the big brush bundle previously launched at such place. The top end of this single brush bundle was made to rest over on the bank formation. This process was continued until a close brush riprap had covered the face of the entire bank formation between the dikes. Then a second series of big brush bundles were manufactured and launched off and against the face of the brush riprap.

The writer has now completed a description of the method of securing a bank formation along the river front. By the first of July the bank formation at the upper end of the work was in good condition to begin filling on with earth. Resort had to be had to team haulage from the point of the bluff shown in Fig. 5. This work was prosecuted with vigor, and by the first of November a fill had been made ample in width west of the right of way of the Burlington railroad to permit the laying of a single track; and by the 15th of November a single track had been built from the connection with the Stock Yards Belt Line to a connection with the Chicago Great Western Railway north of Jule street. This railway had been incorporated under the name of the Union Terminal Railway, with Mr. John Donovan as its president. It was located and built so as to have a connection with all other railway lines in St. Joseph.

In November, 1902, the writer submitted to Mr. Donovan a detailed plan and estimates for the bank reclamation above described. In August, 1903, he requested a recapitulation of the plan and costs and also estimates for the construction of a front line dike, which would secure the reclamation of about 25 acres above the Grand Island bridge. It was finally determined to begin the work under the plan submitted in 1902.

No changes were made in the estimates. The dike work, bank formation and earth filling were completed well within the estimate with results as hereinbefore shown. The writer is confident that the work so done would have remained permanent if it had been thoroughly protected by the brush and rock riprap, as above described. However, Mr. Donovan desired to have the front line dike built in order to effect the reclamation of the land, as described, above the Grand Island bridge to use for railway purposes.

In 1905 the front line dike was built by Mr. S. W. Fox. A very excellent work was put in and the reclamation effected.

In giving this history of river bank protection the writer has undertaken to show the record of all the work done by private enterprise, and the effectiveness of the work.

If only the protection of the river bank is sought, then the Thompson plan of dike is sufficient to stop and prevent erosion. The dike being built upon an incline from the shore end to the outer end, and so as to be driven as low as the lowest low water, and built at a slight angle down stream. The results at all times and with all stages of water is that the flow is turned from the bank towards the center of the stream, and the flowing of the water over the submerged part of the dike prevents the eddy below, and tranquil water is maintained along the bank. The bank thus protected may be covered with a brush and rock riprap, so as to be reinforced against very high floods.

Pacific Type Locomotives for the D. L. & W. R. R.

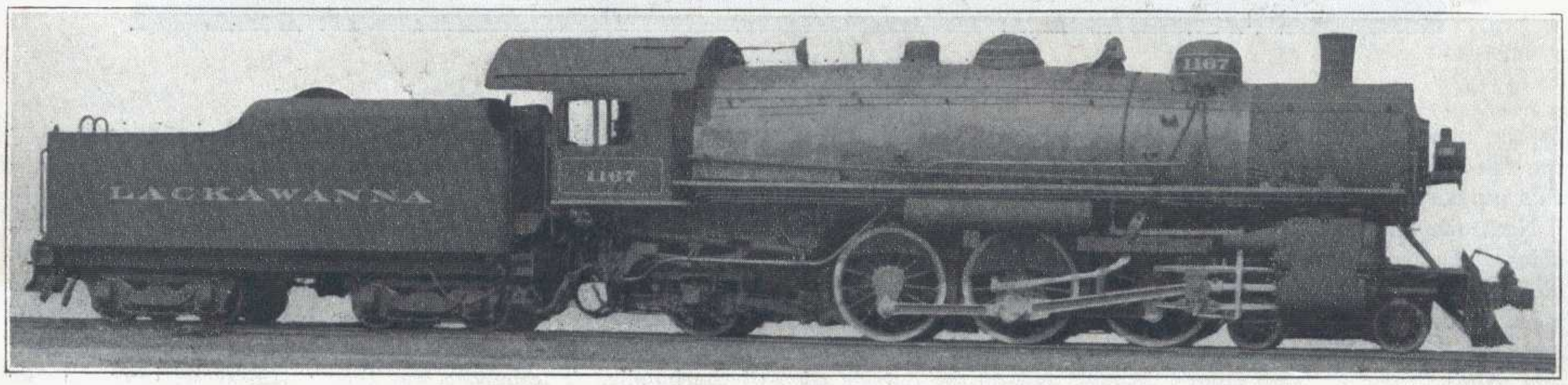
By S. S. Riegel.

