinforcement plate, to give a level, uniform smooth bearing for the track ties.



End Expansion Bearings.



Girder Bearings on End Car.

The bottom chord has two 20 x ⅝-inch and two 20 x 9/16-inch cover plates, only one of the former extending the full length. Each girder is divided into twelve equal panels by 6 x 6-inch vertical web stiffener angles at the splices and intermediate between them, and at the ends there are double vertical angles. The girders of each span are staggered with each other one panel length to correspond with the skew of nearly 45 degrees in the abutments and pier, and they are connected together by sway-brace angle frames normal to the webs at panel points. The top and bottom flanges are braced by transverse struts and X-brace lateral angles.

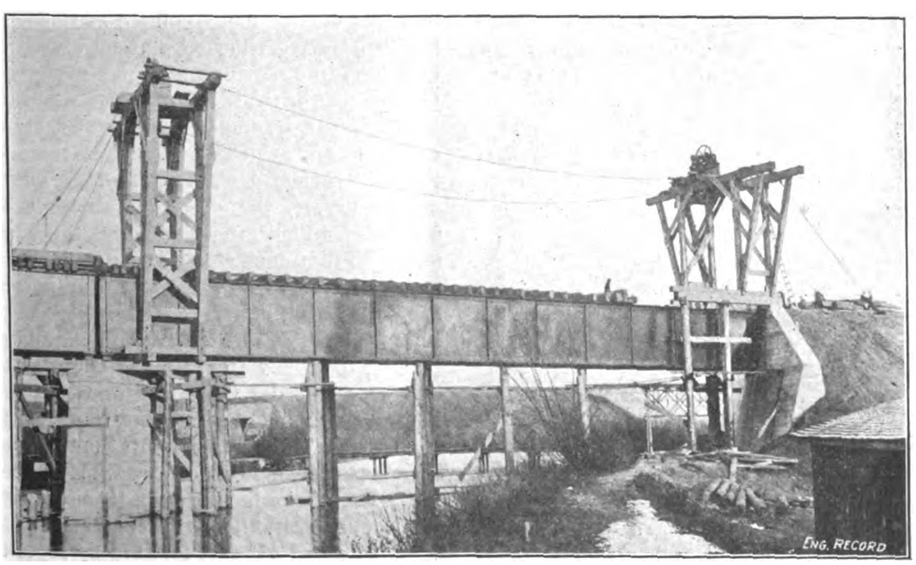
The expansion ends of the girders are seated on cast-iron supports made in two pieces, one above the other, and separated by a planed phosphor-bronze plate 8 inches square and 1½ inches thick, on which the girder is free to slide longitudinally and can deflect without disturbing the pedestal bearings. The upper casting or shoe is bolted to the lower flange of the girder and the lower casting or bed-plate is seated without bolts on top of a large webbed cast-iron box or pedestal, which distributes the load on the surface of the masonry. The shoe and bed-plate have projecting longitudinal flanges which enclose the bronze bearing plate, and lock the girder against transverse displacement. The bronze plate is tap-bolted to the bed-plate and the pedestal is anchor-bolted to the masonry. The fixed ends of the girders are seated on ordinary cast-iron pedestals.

Each girder was shipped from the bridge shop on two 30-ton standard flat cars 40 feet long with a 34-foot idle spacing car between them. The bearings were over the centers of the cars on transverse 12 x 12-inch bolsters 8 feet long with batter braces slightly notched into their ends and fitted under the top-chord flanges of the girder. The bolster swiveled on a vertical steel pin in the center and had steel-plate sliding bearings on five longitudinal sills which were packed up at the ends an inch above the car floor to allow for deflection and to transfer the load nearer to the car trucks.

At the site the cars were run across the river on a pile trestle and unloaded from a pair of double-bent gallows frames with a clearance above the railroad track 21 feet high and 13 feet wide. Each bent had two plumb posts and two batter posts, a 32-foot cap and an 18-foot sill, and the posts were mortised and bolted at both ends. The bents of each gallows frame were set 6 feet apart and on longitudinal sills and were connected together by cross-braces and X-bracing on the sides of the plumb posts and by cross planks on top. All the timber was 12 x 12-inch except the 8 x 16-inch caps and longitudinal tackle beams across them in the middle. The gallows frames were set on pile bents with their sills at the top of the masonry, about 12 feet below the rail base, and although independently stable on their longitudinal sills, were guyed together from pier to abutment and beyond at each end, with tackles to anchorages.

The six-part hoisting tackle was rove with ⅝-inch steel plow rope, and was suspended from a 1¾-inch U-bolt which was placed between the pair of longitudinal beams and was supported by nut bearings on the reinforced web of a short 12-inch transverse channel across the tops of the beams. A hand windlass from the standard derrick car was set on a platform on two 12 x 12-inch longitudinal beams across the caps of each gallows frame, and operated the hoisting tackle, to unload the girders from the cars and lower them to their seats after the cars were withdrawn.

This arrangement is used for the erection of plate-girder spans and for pony trusses up to 150 feet long, the truss or girder being lowered to a transverse timber and then the windlass moved transversely a few inches and the girder lifted and swung over, and so on until it can be lowered directly to the masonry seats. In some cases the windlasses are not moved, but the girders are unloaded on special trucks on transverse rails, and are easily rolled across to position. The trucks are very simply made with a platform consisting of a 13 x ½-inch plate 24 inches long with two 6 x 4-inch angles 24 inches long riveted to the under side with the 6-inch flanges vertical and 5 inches apart, back to back. These flanges are bored for two 2¼-inch axles, on each of which is keyed a 7-inch double flange wheel.

