

Tender, wheels	No. 8
Tender, wheels, diam.....	33½ in.
Tender, journals	5½x10 in.
Tender, tank cap.....	8500 gals. water, 12 tons coal
Tender, service	Passenger

Train Staff Operation on New Zealand Railways.

During the past eight months the train staff system in operation on the railways of New Zealand has been the subject of numerous inquiries from railway men in the United States, and this fact has induced the consular department of our government to investigate and make a report on the system. This report comes from Consul-General F. Dillingham, located at Auckland, the details being supplied by the general manager. We give the report nearly in full, omitting only the part which describes the purpose of the staff system, with which signal engineers are quite familiar. Other readers will find the staff system described many times in the files of the Railway and Engineering Review,

Except as provided in Regulations 27a, 28 and 31, an engineer will render himself liable to dismissal if he leaves a tablet station without the tablet for that section of the line over which he is about to run, or unless it has been shown to him as required by the following paragraph, and by Regulation 18.

When a train has more than one engine in front, or when two or more light engines are coupled together, the tablet must be shown to each engineer, and be delivered to and carried by the engineer of the last engine.

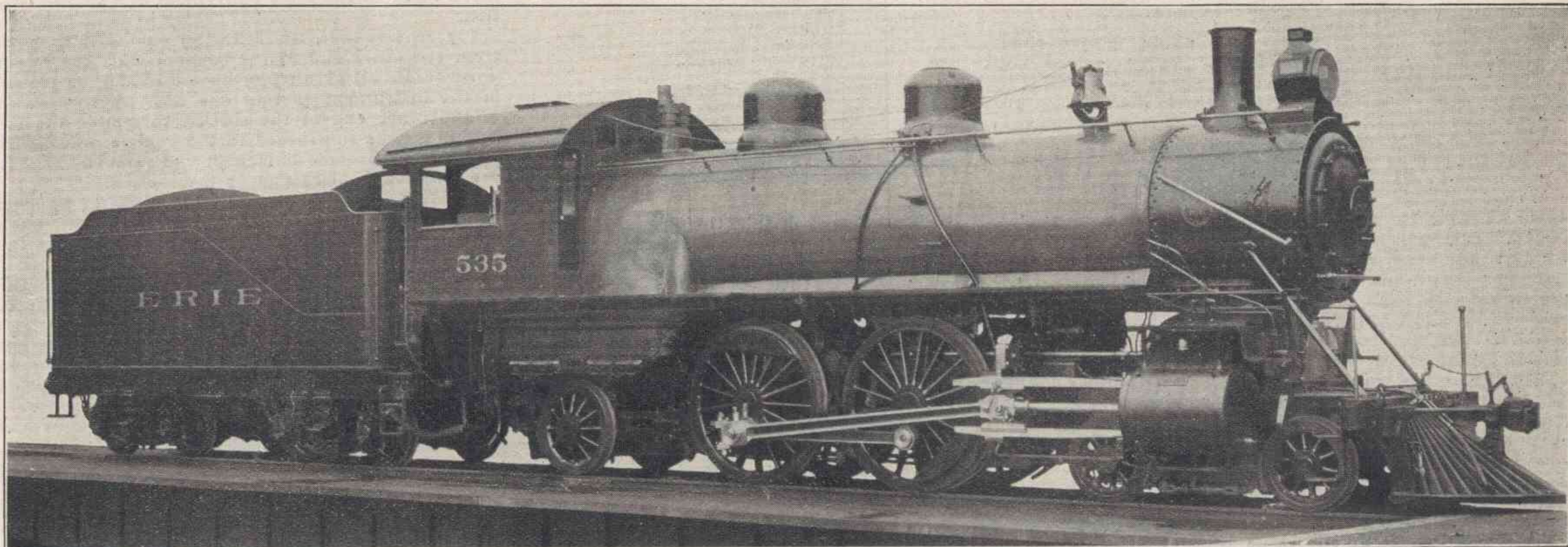
After receiving the tablet the engineer must not proceed until all the necessary fixed or other signals have been exhibited. He must keep the tablet under his own charge (except as explained in Regulations 27, 27a and 34) until he reaches the end of the section, when he must give it up to the signalman or other duly authorized person. The tablet is an indication that the line is clear only to the home signal at the station or junction in advance, and engineers must regulate the speed of their trains accordingly.

