The peninsula reservoirs of the Spring Valley Water Co., San Francisco, have been in service for over 40 years, and no reductions have been made in their computed capacities because of the deposits of silt. Although no surveys of these reservoirs are available, those who are familiar with them state the silting is negligible.

Sedimentation Survey of La Grange Reservoir

An observation to determine the rate of sedimentation was made at the La Grange reservoir, on the Tuolumne River, by J. B. Lippincott for the Hydrographic Branch of the United States Geological Survey. The Tuolumne River is a typical Sierra stream draining the western slope of the Sierra Nevada in central California. The drainage area above the dam is 15,000 square miles, the greater portion of which is in the Yosemite National Park. The basin is heavily forested up to a 9000-ft. elevation. From there up to the crest of the range, which reaches to 13,000 ft., there are large areas of bare granite rock and numerous alpine meadows. Glacial lakes occur above 5000 ft. In the lower portion of the river are a few old gold stamp mills, the tailings from which are washed into the channel of the stream above the reservoir. The La Grange dam was built to divert the Tuolumne River into the Turlock and Modesto irrigation canals. It is an overflow type 120 ft. high. The reservoir is long and narrow, and its capacity compared with annual discharge of the stream is small. In 1895 a topographic survey of the reservoir site was made. In October, 1905, a second survey was made by Edward Johnson for the Geological Survey.

From Oct. 1, 1895, to Nov. 1, 1905, a period of 10 years and one month, 1264 acre-feet of silt were deposited, or 54.2% of the capacity of the reservoir.

Little or no precipitation occurs in the drainage basin between the first of April and the first of October.

LOSS IN CAPACITY OF LA GRANGE RESERVOIR, CALIFORNIA BY SILTING IN 10 YEARS

Contour	Area, Acres (In 1895)	Capacity, Acre-Feet (In 1895)	Area, Acres (In 1905)	Capacity, Acre-Feet (In 1905)
300	56.12	2,332.3	54.1	1,068
299*	....	....	....	1,914
290	48.90	2,060.8	39.6	600
280	42.07	1,571.8	21.3	296
270	33.83	1,151.1	12.1	129
260	25.97	812.8	6.0	39
250	21.45	553.1	1.2	3
245	....	....	0.0	0
240	16.67	338.6	....	.....
230	9.55	171.9	....	.....
220	6.66	76.4	....	.....
210	0.41	9.8	....	.....

*Crest of dam in 1905

During the winter months precipitation is in the form of snow, the melting of which produces summer floods.

The discharge of the river from Oct. 1, 1895, to Nov. 1, 1905, was 18,809,707 acre-feet. According to the surveys, the deposits of solids in the reservoir accumulating between these dates was 1264 acre-feet, or at the rate of 0.0067% of the stream flow.

The above data are interesting to hydraulic engineers as indicative of the small percentage of the stream flow that is deposited as silt in reservoirs. One is frequently confronted with the statement that the construction of a reservoir is prohibitive because of the muddy character of the stream and the consequent rapid accumulations of silt. Although this is true to some extent on muddy streams, such as the Rio Grande and the Colorado, it is a relief to know that there are some streams in California which refute this.

Bascule Bridge Is Erected as a Cantilever

Double-Leaf Market Street Structure at Chattanooga Placed by Means of Traveler Mounted on Deck of Span

By W. J. Howard
Engineer, Kelly-Atkinson Construction Co., Chicago

THE erection of a 300-ft. double-leaf rolling-lift bascule span as a pair of cantilevers, in order to avoid the use of falsework, was one of the most interesting features in the recently completed construction of the Market St. bridge at Chattanooga, Tenn. The bridge is about 2300 ft. long, including the approach fills. Besides the 300-ft. steel drawspan, it has five reinforced-concrete arches of 180-ft. span and two of 165-ft., besides nine 40-ft. concrete-slab spans. The accompanying views show some of the stages of the work.

