RAILROAD DEVELOPMENT IN THE NORTHWEST

EDITOR'S NOTE:—Railroad construction in the Northwest has recently set a pace that has engaged the interest of railroad officials in all sections of the country. The following is taken from an article on this subject by John L. Mathews, published in a recent issue of the *Boston Transcript*.

DURING the last three months contracts have been let for immediate railway construction in the Northwestern states calling for the expenditure of more than $30,000,000. Half of this is for the Harriman lines and includes the Aberdeen-Gate City line, fifty miles, the Des Chutes Railroad, 130 miles; the Tillamock Railroad, 93 miles; the Peninsula tunnel at Portland, the Oregon and Washington tunnel at Tacoma (costing one million each), the Klamath Falls-Natron extension, which forms part of a new trans-Oregon line; the Beaverton-Willsburg cut-off, and a new steel bridge over the Willamette at Portland.

The Northern Pacific has entered upon the Adrien-Connell branch, 70 miles long, and the Ritzville branch, 40 miles. The St. Paul has the Tacoma Eastern extension, the Beverly Richmond branch, 52 miles, and the Gate City-McKenna branch, 35 miles. The North Coast has appropriated $3,500,000 without specifying its mileage, the Oregon Trunk Line is to build 130 miles and the Pittsburg and Gilmore, 65 miles. In addition the interurban electric roads and the short steam lines are all building out to new fields and opening new territory. It is reported that the St. Paul will spend in the next five years $25,000,000 building branch lines in the West.

For a long time the St. Paul was one of the pushing and energetic roads of the West. It drove its lines into Dakota on several parallels, and reached some of the best grain fields in the growing heart of the Northwest. When grain made the roads, when the wheat traffic was the great desideratum, the St. Paul was a kingpin. St. Paul elevators in Chicago were busy centres, and the doings of the road were a chief topic of interest in the grain states. But when the change came to transcontinental interest, when the freight to and from the Coast and the big Western passenger business began to demand attention the St. Paul was soon distanced. The Northern Pacific pre-empted the Yellowstone Valley, the Great Northern sought out the low passes to the north, the Union Pacific found the only available outlet in the middle reach, and there was no room for an expansion without going far south. The North Western and the St. Paul both seemed to be dropping back to an intermediate position as "feeder" roads to the big Western lines; and of the two St. Paul was in the worse position.

A few years ago there came a remarkable change, perhaps with the coming of strong Rockefeller interest into the road. A new outlet to Kansas City was developed, and the road began to advertise widely its passenger routes and seek more through connections. Then came the Great Northern-Northern Pacific purchase of the Burlington and the separation of the St. Paul and North Western from what had been their richest through traffic, that of feeding the two long lines at Minneapolis. For a few months little activity seemed to be aroused. Then it was announced that the St. Paul had purchased terminals in Seattle and was to build west. The news was astounding, but it was true. In little more than two years the work has been accomplished and to-day the St. Paul line is unbroken from Puget Sound to the harbor of Chicago.

From its several Dakota parallels the St. Paul selected its Aberdeen division as offering the best opportunity for extension, instead of the Black Hills division already more prolonged. From a multitude of surveys a route was chosen extending out across the corner of South and North Dakota into Montana. Striking the Yellowstone near the mouth of Powder River it follows the opposite bank of the stream to the Northern Pacific up to the Big Horn, then turns across to the Musselshell River and follows that to its head. From the Musselshell it crosses to the upper Missouri and ascends the Jefferson fork to cross the Continental Divide close beside the Northern Pacific and descends with it into Butte.

From there the two railways side by side descend the Clarks Fork River to Missoula, where the St. Paul turns sharply westward and climbing over the Bitter Root Mountains descends on the west slope the gentle valley of the St. Joe River. Crossing Idaho through the Cœur d'Alene reservation, passing through the rich Palouse region in the Inland Empire, taking the straight line across the irrigable desert region of Washington which the Northern Pacific will some day have to parallel, the St. Paul crosses with its rival through the Yakima pass and descends beside it to the Duwarmish Valley and the sea level at Seattle.

Though the two roads are for hundreds of miles side by side, the St. Paul abandons its companion frequently to seek better grades. It gets over the Divide on a lower summit, and though it goes above the older road at Yakima it will before long have 700 feet the advantage of it by tunnelling.