Engineers must be extremely careful not to take

tions the signals in both directions must be kept at "Danger," and when the train which has to be first admitted into the station has been brought to a stand, or nearly to a stand, the home signal applicable to such train may be lowered to allow it to draw forward to the station or to the starting signal, and after it has again come to a stand and the signalman has seen that the line on which the other train will arrive is quite clear the necessary signals for that train may also be lowered.

(b) Where starting signals or advanced starting signals are provided, except in the cases referred to in Regulations 27, 27a, 28 and 31, the starting signal or the advanced starting signal must not be lowered until a tablet has been obtained for the train to proceed to the tablet station in advance.

No private signals of any kind may be sent by the bell. All signals must be sent slowly and distinctly, the bell plunger or key being allowed to work the full length of its stroke between each beat, and under no circumstances may the officer in charge work with two stations at the same time. The time at which all signals are sent or received shall be immediately entered in the train-register



Ealdwin 4-Cylinder Compound Locomotive, Erie R. R.

most recently in the issues for Oct. 22, 1904, page 758, and for Dec. 31, 1904, page 980. The subject is treated historically in the issue for Nov. 2, 1901.

In New Zealand the train staff is known as the "electric tablet system," and the apparatus, illustrated herewith, consists essentially of a slide, R; a bell plunger, B; a switch plunger, C; a slide, S; a visual signal, V, showing three positions—"Line closed," "Up train approaching," or "Down train approaching," and "Up train on line," or "Down train on line;" a slot, T, and an indicator, I.

The slide R is for the purpose of inserting tablets into the apparatus, and can be withdrawn at will. The bell plunger serves to transmit all signals on the bells, according to the code. The switch plunger C is for the purpose of switching the current into electro-magnets to unlock slide S.

The slide S is kept locked, and can not be withdrawn without the consent and co-operation of the man at the distant station after signals have been exchanged in accordance with the code. The slot T is to show the tablets in the cylinder of the apparatus. The indicator I indicates all signals sent on the bell plunger from either end.

What follows consists of the general regulations, which we give in full. Whenever the term "officer in charge" is used it is understood to mean the station master, signalman, or other employee who is in charge of the tablet apparatus for the time being.

GENERAL REGULATIONS.

Custody and Transference of Tablet.

Except as provided in Regulation 23, the officer in charge of the tablet working for the time being is the sole person authorized to take a tablet from or place it in the instrument, and to receive the tablet from and deliver it to the engineer, provided, however, that the officer in charge of the tablet working may, in exceptional cases, specially appoint a member of the station staff, duly qualified to act, and delegate to such member the duty of delivering the tablet to and receiving it from the engineer. The member so appointed will be held responsible for the safe custody of the tablet given him, and for the prompt and proper discharge of the duty assigned to him. The engineer, while the tablet is in his charge, must carry it in the socket or other place provided for the purpose. Under no circumstances, except as provided in Regulations 10, 27 and 27a, must a tablet be transferred from one train to another without being passed through the instrument and dealt with in accordance with these regulations. The number of the tablet carried by each train must be entered in the train register book.

the tablet beyond the station at which it ought to be left.

Engineers must reduce the speed of their trains when passing a tablet station at which they are not scheduled to stop, so as to admit of their safely delivering and receiving the train tablet.

The person in charge of the tablet working will render himself liable to severe punishment should he contribute to any irregularity in the tablet working.

Each tablet has engraved or marked on it the name of the tablet station at each end of the section to which it applies, and the tablets of adjoining sections are different in shape.

Normal Position of Fixed Signals.