The use of Pacific type locomotives for freight service is sufficiently unusual to attract attention. The road to which these engines have been delivered has found this type of power well adapted to the needs of its fast freight service, so much so that the engines constituting the present order are in a large measure, a repeat order for power of a type placed in service a year or so ago. An interesting detail is the type of drifting valve applied, same being illustrated herewith.

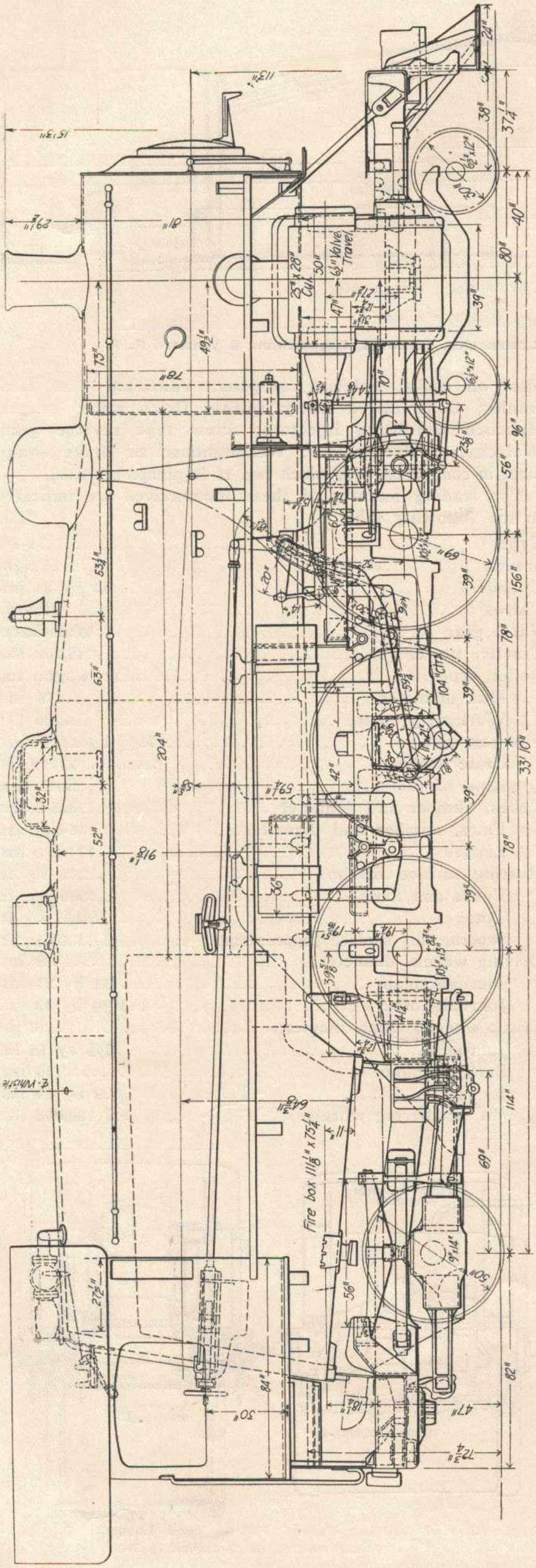
The Delaware, Lackawanna & Western R. R. is now receiving from the Lima Locomotive Corporation a lot of fourteen rather interesting locomotives of the Pacific type for fast freight service. These engines were designed under the supervision of H. C. Manchester, superintendent of motive power and equipment of the Lackawanna, at Scranton, Pa. The engines were designed to handle manifest freight trains and resemble, with some improvements, a similar lot of engines secured a year ago, for the same service, and which have proven very satisfactory. The principal item of change in the present engines is the introduction of a 36-inch combustion chamber with a consequent reduction of the length of flues. This change has enlarged the boiler at its greatest diameter and added to the engines a slight increase in weight, which doubtlessly has benefited the steaming qualities of the engines and to some extent added slightly to their hauling capacity.

As the engines are frequently expected to do head end work front couplers are provided with Miner friction draft rigging, which in this type is a very compact and satisfactory arrangement.