Inspected to-day either on the map or on the face of the country this attenuated single track, extending more than 1500 miles beyond the Missouri River bridge in South Dakota, appears in odd contrast to the thick network of main line and branch tracks which fill the old field of the St. Paul. It is in itself the typical exemplification of the demand for growth which puts forth such shoots. It is like an irrigated grape vine forced to grow by the pressure from the roots, reaching out blindly a single long arm until it reaches a clinging point—as the railway reached its port. It appears feeble and unsupported, as if it were merely awaiting the pruner's knife to cut it back to the profitable, fruit-bearing wood.

But there is to be no pruning of this new extension. Instead other new shoots, other tendrils which will bind it fast along the way, are being constructed. And there is no doubt that in a few years this undecorated stem will be as well leafed out with branches as its predecessor in Iowa.

The St. Paul seems to be the first railroad earnestly to endeavor to build up the middle country. It has already filled the Musselshell with a fine small-farming population, and it has almost countless opportunities along its road. To advertise them it will run special trains of exhibits through Eastern cities.

There is very little novel about the new road except its plans for electric installation. It is not yet definitely settled what shape these will take; but an investigation of water powers is being made in the Bitter Root and the St. Joe country to determine whether these rivers will not economically suffice to haul the trains of the new road over the mountain divisions.

If they do this they will be following the example of the ubiquitous Jim Hill, who has just installed electric locomotives in the Cascade Tunnel of the Great Northern. This tunnel has always been a nightmare to passengers and to trainmen. It required an hour after each train passed to clear it of smoke sufficiently to pass the next and its capacity was thus limited to twenty-four a day. To remedy this a river beside which the railway runs has been dammed twenty-four miles from the tunnel and harnessed to an electric generator. Four electric locomotives are in service and trains can now be sent through—with comfort to the passengers—as often as the speed regulations will permit.

The activity of the St. Paul in driving westward has stimulated the North Western to greater activity. That road has a feeler far out in Wyoming from which a stage

line reaches to Yellowstone Park. This has always looked like a Western extension, but recently the proprietors have allowed it to run down and it is said the desperate character of the country between Lander and the Snake River has dissuaded them from advancing that way.

There remains for the North Western several options, chief of which is the extension of the Black Hills division. For several years—and recently with more determination—surveyors have been seeking a route from this point westward, and it is said that the route is now chosen and the construction soon to begin. But there is no statement from the railway officials to that effect. A number of small lines in the Northwest which lie in the way of the Northwestern have been active, and suggestions are made that the road is buying them up and extending them.

Just what route the North Western will take is not yet clear, but it is expected to go down the Snake or the Salmon, cross through the Owyhee country and come down the John Day to the Columbia.

Meanwhile Harriman and Hill are warring at every point in the Northwest. Their most active and openly acknowledged fight at present is in the so-called Lola Pass, which each of them seeks and in which some other railway already has an interest. The Northern Pacific is building a cut-off from Missouri directly across the Bitter Root Mountains to connect with the Spokane, Portland and Seattle and form a short and direct line to the Coast. The Oregon Railway and Navigation Company, which already has a line to Pasco and Lewiston, seeks Lola Pass as an entrance to the rich and increasingly prosperous fields of southwestern Montana, and incidentally a connection toward the present Harriman Butte line. Surveyors for both sides are in the field struggling for the most advantageous sites, and both parties are keeping their work as secret as possible.

On the Des Chutes River in southern Oregon, Porter Brothers, of Spokane, owners of the Oregon Trunk road, and Twohy Brothers, contractors for Harriman (both well known railway contracting firms), are engaged in actual warfare. Each has a grant to a right of way from Secretary Ballinger, and each is trying to best the other in the narrow gorges where, if one road is built, the second will entail very great expense. Porter Brothers are popularly believed to represent the Hill side. This has been strongly denied. At any rate they represent some determined person who wishes to break from the north—where the Hill lines lie—into the rich and as yet untouched field of Central Oregon and northeastern California. Harriman is also seeking this district from another direction and wishes a new north and south line through the state. It is said that the Hill lines contemplate building this way to San Francisco to offset Harriman's advance on Puget Sound. Porter Brothers recently bought a big ranch which lay across the team trail of their opponents and refused to allow their provision trains to pass into Des Chutes Canon. They own much of the way by warranty deed and will extend to Portland. This, too, is pointed out as a possible "North Western" extension.