Drawspan Erected in Closed Position

The steel drawspan was erected in its closed position (*A*, Fig. 1) by means of a timber traveler having a 55-ft. boom and a 32-ft. mast at one corner of its 20 x 40-ft. frame. It was mounted on rollers and pulled ahead by a manila runner line as required (*B*, Fig. 1). The traveler was placed at one side of the deck (between the lower chords of the trusses), so that the push-car with material could be brought to it and the boom swung to pick up the material and erect it in place without shifting the traveler.

The three-drum, 30-hp. American hoisting engine (with cylinders 8¼ x 10 in.) was mounted at the rear of the traveler frame. The coal bunker and water tank were also placed there for additional ballast. For some heavy lifts the traveler was anchored to the span. One 3-sheave and one 4-sheave block were used for the topping lift, and two 3-sheave blocks for the hoisting line. All the rigging was of ⅝-in. steel cable. The heaviest pieces handled by the traveler were the 14-ton main post (N.O.-L.O.) and the 11-ton end sections of the chords (*C*, Fig. 1).

Forms Three-Hinged Arch When Closed

The 22-ton rocker sections were unloaded from the cars to the tramway push-car, and then unloaded and erected on the roller castings by jacks. The counterweight truss and cantilever truss to panel No. 3 were then erected, and the whole pulled back and anchored so as to give the end of the leaf an elevation of about 4 ft. when erected. The second leaf was erected at its proper elevation. This plan (*A*, Fig. 1) was adopted so that the end sections of the chords, which telescope to form a three-hinged arch when the bridge is closed, could be erected without cutting them apart or raising the bridge.

The steel of the counterweight truss balanced the main truss as far as panel No. 3, and falsework and forms were then placed for concreting the counterweight (*D*, Fig. 1). Owing to the slab construction of the deck of the concrete arch span on which this falsework was erected, and the use of 8 x 10-in. posts for supporting the counterweight, only 310 cu.yd. (of