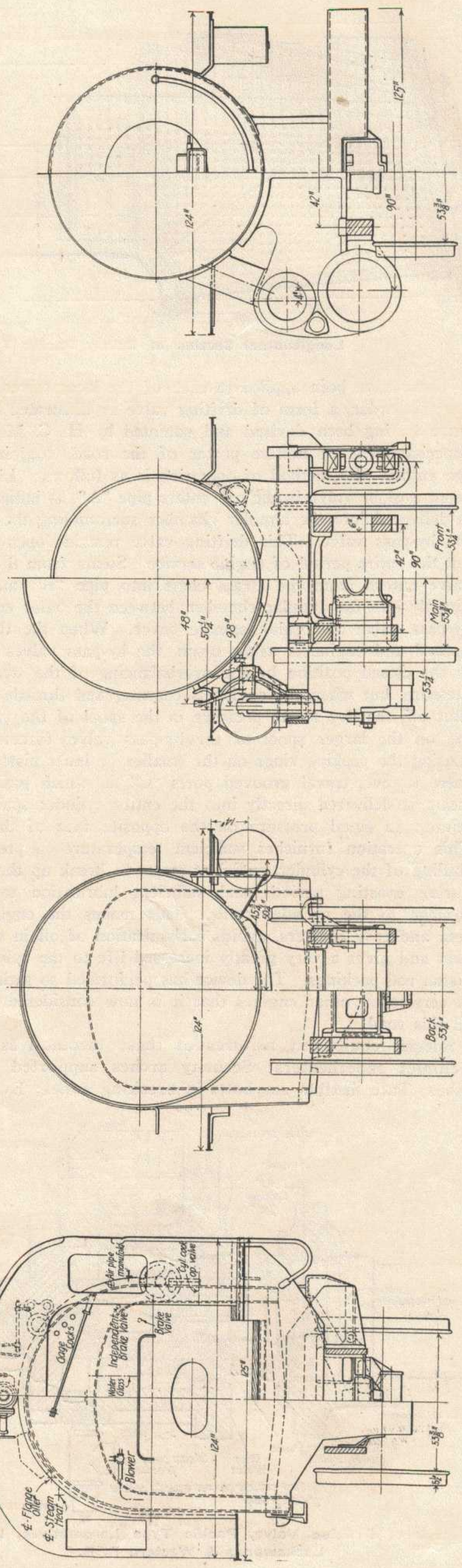
The engine truck is provided with the Woodard inverted link self centering engine truck device; the main driving boxes are the long type, 21 inches in length; radial buffers are employed between engine and tender; Franklin butterfly fire doors and Economy type grate shaker brackets are used; low type tank wells which provide full opening water supply when in use and when closed permit the water in the tank hose to blow back into the tank so as to leave the hose dry against freezing in winter weather, have also been provided. These tank wells are operated from the ground and entirely dispense with the ordinary upper operating riggings. The boilers are provided with auxiliary manhole domes so that the interior of the boilers may be inspected without removal of the throttle valve and a special form single manifold cab turret is used, so arranged that it can be removed from the boiler for necessary repairs with the full steam pressure on the boiler.