In central Washington and, in fact, from Spokane to the Coast by way of Yakima Valley is another new line which is causing much speculation. This is the North Coast Railway, which, proceeding slowly, seems to have ample capital behind it. This is commonly reported to be another Harriman move; but this is as strenuously denied. Whoever owns it has given the Hill lines much annoyance. It has so superior a location to the Northern Pacific that the latter is being forced to cut-off work and new grades to meet its threatening competition.

The Hill-Harriman warfare breaks out in many unexpected places. It is not so long since Hill acquired the Colorado and Southern to give him a Gulf outlet in competition with Harriman's roads. Now he is reported to be about to extend the Burlington down through Illinois and so to the Gulf parallel with the Illinois Central. But more immediate is his extension from the Burlington in northwestern Wyoming down across that state to connect with the Colorado and Southern. This will give him from Butte a direct line through Cheyenne and Denver to the Gulf, forming a direct and very capable competitor for the Oregon Short Line.

Of course all these roads are opening up new country. Go where you will new Government land and new patented land is to be had on easy terms—fertile land ready for the plow. Little by little the untillable patches are diminishing, the deserts fading away, and these great waste places are being crossed by tracks, put under irrigation ditches and added to the producing region of America.

At the Coast the trend of them seems to be to concentrate at Seattle. The Duwarmish Valley, down which they come to the latter city, is fast turning into a broad and many-railed way of increasingly heavy traffic. The Northern Pacific, the St. Paul and the Columbia and Puget Sound all come down it side by side to the wharves at its mouth. Seattle is preparing to dredge and straighten it four or five miles further up the valley with the idea of eventually extending it thirty miles, to Tacoma, as a site for manufacturing plants; and the indications are that this corner of Elliott Bay will develop into the real focus of our Alaskan and Oriental trade.

THE INTERSTATE COMMERCE COMMISSION AND RATE ADVANCES

EDITOR'S NOTE:—The following is taken from an article which appeared in the *New York Sun* of August 18th. It calls attention to the vast sums of money the railways will have to procure in the next few years in order to meet the growing demands of commerce, and of the necessity of permitting the railroads to earn enough to make investments in their securities attractive.

THE Interstate Commerce Commission, inaugurated in response to a popular demand for recourse against the railroads that would lead to prompt and effective result, has acquired power to investigate, to prosecute, to adjudicate and to enforce its decisions. The grant of such powers to one body remains of doubtful constitutionality. The grant with specification that their exercise be not subject to court appeal would doubtless have been without constitutional warrant; yet there was a widespread popular demand that that appeal be denied. It was therefore unquestionably the general impression that the Commission was to protect the shippers from the rapacity of the railroads. That the railroads might need protection from the rapacity of the shippers was an idea not entertained by many, and yet, inasmuch as one-half of the complaints made to the Commission are dismissed, it would seem if the number of cases be taken as the sole criterion, that the railroads have needed as much protection as the shippers.

The Commission in its earlier years, while doubtless disposed to be fair to the railroads, undoubtedly shared to a considerable extent the popular misconception of the conditions that forced the railroads to practices that are now considered to be reprehensible and to adjustments of rates the substantial equity of which is becoming more widely understood. Although the Commission has never been subordinate to any department of the executive branch of the Government, being, in theory, independent of the President himself, its decisions have often been appealed to the Federal courts, and it has been subjected to severe discipline by the Supreme Court of the

United States. This and the wider outlook which has come to members of the Commission through years of study of and actual contact with the transportation situation, have tended to modify the views that may have been held by one or another of them at the time of appointment. Even that Commissioner who, receiving his appointment a few years ago after an unsuccessful campaign for governor of his state, in which he is said to have believed himself defeated by the railroad interests, and whose public utterances in the months succeeding the assumption of his duties unquestionably betrayed a certain vindictiveness toward them, has toned down in marked degree. Any one who has given attention to the cases presented to the Commission, to the evidence brought forth at the hearings, and to the many considerations to which they have been obliged to give cognizance in arriving at their decisions, cannot but be impressed with the fact that a man of even unusual intellect and discernment and impartial poise cannot become a good commissioner until he has been in the harness at least two years. This, of course, implies that the executive should exercise great care in the selection of an appointee and that he should have a long tenure of his office.

Although inaugurated in obedience to popular behest, it has been difficult for the Commission to maintain, if it has maintained, general popularity. A great number of the informal complaints are simple and foolish, and the complainant has to be practically so informed, although, of course, in diplomatic language. That one-half even of the formal complaints are dismissed or withdrawn does not conduce to the popularity of the Commission with the one-half of the complainants concerned. It would not perhaps be a breach of confidence to intimate that admissions are quietly made within the walls of the Commission that pertinacious and grasping shippers cause it far more trouble than the railroads.