(a) "Danger" signals must be kept exhibited at all the fixed signals at tablet stations except when it is necessary to lower or turn them off for a train to pass, and before any signal is lowered or turned off care must be taken to ascertain that the line on which the train is about to run is clear and that these and other regulations have been duly complied with.

(b) At places which are not tablet stations the "All right" signal must, unless special instructions to the contrary are issued, be kept exhibited at all the fixed signals (where such signals are provided), except when required to be placed at "Danger" for the protection of trains having to stop in the section or of any other obstruction that may exist on the main line which the signals are intended to protect.

Working Fixed Signals.

(a) When trains which have to pass each other are approaching a tablet station in opposite direc-

book in ink, "speak on telephone" signals excepted. If the officer in charge receives a signal which he does not understand, he must immediately stop any train from entering the section and reply by giving the "Repeat" signal. No signal is complete until it is correctly acknowledged, and all signals must be slowly repeated until properly acknowledged.

When the tablet instruments are not in use the words "Line closed" are shown on the screens and the needle indicators are in the vertical position.

Bell Signals.

The instruments must not under any circumstance be subjected to violent usage, and all movements should be steady and distinct one from the other.

As it is essential that the tablets be free from dirt and grit, the officer in charge must, when necessary, wipe the tablets on both sides before placing them in the slide.

SPECIAL REGULATIONS REGARDING USE OF SIGNALS AND APPARATUS.

1. Tablet and Telephone Switch.

At stations where the telephone is operated upon the same wire as the tablet instruments, by means of a switch, when it is necessary to speak on the telephone, give one beat on the tablet bell plunger, and when this signal is acknowledged turn switch to "up" or "down" telephone, as the case may be, and speak. The officer in charge receiving the telephone signal must, after acknowledging, also turn his switch to "up" or "down" telephone, as the case may be, and listen. When speaking is finished the switches must at once be turned to their normal position again.

2. Repetition and Acknowledgment of Signals.

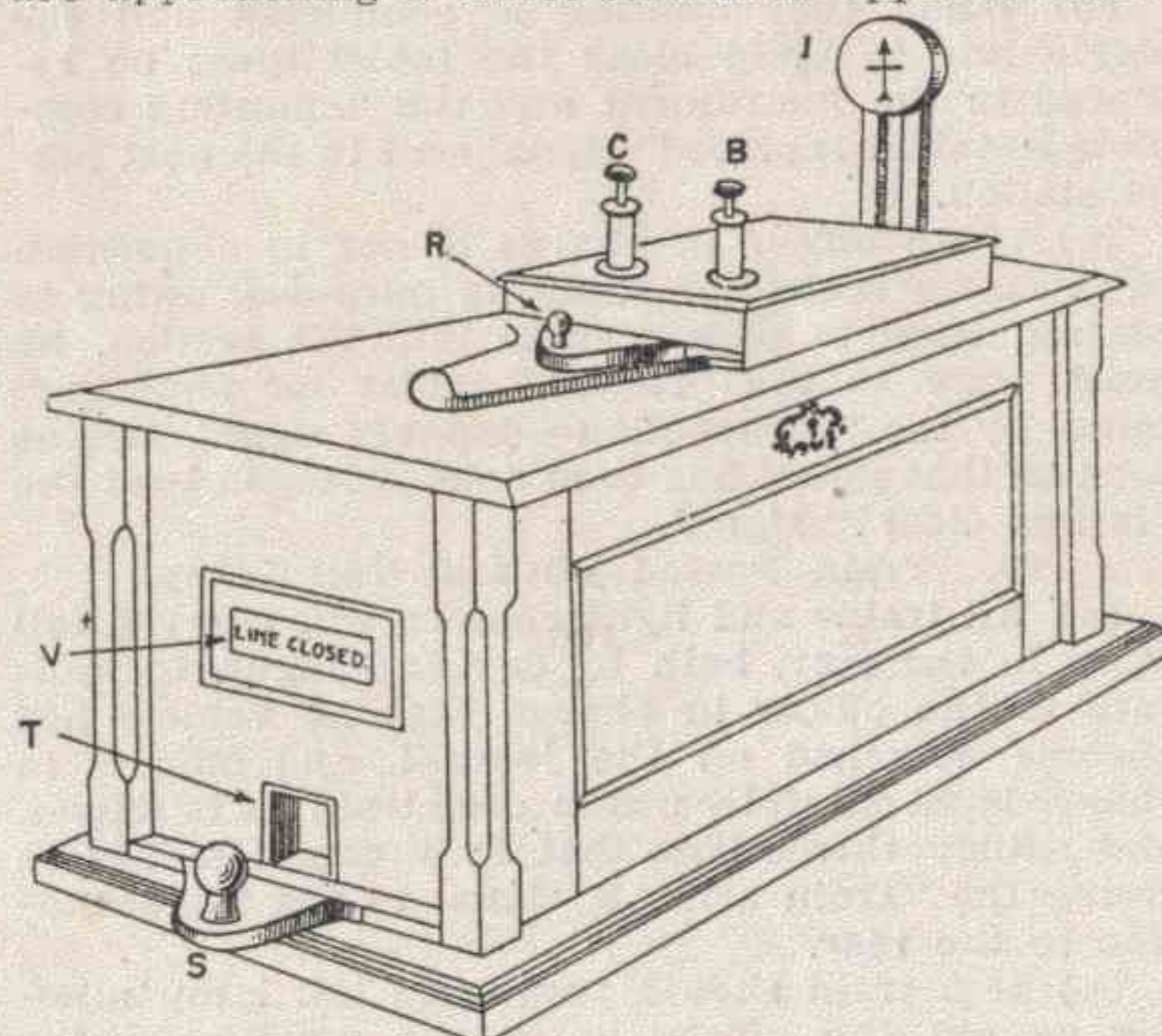
Except when special instructions are issued to the contrary, all signals must be acknowledged by repeating them, and no signal must be considered as understood until it has been correctly repeated to the tablet station from which it was received.