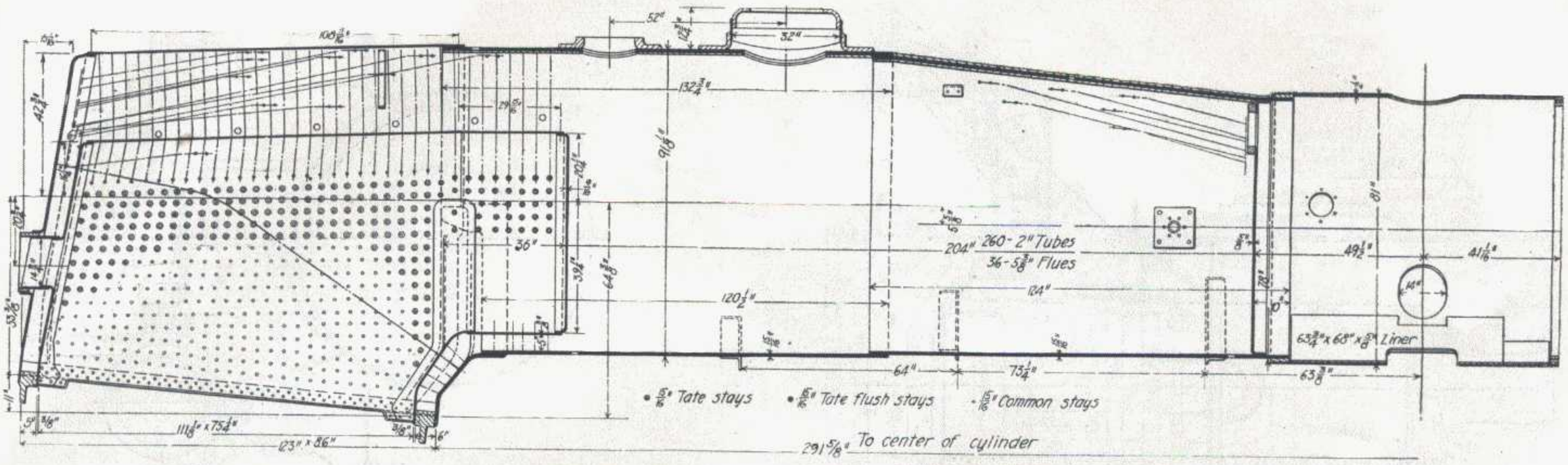
Pacific Type Freight Locomotive, Delaware, Lackawanna & Western R. R.



Elevation, Pacific Type Freight Locomotive, Delaware, Lackawanna & Western R. R.



Cross Sections, Pacific Type Freight Locomotive, Delaware, Lackawanna & Western R. R.



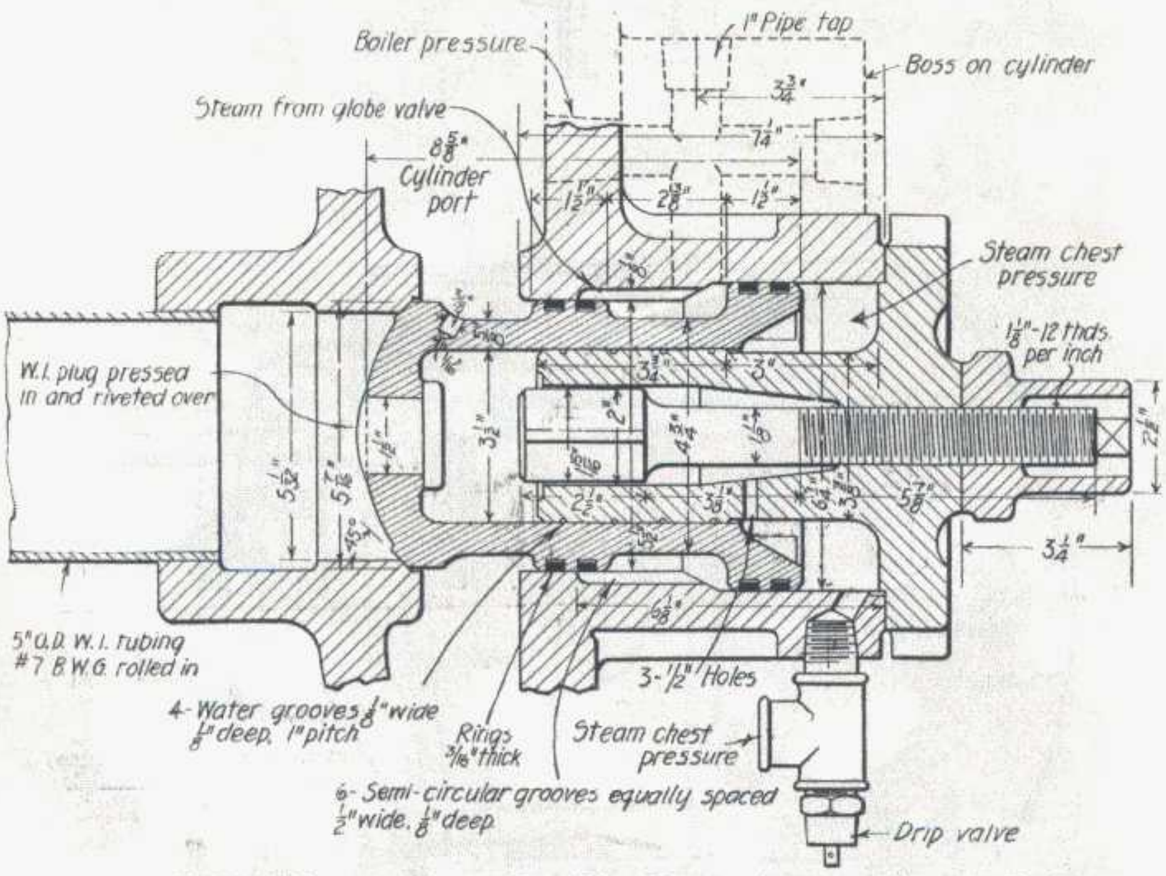
Longitudinal Section of Boiler, Pacific Type Freight Locomotive, Delaware, Lackawanna & Western R. R.