In many ways other than in its judicial decisions the Commission has, whether consciously or unconsciously, made utterances that would seem designed to retain its hold upon popular esteem. Senate Document No. 257, which grossly exaggerated the increased revenue obtained by the railroads for the year 1903 and did not mention their increase in expenses, which six times exceeded that of the increase in return, was of this nature; as was also the statement in its twenty-second annual report that, upon the figures there given, the railroads of the country as a whole did not suffer so severely in the year 1908 in comparison with years of normal traffic and business conditions as may have generally been supposed. It was not mentioned that the figures given for the fiscal year ending June 30, 1908, included five months of 1907 during which the traffic of the railroads was of extraordinary volume, the panic not having befallen until November. A comparison of the returns for the calendar year 1907 with those of the calendar year 1908 would have given a true measure of the severity with which the panic bore upon the carriers; but this the Commission did not make.

In a less important way, but one which is open to criticism, are other presentations in the annual report. For example, in the list entitled "Complaints in Which Reparation Was Authorized on Informal Pleadings," there are many hundreds of cases in which it is indicated that reparation has been ordered because of an "excessive rate." A reader of the annual report not familiar with the conditions under which reparation is awarded in these cases would easily gain the impression that in each one of them the railroad had been guilty of actual injustice. The truth is that these complaints are as to cases in which a railroad has committed an admitted error of application of a rate or a practice. The acknowledgment of the carrier and the expression of its willingness to pay reparation is filed with the complaint, and reparation is awarded automatically. Such an award does not mean that a railroad has been convicted of the filing and publishing of a rate that is unjust and unreasonable, as might readily be inferred.

A survey of the work of the Commission as affecting the movement of the freight traffic of this country would be incomplete that does not accord the fullest measure of credit for the efforts that are leading to complete success in the way of systematizing the tariffs of the carriers, the formulation and promulgation of rules that have led to their being uniform in size and arrangement and easily intelligible. In previous years it was the custom of many railroads to issue their tariffs in various sizes, to print them or typewrite them or to multi-copy them by duplicating process of one kind or another, and supplement after supplement was issued tending to make the ascertainment of a particular rate, especially one of infrequent reference, a very difficult matter.

The work of the Commission in connection with accounts and statistics, the regulation of safety appliances, the recording of accidents, and in connection with the hours of service, is not within the province of this comment. It should be said, however, that its annual volume of statistics is an admirable document of increasing accuracy and usefulness.

Whatever strictures may have been passed in this series of articles upon the Commission or upon any of its actions in the past are not intended to intimate that there should not be a Federal body invested with a proper regulation of the rates charged by the common carriers. A human institution is not of perfect working at any time, and not nearly so in its early stages. An equitable discharge of its functions is the result of a long-continued moulding that tends to adapt means to end. The present members of the Commission are of varying grades of ability and differ in temperament, but doubtless desire to conscientiously and impartially discharge their duties. They have perhaps not surrendered to popular pressure to a greater degree than could naturally have been expected, and the extent to which the railroads have suffered by such surrender has been more than counterbalanced by the protection which many of the decisions have given the railroads. A freight traffic manager does not always have the broadest view, and under the unrestrained competition of the past was often debarred from adopting the procedure that he knew to be right. There are many traffic managers of varying views. A detached tribunal can serve to harmonize what otherwise might be heterogeneous action without fault. Such a tribunal can stand, as the Commission does stand, even although it makes occasional errors, between unreasoning demands of the people and the rights of the carriers. Although very many of the cases that come before the Commission could readily be decided by the ordinary courts, there are more important matters in which coherent and consistent action could not be expected from a multitude of judges passing upon general litigation, but which ought to flow from a body of men gaining experience from the continued and exclusive consideration of the varying phases of questions that belong to one general class.

That there are different standpoints from which questions pertaining to traffic regulation are viewed is abundantly manifested by the varying and conflicting action of the different state legislatures and state railroad commissions. While the decisions of the Interstate Commerce Commission do not seem to be without exception based upon underlying principle, its action is consistency itself compared with that of the state organizations. That the states may properly exercise police authority over the maintenance and operation of the railroads within their respective limits cannot be disputed at this time. It may, however, not be an enirely absurd proposition that inasmuch as the intrastate rates and interstate rates are so closely correlated as to form a practically indivisible rate structure, such authority as may be conferred upon the Interstate Commerce Commission to regulate interstate rates should, as a corollary, include the regulation of so-called intrastate rates. It is not too much to say that the discordant decrees of the different states are a greater impediment to the equitable conduct of the traffic of this country than all other handicaps and drawbacks combined.