When the "Is line clear?" signal is not acknowledged, it must be given again at short intervals.

3. Mode of Signaling.

Let A and B represent the station at each end of a tablet section. A has a train ready to enter the section and proceed toward B. A gives B the signal "Is line clear?" as per code. B replies by repeating the signal. A holds down on his bell plunger, marked B. B depresses his switch plunger with his left hand, and at the same time withdraws his slide S with his right hand. The withdrawal of this slide (which can only be half way) will reverse the commutator in the instrument, and will bring the signal "Up train approaching" or "Down train approaching" in view.

B will then depress his bell plunger, holding



Train Staff Instrument, New Zealand Railways.



Fig. 1—Western End of American Railway Appliances Exhibition, Washington, D. C.

possession may weigh and stencil the car, making a charge for each car weighed, stenciled and reported." (Balance of rule to remain as it is.)

Rule 85, Page 27: That the last sentence of this rule be changed to read: "Coupler springs, followers and yokes may be included in the above, providing they have been lost with the couplers or when the coupler has been pulled out."

Rule 92, Page 31: Recommend an addition at the bottom of page 31 as follows: "Brake shoe, steel or reinforced back, applied, no credit for scrap: 40 cents."

Rule 98, Page 35: That this rule be changed to read: "Journal bearings having a lining thicker than 3/8 inch shall be charged as filled journal bearings, and not as lined journal bearings."

Rule 104, Page 37: That the words "or both" be stricken from third item from top of page so that it will read: "Arch bar, upper or lower, blacksmith shop labor, repairing, two hours, 40 cents."

Rule 105, Page 42: Would suggest the elimination of the words "clevises, clevis pins, lift chains and brake shoes," owing to suggested changes in Rules 27, 37 and 39.

Rule 115, Page 53: That "lugs and lug bolts" be added to the items which switching roads are allowed to bill against car owners when repaired.

The committee consisted of C. A. Schroyer, chairman; J. W. Fogg, H. LaRue, J. S. Downing, and W. A. Sharp.

Milling in Transit.