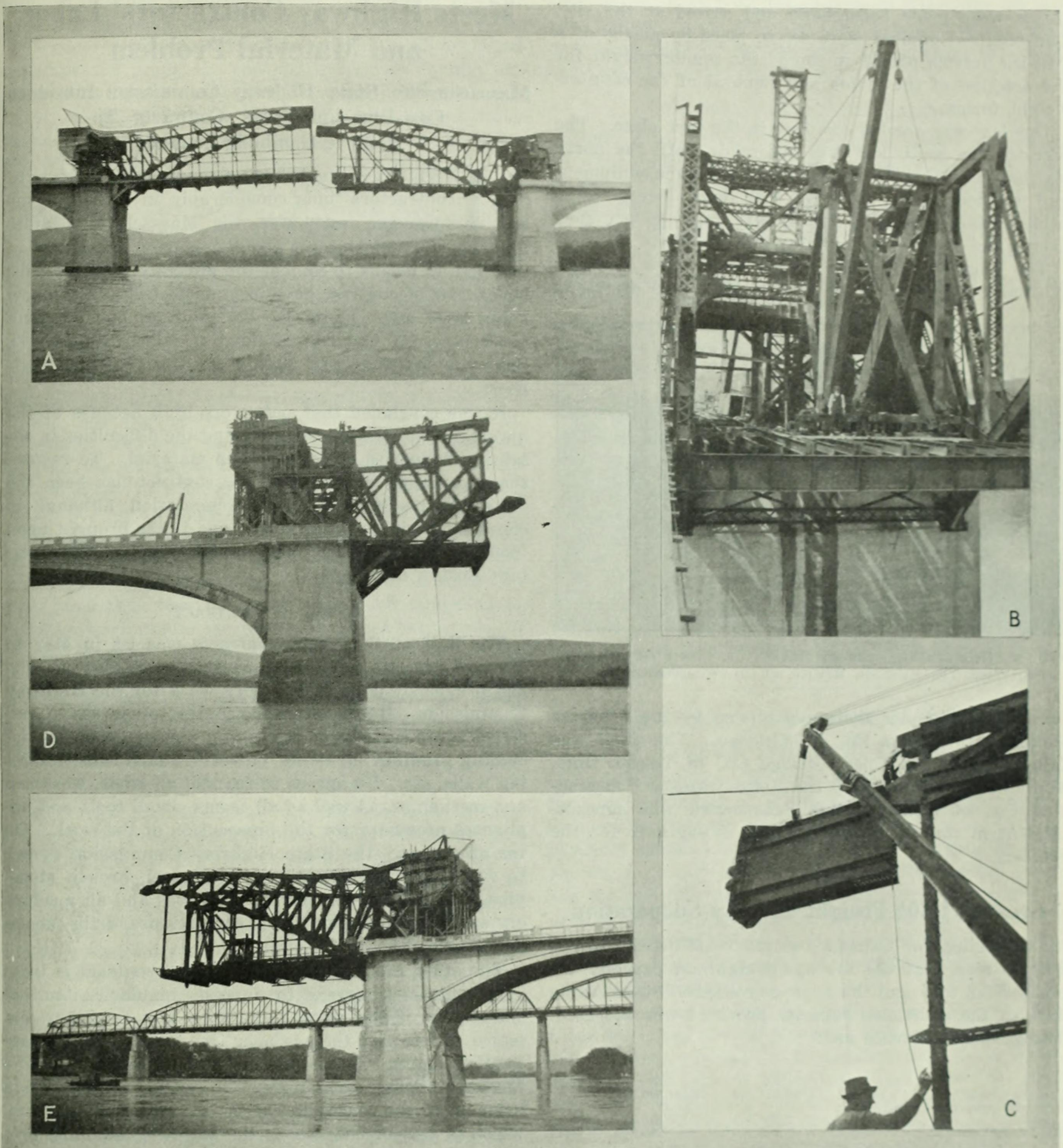

FIG. 1. CANTILEVER ERECTION OF 300-FT. BASCULE BRIDGE OVER THE TENNESSEE RIVER AT CHATTANOOGA, TENN.

A—Leaves were erected at different elevations to avoid interference of chords. B—Traveler at side of bridge floor. C—Traveler placing 11-ton end section of top chord. D—Cantilever erected for three panels; derrick on arch span hoists concrete materials for counterweight. E—Concrete counterweight balancing cantilever and traveler; derrick on top for setting motors and counterweight blocks

the 744-yd. total) was placed at first. Then the erection of the steel span was continued to panel No. 5, the balance of the concrete being poured while the steel was being erected (*E*, Fig. 1).

Sand and gravel for the concrete were delivered on barges, which were moored to the pier directly under the counterweight. The right proportions of sand and gravel were filled into a drop-bottom bucket, which was then hoisted by a stiff-leg derrick (*D*, Fig. 1) and dumped directly into the ½-yd. Smith mixer. The concrete was hoisted in a Lakewood self-dumping bucket in a 90-ft. tower, and spouted to the forms. About 100 yd. of concrete per 10-hour day was placed in this manner.

The concrete was so proportioned as to weigh 140 lb. per cu.ft., to give the required load. An opening was left in the counterweight for placing concrete adjusting blocks, which weighed about 1100 lb. each. These blocks were made beforehand and stored at the site. The required number were set in place by means of a stiff-leg derrick placed on top of the counterweight for the erection of the motor and removal of the counterweight forms.

One leaf was erected complete in the first place. The pier for the south leaf was not ready until the north leaf had been almost completed, and the same equipment and methods were followed with both leaves. The bridge was completed by July 1, 1917, ready to be turned over to the county board of Hamilton County.