That the railroads of this country were inadequate to the satisfactory handling of the traffic that poured upon

them during the half-dozen boom years succeeding 1900 is admitted on all hands. Their facilities have been vastly increased and are more than equal to the demands of today. It is doubtful that they will be fully abreast of the demand of the near future if the promised wave of prosperity continues to roll. Judging by the past the volume of traffic will be doubled within the next ten or fifteen years. For the railroads to double their facilities will require the expenditure of hundreds of millions of dollars. This expenditure is well under way, but many hundreds of millions more will have to be raised for its continuance. While the main lines of rail transportation are well built and well equipped, there are thousands and thousands of miles in the less forward but rapidly developing sections of the country that will need to be practically rebuilt and re-equipped. The extension of improved signal systems, the abolition of grade crossings must go on. The vast expenditures that the railroads will need to make in order that they may adequately perform their part as a factor in the industry and commerce of the country cannot be met unless they are allowed revenue ample for their maintenance and improvement and that will moreover yield a return sufficient to attract the additional capital required.

The profits of the railroads are on the average less than half those of the farmer and but a third of those of the manufacturer. A movement toward an increase of rates was inaugurated in the spring of 1908, which it was reported that members of the Commission had unofficially stated to be justified. This widely published report was not contradicted for several weeks, when it was announced that the Commission would view with disfavor any general increase in charges and would subject attempts in that direction to scrutiny and criticism. It cannot be definitely so stated, but there is strong ground for suspicion that this apparent change of attitude was at the direct instigation of President Roosevelt. In the very nature of things the question must come up again, and the essential justice of such advances in rates as will not work harm to the whole people must be recognized by them as well as by their constituted tribunals.

CROSS-TIES PURCHASED IN 1908

EDITOR'S NOTE:—The annual Federal report on the statistics of forest products, of which this article constitutes a part, is compiled through the co-operation of the Bureau of the Census in the Department of Commerce and Labor and the Forest Service in the Department of Agriculture. The work is conducted under the direct supervision of a committee of four, consisting of W. M. Steuart, chief statistician for manufactures, and J. E. Whelchel, expert chief of division, representing the Bureau of the Census; and R. S. Kellogg, assistant forester, and A. H. Pierson, forest assistant, representing the Forest Service.

THE steam and electric railroads of the United States purchased a total of 112,463,449 cross-ties in 1908, this number being a decrease of 41,236,171 ties, or 26.8 per cent, from the number purchased in 1907. The chief cause of this decrease was the widespread business depression during the year. Any check in commerce and industry reacts upon transportation, and consequently the general policy of the roads during 1908 was to purchase only the ties absolutely necessary for renewals and such additional ties for new trackage as were essential to carry out projects under way. In 1908 only 7,431,170 ties, or 6.6 per cent of the total, were reported as purchased for new track, while in 1907, 23,557,000 ties, or 15.3 per cent of the total, were purchased for the same purpose. Two-thirds of the ties purchased for new track in 1908 were reported by the steam roads and one-third, by the electric roads. Since the total mileage of the steam roads was several times that of the electric roads, these figures indicate that the building activity on the part of the electric roads was relatively much greater than that of the steam roads in 1908.

The number of ties purchased in 1907 and 1908 are given in the following table, which also shows their distribution by kinds of wood and classifies them under "hewed" and "sawed":

CROSS-TIES PURCHASED—NUMBER, BY CLASSES AND BY KINDS OF WOOD, 1908 AND 1907.