The Interstate Commerce Commission, in an opinion by Commissioner Knapp, has rendered its decision in the case of W. J. Koch and H. W. Koch against the Pennsylvania R. R. and the Pittsburgh, Cincinnati, Chicago & St. Louis Ry. The important points of the decision, which sufficiently state the facts, are as follows:

extension of transit privileges into a large territory where heretofore such privileges have not been allowed. The case is continued for further hearing.

Buildings of the American Railway Appliance Exhibition.

The accompanying illustrations give some idea of the extent of the preparations which have been made for exhibiting railway appliances at the International Railway Congress, which opens in Washington, D. C., on Thursday of next week, May 4. In Fig. 1 the main exhibition building, containing 70,000 sq. ft. of space, appears in the foreground. The post office building is seen in the distance, beyond the stacks of the power house, from which steam and electrical power is supplied. This illustration shows the western end of the exhibit grounds. The eastern end of the grounds appears in Fig. 2. This picture shows prominently the buildings of some of the individual exhibitors, that at the extreme right being the Westinghouse Companies' building. The building with the dome, in the center of the picture, is that of the Adams Westlake Co. The American Steel Foundries and other supply firms also have individual buildings.

Four-Cylinder Balanced Compound Locomotive, Erie R. R.

The Baldwin four-cylinder balanced locomotive, illustrated herewith, by courtesy of the builders, represents two engines recently built for the Erie R. R. for an especially heavy passenger service, in which the trains weigh over 600 tons. Including the

ords made by the Baldwin product of this design now in service on other roads, there is every reason to expect that they will closely approach the desired results on the Erie.

The firebox heating surface of 186 square feet is about five per cent of the total, which is a higher ratio than has been given in many of the later engines having an enormous heating surface, and the volume of the firebox, which is one of the most vital elements in the combustion of bituminous coal, and for which too little consideration is often given, is over 300 cubic feet. These, taken in connection with the immense grate area of 54 square feet, should make these engines reliable steamers, even under the severe trials they will encounter when negotiating the speed problem out of Jersey City. These engines are not yet in service on the division for which they were designed, but are doing remarkable work on a more nearly level part of the road. The following specification contains descriptive matter of interest for a study of the elements going to make up these machines:

Cylinder	16 in. and 27x26 in.
Valve	Balanced piston
Boiler, type	wagon top
Boiler, material	steel
Boiler, diameter	68 in.
Boiler, thickness of sheets.....	11-16 in. and 3/4 in.
Boiler, working pressure.....	225 lbs.
Boiler, fuel	soft coal
Boiler, staying	radial
Firebox, material	steel
Firebox, length	108 1/4 in.
Firebox, width	72 in.
Firebox, depth front.....	71 1/2 in.
Firebox, depth back.....	69 in.
Firebox, thickness of sheets, sides.....	3/8 in.
Firebox, thickness of sheets, back.....	3/8 in.