The engineers for the entire work were Greiner, Whitman & Spiker, of Baltimore, Md. The drawspan

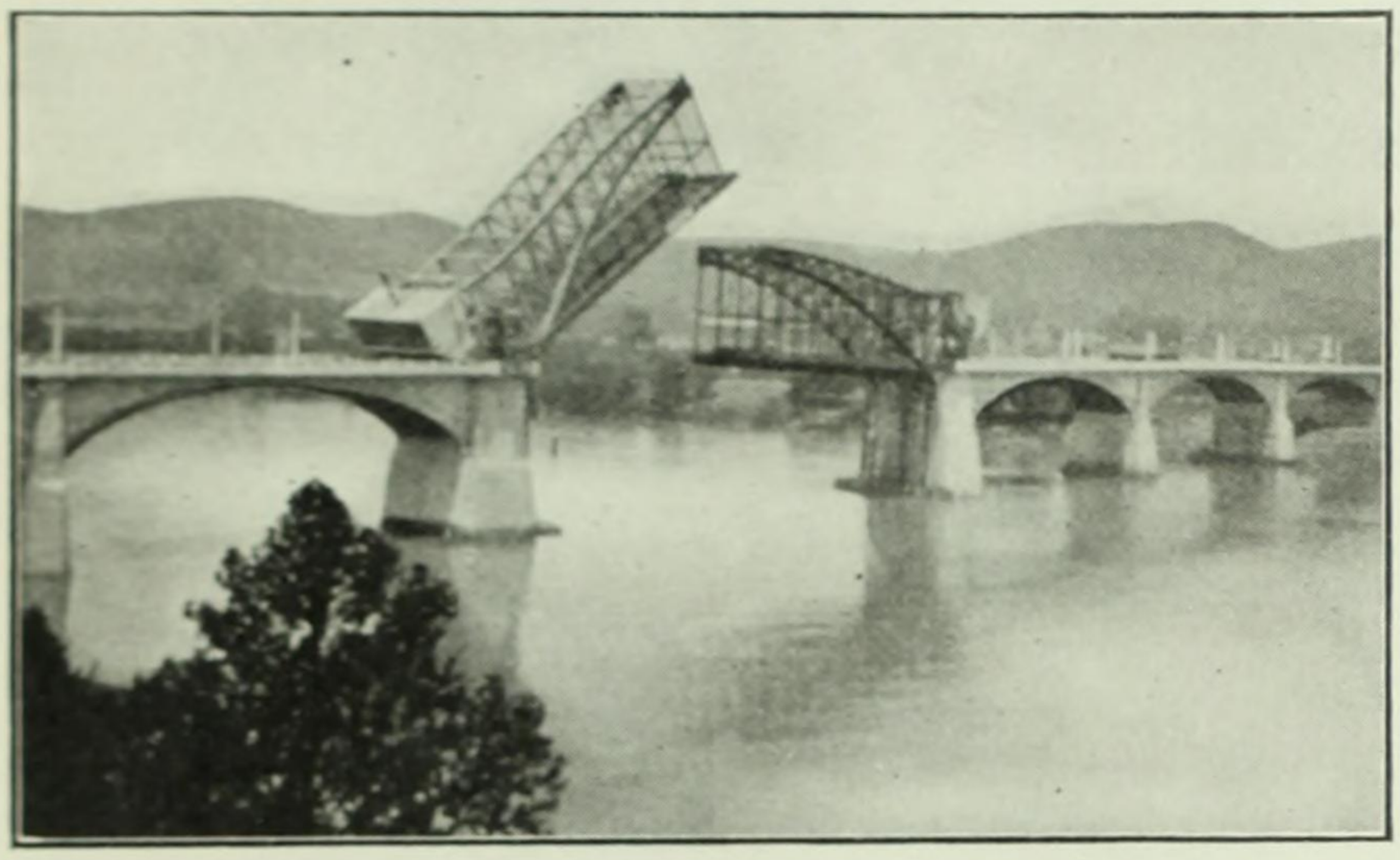

FIG. 2. COMPLETED 300-FT. BASCULE SPAN OF BRIDGE OVER THE TENNESSEE RIVER AT CHATTANOOGA, TENN.

was designed under their supervision by the Scherzer Rolling-Lift Bridge Co., of Chicago. The steel was fabricated by the Toledo Bridge Co., of Toledo, Ohio. The erection was done by the Kelly-Atkinson Construction Co., of Chicago; Gus Schenewerk was superintendent in charge, and the writer is engineer for the erectors.