Kind of wood.	1908. Hewed.	1908. Sawed.	1907. Hewed.	1907. Sawed.
Total	91,979,233	20,484,216	118,383,537	35,316,083
Oaks	42,143,168	5,967,685	53,702,448	8,054,970
Southern pines	18,555,356	2,973,518	26,226,970	7,988,111
Cedar	7,468,495	702,997	8,361,704	591,501
Chestnut	5,399,809	2,673,876	6,330,310	1,521,015
Douglas fir	1,945,380	6,041,570	1,631,065	12,893,201
Tamarack	3,806,249	218,670	4,152,134	410,056
Cypress	3,090,702	366,000	5,880,274	898,670
Hemlock	3,035,819	84,181	2,287,203	79,256
Western yellow pine	2,140,308	952,635	3,254,954	1,764,293
Redwood	757,090	114,816	1,484,842	546,140
White pine	564,465	142,396	293,753	180,702
Lodgepole pine	486,643	30,666	666,916	.....
Gum	261,551	.....	15,124	.....
Beech	191,384	1,464	7,622	43,577
All other	2,132,814	213,742	4,088,218	344,591

The bulk of the ties were of comparatively few kinds of timber, although at least forty different species were used to some extent. The oaks continued to be very far in the lead, being credited in 1908 with 48,110,853 ties, or 42.8 per cent of the total number of ties purchased. In the production of ties white oak is more largely used than any other species, although several other varieties of oak were employed for this purpose. There is, however, so much confusion of names among the different varieties of oak that it is not practicable to give separate statistics for them. A similar confusion of names exists in the case of the three or four Southern yellow pines, which, taken together, furnished 21,528,874 ties, or about one-fifth of the total number. Combined, the oaks and pines supplied about five-eighths of all the ties purchased. Cedar, chestnut, and Douglas fir were used for about 8,000,000 ties each, the three varieties combined forming over one-fifth of the total number purchased. Several other kinds of wood used to a smaller extent in the manufacture of cross-ties are also shown in the table. The principal species of wood included under "all other" are in order of their importance: Maple, spruce, birch, elm, sycamore, mesquite, locust, hickory, cherry, walnut and mulberry.

CROSS-TIES PURCHASED—PER CENT DISTRIBUTION, PER CENT OF INCREASE, AND PER CENT HEWED AND SAWED FORM OF TOTAL, FOR EACH KIND OF WOOD: 1908 AND 1907.

Kind of wood.	Per cent distribution. 1908	Per cent distribution. 1907	Per cent of increase, 1907 to 1908. Total.	Hewed.	Sawed.	Per cent of total, 1908. Hewed.	Sawed.
Total	100.0	100.0	*26.8	*22.3	*42.0	81.8	18.2
Oaks	42.8	40.2	*22.1	*21.5	*25.9	87.6	12.4
Southern pines	19.1	22.3	*37.1	*29.3	*62.8	86.2	13.8
Cedar	7.3	5.8	*8.7	*10.7	18.8	91.4	8.6
Chestnut	7.2	5.1	2.8	*14.7	75.8	66.9	33.1
Douglas fir	7.1	9.5	*45.0	19.3	*53.1	24.4	75.6
Tamarack	3.6	3.0	*11.8	*8.3	*46.7	94.6	5.4
Cypress	3.1	4.4	*49.0	*47.4	*59.3	89.4	10.6
Hemlock	2.8	1.5	31.8	32.7	6.2	97.2	2.7
Western pine	2.8	3.3	*38.4	*34.2	*46.0	69.2	30.8
Redwood	0.8	1.3	*57.1	*49.0	*79.0	86.8	13.2
White pine	0.6	0.3	49.0	92.2	*21.2	79.9	20.1
Lodgepole pine	0.5	0.4	*22.4	*27.0	....	94.1	5.9
Gum	0.2	(†)	1,629.4	1,629.4	....	100.0	..
Beech	0.2	(†)	276.7	2,410.0	*96.6	99.2	0.8
All others	2.1	2.9	*47.1	*47.8	*38.0	90.9	9.1

*Decrease. †Less than one-tenth of 1 per cent.

There was an increase in the proportion of oaks, chestnut, and cedar used in 1908 as compared with 1907, while decreases are shown for Southern pines, Douglas fir, and cypress.

While the decrease in the number of cross-ties purchased in 1908 as compared with 1907 was 26.8 per cent, the decrease in the number of sawed ties was much greater. The condition in the case of Douglas fir was unusual. Normally, a very large proportion of the Douglas fir ties is sawed. The proportion of ties of this kind fell from 88.8 per cent in 1907 to 75.6 per cent in 1908. The number of such ties purchased in 1908 was less than one-half of the number bought during the preceding year. On the other hand, the number of hewed ties of this variety increased almost one-fifth. The heavy decrease in sawed ties was undoubtedly a result of the decrease in the output of Douglas fir lumber. A heavy decrease also occurred in other sawed ties which were made from woods that are chiefly manufactured into lumber.