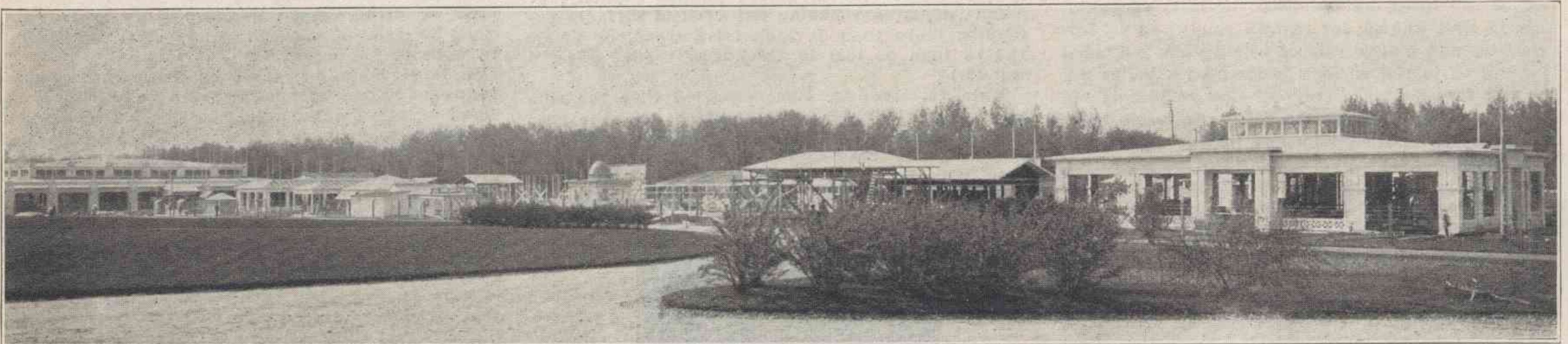


Fig. 2—Eastern End of American Railway Appliances Exhibition, Washington, D. C.

Shippers are not entitled, as a matter of right, to mill grain in transit and forward the milled product under the through rate in force on the grain from the point of origin to the place of ultimate destination; but allowance of the privilege by a carrier to shippers in one section must be without wrongful prejudice to the rights of shippers in another section served by its line.

Considering the defendants as a single line, the granting of transit milling west of Pittsburg and denying it to millers at Harrisburg is not necessarily unlawful, because conditions on that line in Ohio and Indiana may be very different from conditions in eastern Pennsylvania; and it does not follow that the allowance of transit privileges in the former territory requires as a matter of law the like allowance in the latter territory; but such differences have not been shown, nor their bearing explained, by the testimony in this proceeding, and upon the meager and incomplete facts now appearing, the commission is not warranted in making a decision which, in principle, if complainant's contention is well founded, would involve a general

weight of the engines the load is about 780 tons. These engines are of the same type as that furnished the New York Central, but are more powerful, although of the same weight, having a maximum starting power of 28,500 lbs. They were built with the direct object in view of making the time with the tonnage named, over the district between Jersey City and Port Jervis, where the haul is one of the most severe character, being for the most part stiff hill climbing, with not many chances for relief by momentum spurts, and this hard work against gravity is further aggravated by the curve resistances; the whole presenting an array of conditions very difficult to overcome.

This service, it is plain, requires not only a powerful locomotive, but one with a heating surface that will satisfy the demands of the load, both of which factors are distinguishing features of these engines; but whether sufficient for the work cut out for the them is yet to be demonstrated. They rank, however, with the heaviest engines of the type yet built, having a journal load of 28,875 lbs., on driving axles. Basing a prediction on the fine rec-

Firebox, thickness of sheets, crown.....	3/8 in.
Firebox, thickness of sheets, tube.....	1/2 in.
Water space...front, 4 in.; sides, 4 in.; back, 4 in.	
Tubes, material	Iron
Tubes, wire gage, No. 12; No. 309.....	
.....diam., 2 1/4 in.; length, 19 ft.	
Heating surface, firebox.....	186.2 sq. ft.
Heating surface, tubes	3442.8 sq. ft.
Heating surface, firebrick tubes.....	28.0 sq. ft.
Heating surface, total.....	3657.0 sq. ft.
Heating surface, grate area.....	54.0 sq. ft.
Driving wheels, diam., outside, 72 in.....	
.....inside, 66 in.	
Driving wheels, journals, front.....	10x10 1/2 in.
Driving wheels, journals, back.....	9x12 in.
Engine truck wheels, front.....	33 1/2 in.
Engine truck wheels, journals.....	6x12 in.
Trailing wheels...diam., 44 in.; journs., 8 1/2 x12 in.	
Wheel base.....driving, 7 ft.; rigid, 16 ft.	
Wheel base, total engine.....	30 ft. 1 in.
Wheel base, total eng. and tender.....	59 ft. 10 in.
Weight, on driv. wheels.....	115,500 lbs.
Weight, on truck, front.....	47,500 lbs.
Weight, on trailing wheels.....	41,200 lbs.
Weight, total engine.....	204,200 lbs.
Weight, total engine and tender, about.....	356,000 lbs.