There have been applied to each of the locomotives comprising this order, a form of drifting valve as illustrated herewith, same having been devised and patented by H. C. Manchester, superintendent of motive power of the road, conjointly with the author. Its method of operation is as follows: Live steam from a globe valve in the cab enters pipe "A", as indicated, and is delivered into the annular chamber surrounding the spool of the by-pass valve. This drifting valve remains open throughout the entire period of engine service. Steam from the throttle valve enters from the steam chest into pipe "B", and passes directly into the annular chamber, between the outer end of the by-pass valve and guide spindle cover. When the throttle is opened and engine is using steam, the by-pass valves are held in the closed position by the overbalancing of the steam chest pressure, but when the engine is coasting and throttle steam is shut off, the live steam pressure in the spool of the valve, acting on the larger spool of the by-pass valve, forces it open, causing the packing rings on the smaller or inner piston of this valve to over-travel grooved ports "C", in which position live steam is delivered directly into the entire cylinder space, maintaining an equal pressure on the opposite face of the piston. This operation furnishes sufficient temperature to prevent the chilling of the cylinder, sufficient steam to break up the vacuum during coasting periods and sufficient lubrication to prevent damage to the cylinder walls. This makes the engines very free and easy coasters, avoids carbonization of oil in the cylinders and gives a very greatly increased life to the cylinder and piston rod packings. The device has performed so satisfactorily in service on other engines that it is now considered standard on this road.

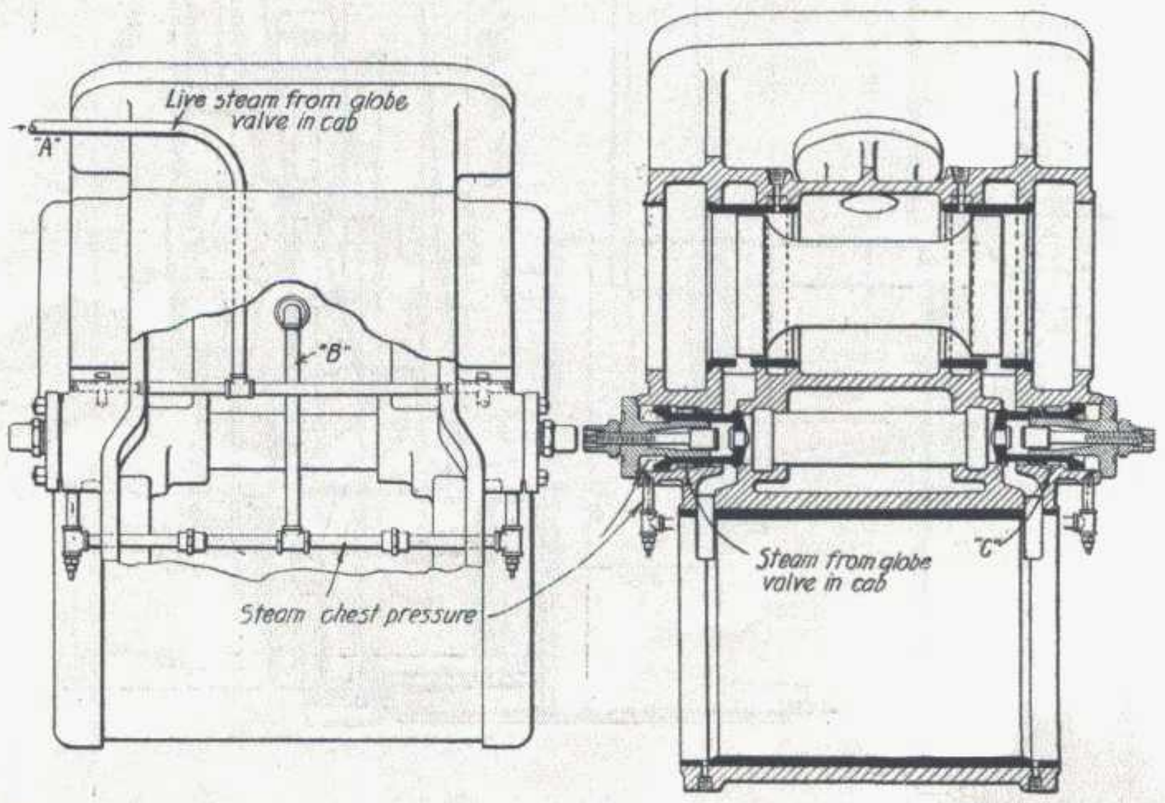
Special equipment features of these locomotives include Schmidt superheaters; Security arches supported on arch tubes; Tate flexible staybolts in breaking zones; Everlasting blow off cocks; Talmage ashpans; Vanadium cast steel frames; Consolidated safety valves; Delco water gauges; Hancock non-lifting injectors; screw type reverse gear; Walschaert valve motion; Westinghouse air brake equipment in connection with which two 11-ft. pumps are used.