Of all the ties purchased in 1908, 81.8 per cent were hewed and 18.2 per cent were sawed. This proportion of hewed ties was larger than the proportions for 1906 and 1907, the percentages of hewed ties in those years being 75.4 and 77, respectively.

The third table shows the number and cost at point of purchase, by classes and by kinds of wood, of the ties purchased by the steam and electric roads in 1908.

The steam railroads purchased 106,038,081 cross-ties, or 94.3 per cent of all the ties purchased. Of this number, 82.4 per cent were hewed and 17.6 per cent were sawed. Steam railroads used 95 per cent of all the hewed ties and 91.1 per cent of all the sawed ties purchased during the year. The electric railroads purchased 6,425,368 ties, or 5.7 per cent of the total number of ties purchased. Of these, 71.5 per cent were hewed and 28.5 per cent were sawed.

The distribution of the different kinds of ties between the steam and electric roads does not indicate any noticeable preference of either for particular kinds of wood. None of the electric roads reported the use of lodgepole pine, gum, or beech ties.

While the quantity of ties purchased in 1908 was much less than the quantity purchased in 1907, the average prices in the two years were remarkably close together, the average cost per tie for all kinds of ties purchased in 1908 being 50 cents and the corresponding average for the purchases in 1907 being 51 cents. The lowest priced ties purchased in 1908 were those of hemlock, the average cost of ties of that wood being 38 cents. The highest priced ties were the Southern pines, the average cost per tie of this species being 54 cents. Sawed ties were slightly more expensive than hewed ties. The average cost of the hewed ties purchased by both the steam and the electric roads was 50 cents, while the average cost of the sawed ties was 52 cents for those purchased by the steam roads and 54 cents for those purchased by the electric roads.

CROSS-TIES PURCHASED—NUMBER AND COST AT POINT OF PURCHASE, BY CLASSES AND KIND OF WOOD, GROUPED ACCORDING TO PURCHASE PRICE.

	STEAM RAILROADS			ELECTRIC RAILROADS.		
	Total.			Total.		
Kind of wood.	Number.	Cost.	Average cost per tie.	Number	Cost.	Average cost per tie.
Total	112,463,449	$56,280,568	$0.50	6,425,368	$3,272,709	$0.51
Oaks	48,110,853	24,653,042	0.51	2,414,403	1,285,968	0.53
Southern pines	21,528,874	11,598,896	0.54	944,690	592,046	0.63
Cedar	8,171,492	4,028,333	0.49	850,687	377,868	0.44
Chestnut	8,073,685	3,980,744	0.49	1,282,128	605,077	0.47
Douglas fir	7,986,950	3,598,856	0.45	357,460	133,148	0.37
Tamarack	4,024,919	2,020,109	0.50	28,249	10,327	0.37
Cypress	3,456,702	1,519,326	0.44	107,676	44,727	0.42
Hemlock	3,120,000	1,178,996	0.38	25,063	9,501	0.38
Western pine	3,092,943	1,573,008	0.51	23,024	9,305	0.40
Redwood	871,906	443,066	0.51	330,762	170,473	0.52
White pine	706,861	335,724	0.47	18,427	11,044	0.60
Lodgepole pine	517,309	246,299	0.48	.....	.....	.....
Gum	261,551	116,631	0.45	.....	.....	.....
Beech	192,848	85,447	0.44	.....	.....	.....
All other	2,346,566	902,091	0.38	42,799	23,225	0.54

DEVELOPMENT OF THE FREIGHT LOCOMOTIVE*

SO rapid has been the growth in size and power of the locomotive in this country during the last decade that to-day we have freight engines of twice the power of the heaviest engines of ten years ago.

In order to meet the demand for increased power to handle the ever-growing volume of traffic, the locomotive has been made larger and larger, until it has exceeded limits of size and capacity which a few years ago would have been thought beyond the realm of possibility.

As the limits of size of one type of locomotive have been exceeded, other types have been introduced which offered possibilities for further increase in power until, where ten years ago, the consolidation and twelve-wheel types of locomotives, with eight driving-wheels, represented the heaviest class of freight engine, we now have the Mallet articulated compound engine, with twelve and sixteen driving-wheels.

It is not the purpose here to attempt to trace this development step by step, but to simply mention briefly a few of the most notable examples of different types of freight engines built in this country during the last ten years, leaving it for a subsequent article to take up some noted examples of passenger engines of the same period.