Create 54,800 Freight Cars by Coöperation

Comparing, for Canada, the years 1907 and 1915, it will be seen that the average freight-car capacity increased 5.8 tons and the average contents 3 tons, while 48% of the additional capacity provided was not used. The general statistics are:

Items	1907	1915	% Increase
Total tons freight carried 1 mile	11,687,711,830	17,661,309,723	51.1
Aggregate capacity of freight cars, in tons	2,908,903	6,731,265	131.4
Total freight cars	105,540	201,690	91.1

The difference in capacity and contents between the average 1907 car and the average 1915 car is represented by the figures: Capacity, 27.6 tons, and contents, 15.4 tons, in 1907; capacity, 33.4 tons, and contents, 18.4 tons, in 1915. Material gains in freight-handling efficiency could be made by increasing the load. An average 1915 load of 18.4 tons, if increased by 5 tons, would be equivalent to placing 54,800 additional cars in service. Shippers should be urged to coöperate with the railroads in their endeavor to increase the existing carrying capacity by using the present available rolling stock to better advantage. Light bulky commodities, of which there are many, should be loaded to the full cubic capacity of cars, while heavier freight should be loaded to the full carrying capacity.

Meets Highway Contractors' Labor and Material Problem

Massachusetts State Highway Commission Introduce Cost-Plus-Unit-Profit Contracts To Remove Gambling Element

MEETING at the outset of the season's work with contractors' bids considerably in excess of the engineers' estimates, the Massachusetts State Highway Commission set about analyzing the situation and finding means to combat the difficulty. As a result, new forms of contract have been developed and are now being tried out. These are the joint product of many conferences of the commission, of which William D. Sohier is chairman and Arthur W. Dean is chief engineer.

It was concluded that bids were high because of the uncertainty of the labor supply and the difficulties in obtaining deliveries of construction material. To remove these gambling elements of the contract has been the object of the State Highway Commission, although in conscientiously working to that end it has brought upon itself and its chief engineer much criticism from certain Boston newspapers.

TERMS OF CONTRACT

The first of these new contracts was let in May to Michael Serretto, an Italian contractor of Boston, who had previously done satisfactory work for the Highway Commission. By its terms the contractor agrees to construct seven sections of road in the western counties, including grading, surfacing, culverts, guard rails, retaining walls, etc. He agrees to furnish all labor, workmen and mechanics, as well as all teams, small tools and appliances necessary for the prosecution of the work. On the other hand, the State Highway Commission agrees to furnish all materials such as gravel, broken stone, pipe, cement, etc., as well as explosives and all machinery such as power pumps, air compressors, drills, steam shovels, etc.

The other interesting feature of the contract is this: The contractor agrees to furnish regularly itemized statements of the amounts paid by him for labor and teams, and to give the engineer free and constant access to all accounts, bills and vouchers relating thereto. The Highway Commission agrees to weekly or bi-weekly payment to the contractor of the amount of his payroll, which is kept or checked by the Highway Commission's inspector or engineer and sworn to before a notary public by the contractor. The contractor is the actual employer and takes all responsibility under the state and national employers' liability laws. By this particular contract, however, the State Highway Commission pays for insurance under the Workmen's Compensation Act as a part of the labor cost. An 8-hour day is specified in the contract, and the men are allowed to board as they see fit.

The contractor agrees to give his personal attention to the faithful prosecution of the work, and he cannot assign or sublet any part of it without the consent of the commission. He agrees to pay all his bills promptly and to allow the Highway Commission to withhold any sums due him for satisfying legitimate claims against