The leading features of these locomotives are indicated in the following table:

Type	4-6-2
Service	Freight
Cylinders	25 by 28 ins.
Valves	Piston
Valve gear	Walschaert
Tractive power	43,200 lbs.
Boiler, type	Ext. wagon top
Min. diameter	78 ins.
Working pressure	200 lbs.
Fire-box, size	75¼ by 111⅛ ins.
Grate area	58 sq. ft.
Kind of fuel	Soft coal
Tubes, number and diameter	625-2 ins.
Flues, number and diameter	36-5⅜ ins.
Length	17 ft. 0 ins.
Heating surface, fire-box	279 sq. ft.
Tubes and flues	3279 sq. ft.
Total	3558 sq. ft.
Superheating surface (approximate)	1000 sq. ft.
Driving wheels, diameter	69 ins.
Journals, main	11 by 21 ins.
Journals, others	10½ by 13 ins.
Truck wheels, front, diameter	30 ins
Journals	6½ by 12 ins
Back, diameter	50 ins.
Journals	9 by 14 ins.
Weight, on driving wheels	188,000 lbs.



Details of Drifting Valve, Pacific Type Locomotives, Delaware, Lackawanna & Western R. R.



Application of Drifting Valves, Pacific Type Locomotives, Delaware, Lackawanna & Western R. R.

Total engine	291 lbs.
Total engine and tender	456,000 lbs.
Wheel base, driving	13 ft. 0 ins.
Total engine	33 ft. 10 ins.
Total engine and tender	66 ft. 4 ins.
Tender, capacity water	9000 gals.
Capacity, coal	10 tons

The Air-Brake Story Contest.

ANNOUNCEMENT OF PRIZE WINNERS.

Our readers are familiar with the offer made by the Westinghouse Air-Brake Company, of large prizes for the best true stories illustrating the value of the air-brake. The competition was open only to men in railway service and the prizes were liberal enough to call out the best material obtainable. Not many railway men who rank as "officials" seem to have had confidence enough in their own literary ability to enter the lists, although the first prize was one thousand dollars. The men who handle the throttle and those who assist them in operating the trains came up in an army of nearly 250. There was a wealth of incident and narrative which in the hands of skilled literary workers would have been good material for publication. But only sixty really qualified for consideration by the judges; and there were only six prizes to be awarded.

The state of Indiana has again justified its literary reputation by carrying off the first prize, which has been awarded to James Cain, a locomotive engineer of the Wabash R. R., at Peru, Ind.

The other prizes were awarded as follows:

Second—H. C. Woodbridge, general manager's special representative, B., R. & P. R. R., Rochester, N. Y.

Third—Alex. M. Stewart, engineer, Illinois Central R. R., McComb City, Miss.

Fourth—D. Oxenford, road foreman of engines, Lehigh Valley R. R., New York.