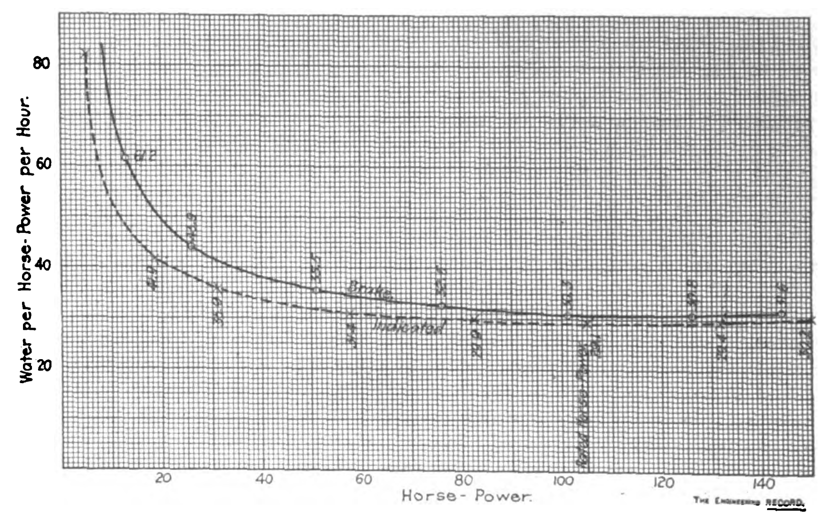


PLANT FOR ERECTION OF PLATE GIRDER SPANS.

The Janesville bridge was designed in the department of bridges and buildings of the Chicago, Milwaukee & St. Paul Railway Company, while Mr. Onward Bates was engineer of bridges. Mr. Albert Reichman was the assistant engineer in charge of the work, and the contractor was the American Bridge Company.

Test of Engines Under Different Loads.

Some valuable information showing the effect of the change in load on the steam consumption per indicated and per brake horse-power in an Ames engine is given in the accompanying illustration, which is printed through the courtesy of the Ames Iron Works, Oswego, N. Y. This firm has made a practice for some time of testing their engines by means of the indicator and the Prony brake, where guarantees are made, and the diagram reproduced is typical of a number of others that have been obtained. The engine is of the usual high-speed automatic cut-off type made by the builders, having a cylinder 13 inches in diameter and 12 inches stroke. The steam pressure was 95 pounds and the rotative speed 250 revolutions per minute. At the rated load of the engine, 105 horse-power, the steam consumption was 29.1 pounds per indicated horse-power per hour, while at half load, it was about 31.5 pounds, an increase of less than 10 per cent. per unit of power developed. At 31 horse-power, a little more than quarter-load, the steam per horse-power per hour was, according to the test, 35.9 pounds, or an increase of about 20 per cent. per horse-power over the rate at normal load. Of course the proper basis for comparing the economy is the steam consumption per brake horse-power, for that is the useful work done by the engine. It will be seen that the steam consumption is about 30.3 pounds at full load; 35.5 pounds at half load, and 43.9 pounds per brake horse-power per hour.

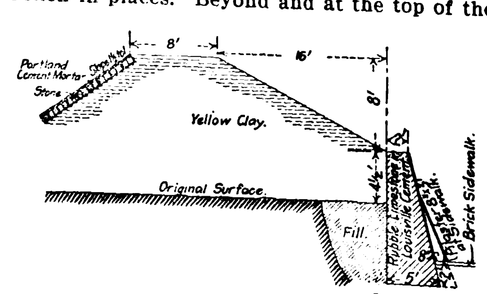


DUTY CURVES OF AUTOMATIC ENGINE.

The overload tests show that the economy falls off about as rapidly as the load is increased above the normal, as it does when the load is decreased from this point. The engine, it will be noticed, was tested to about 50 per cent. over its rating. When developing its rated power of 105 horse-power, the mean effective pressure would have to be about 52 pounds with the cylinder dimensions and rotative speed as given.

The Restriction of Watersheds as sources of municipal supply, to the communities nearest them, has been before the House of Commons twice this year. The first case, according to the "Journal of Gas Lighting," was when the authorities of Wolverhampton sought to improve their supply by drawing on sources at some distance from the borough. The House decided that the construction of the contemplated works would deprive the local landholders of water, to their injury, and the bill was accordingly thrown out. A few weeks ago the Rickmansworth & Uxbridge Valley Water Company sought power to take more water from an area which helps to feed the Thames. This was refused for the same reason. These decisions are in line with recent recommendations of the British Association of Water-Works Engineers and with the action of the Massachusetts State Board of Health in the matter of an increased supply for Springfield, and show that the fallacy of "water free as air" has about run its course in thickly populated districts.

A Retaining Wall holding back one side of a service reservoir at Ottumwa, Iowa, was recently shoved forward bodily on its base from 1 to 2 feet, except near the center, where 6 inches of the batter was taken up by a turning of the wall on its toe to that extent. The acompanying cross-section of the wall and embankment is given on the authority of City Engineer John T. Brady, who states that at the place marked fill, there had been a cave-in after the street grade was lowered, at which time the wall was built. The pilasters on the face of the wall were spaced 16 feet on centers. The sliding of the masonry followed the laying of a switch in the street, for which purpose some of the pavement was taken up. The bricks in the sidewalk were pushed up and the curbstone was broken in places. Beyond and at the top of the wall, the bank between the masonry and reservoir for a distance of about 12 feet back from the coping dropped 4 feet or more.



The Setting of Portland Cement is the subject of an interesting article by Mr. Gavin J. Burns, recently printed in the "Professional Notes" of the Surveyors' Institute. The pith of the article is given in the following quotation: "In order to watch the process of setting, a little