Fifth—Carl H. Fuller, chief engineer Macon Ry. & Light Co., Macon, Ga.

Sixth—Millard F. Cox, assistant superintendent of machinery, Louisville & Nashville R. R.

While these were all the prizes provided, the judges deemed some fifteen of the stories of such excellence as to call for "honorable mention" on their part. The authors were as follows, no attempt being made to grade them or to list them in the order of merit:

J. S. Quinn, Malden, Mass.

S. H. Lane, Harrisburg, Pa.

Elmer Groff, C., M. & St. P. roundhouse, Dubuque, Iowa.

Karl W. Muhl, engineer, Western Pacific, Elks, Nevada.

M. L. Phelps, superintendent, Colorado Midland, Colorado City, Colo.

G. H. Wilson, engineer, A. T. & S. F., Chanute, Kansas.

W. A. Kline, R. F. E., Central of Georgia Ry., Columbus, Ga.

Ernest Cordeal, statistican, St. L. & San Francisco R. R., St. Louis, Mo.

Frank J. Borer, foreman air-brake department, Central R. R. of N. J., Roselle, N. J.

Wm. A. Murphy, engineer, St. Joseph & Grand Island R. R., St. Joseph, Mo.

Geo. Frederick, instructor, P. W. & B. R. R., Wilmington, Delaware.

C. Kugle, Middletown, Pa.

J. E. Daly, Xenia, Ohio.

Jas. G. Smeltzer, air brake inspector, Philadelphia & Reading, Philadelphia, Pa.

Jas. L. Cole, New Castle, Pa.

In passing upon the merits of the stories the judges were in complete ignorance of who the authors were.

No announcement is as yet made regarding the use to be made of this unique collection of true stories. They are full of life and incident, and will be of fascinating interest to any reader. The idea of a contribution of this kind as a memorial to Mr. Geo. Westinghouse was a very happy one. If the highest literary genius has not been found in the railway staff of the country, there is compensation in the truth and loyal conviction of the men whose hands are accustomed to other engines than the pen, and who are on the firing line of the world's progress.

Proposed Government Railroad Building in Utah.

A bill was introduced in congress September 14, by James W. Bryan, congressman from Washington, which if enacted will authorize the United States Department of Agriculture to build a railroad from Marysvale, Utah, into the Kaibab national forest. It is estimated that the cost of the road will be $3,000,000, and that the increased value of the timber to the government will reach $4,000,000. The object of the road is to give the government adequate returns on its stumpage which has been advertised for sale. It is about 200 miles from Marysvale to the Kaibab forest, and the government has made an allowance of $2.45 a thousand board feet on account of the lack of transportation facilities over the country. The country is extremely rough, and it is claimed by railroad officials that the tonnage would not be sufficient to justify the construction of a road under present conditions. Congressman Bryan proposes that the government own and operate the road. He stated that the forest contains more than 2,000,000,000 feet of timber, and that one-half of it is going to waste. Railroad connection would be with the Denver & Rio Grande at Marysvale.

The introduction of the bill was prompted in part by a favorable report of Chief Forester H. S. Graves, which reads as follows:

"From the standpoint of commercial returns to the government, logical business arguments may be advanced for railroad construction under such conditions, assuming always that it is to be the public policy to develop these areas immediately rather than wait for more gradual development from private initiative. It was necessary in appraising the Kaibab timber to allow aggregate profits to the operator for railroad transportation of logs and lumber of $2.45 per 1000 board feet. This is aside from the cost of operating the road and from any depreciation or sinking fund charges to recover the initial investment. If the government itself built the railroad, the greater part of this amount could be added to the sale value of the timber. The Kaibab national forest contains, all told, some 2,000,000,000 feet of stumpage. Unquestionably the construction of a railroad would increase its average value at least $2 per 1000 feet. The total increase would thus approximate $4,000,000, or considerably more than the estimated cost of the railroad. This amount might, of course, be created separately to railroad earnings instead of to increased value of the timber.

"Aside, however, from opening up the national forest, such railroads would greatly benefit many adjacent sections, which are now shut off from markets, and stimulate the development and use of much unpreserved public land, which now is comparatively idle. The Kaibab railroad, for example, would traverse a rich agricultural, grazing and mineral district in southern Utah and northern Arizona, whose development would be greatly hastened by government construction of the road."