Among the forerunners of the enormous freight locomotives of the present day, two of the most conspicuous were those built in 1899 for the Illinois Central Railroad. In that year, in order to ascertain the advantages of heavier locomotives from the standpoint of operation, they placed orders with the Brooks and Rogers Locomotive Works, both of which are now included in the American Locomotive Company, for an engine which would pull trains of 2,000 tons over the Makanda Hill, on the Centralia district. At that time their standard freight locomotive had a normal rating of 1,000 tons on this grade, so that these new engines were to have twice the power of any previously used on the road and represented a very bold step in advance.

The engine built by the Brooks Works was Number 640, and was of the twelve-wheel type, having a four-wheel leading truck and eight driving-wheels. It was at that time the heaviest engine ever built, and was the center of interest of the railroad world. In the opinion of the builders, it marked a limit in weight which would not soon be passed. In working order, the total weight was 232,000 pounds, of which 193,200 pounds was carried on the driving-wheels. Its driving-wheels were 57 inches in diameter and the cylinders were 23 inches in diameter and 30 inches in stroke. The boiler carried a pressure of 210 pounds per square inch, and had a total heating surface of 3,494 square feet.

The engine built by the Rogers Locomotive Works—Number 639—was somewhat lighter, though just as powerful as the Brooks engine. This one was of the consolidation type, with a two-wheel leading truck and eight driving-wheels, and weighed 218,000 pounds, with 198,000 pounds on the driving-wheels. The size of the cylinders and wheels, and the boiler pressure, were the same as those of the twelve-wheel engine; but the total heating surface of the boiler was 283 square feet less.

Exhaustive tests were made by the Illinois Central, comparing the cost of operation of these heavy engines and their standard freight engines of lighter weight. These tests proved conclusively that when loaded to their maximum capacity, the large engines were the more economical, and thus were undoubtedly an important factor in bringing about the movement which followed on the part of railroads throughout the country toward the use of more powerful locomotives.

For heavy freight service, the consolidation type of locomotive is at present the one most commonly used in this country. The limit of power so far attained in this type of engine was reached in two locomotives built for the

*From the Illinois Central Employes Magazine for August.

Bessemer and Lake Erie Railroad, in 1900, by the Pittsburg Locomotive Works, which is now one of the plants of the American Locomotive Company. One of these locomotives, Number 151, weighed 250,300 pounds, and this broke the record for weight, established only the year before by the Illinois Central twelve-wheeler. The cylinders were 24 inches in diameter and wheels were 54 inches in diameter. The boiler had a heating surface of 3,805 square feet, and carried a boiler pressure of 210 pounds. It was capable of hauling 1,950 tons up a one per cent grade on a straight track, at a speed of 10 miles per hour.

On many roads where the power required exceeded the limits obtainable in a locomotive with eight driving-wheels, various other types with a greater number of driving-wheels have been introduced. Among these are the famous so-called Santa Fe type, with its ten driving-wheels and two-wheeled truck front and back, and the decapod type, which also has ten coupled wheels, but a two-wheel truck in front only. One of the most notable examples of this last type is locomotive Number 506, built in 1907 by the American Locomotive Company, for the Buffalo, Rochester and Pittsburg Railway. In this engine a weight of 268 pounds has been attained, of which 243,000 pounds is carried on the driving-wheels. It is used in pushing service and has cylinders 24 inches in diameter by 28 inches in stroke. The boiler pressure is the same as that of the consolidation engine built for the Bessemer and Lake Erie, but the total heating surface is less, being 3,535 square feet.

Another type of locomotive having ten driving-wheels is Number 8799, built by the same company for the New York Central lines. This type is used principally in pushing and switching service. This engine is the largest of its type in use, and was built in 1907. It has a total weight of 274,000 pounds, all of which is carried on the driving-wheels. The cylinders are 24 inches in diameter by 28 inches in stroke, and the driving-wheels are 52 inches in diameter. The boiler has a total heating surface of 4,625 square feet, and carries a pressure of 210 pounds.

On most roads in the country the requirements of heavy freight traffic have, during the past ten years, far outgrown the capacity of the mogul type, with its six driving-wheels; but where these are not too severe, this type is still used. Locomotive Number 158, built by the American Locomotive Company for the Vandalia line, in 1906, is a good example of the development attained in this type of engine.

This engine, which is the largest mogul ever built, has a total weight of 187,000 pounds, which ten years ago was considered a heavy weight for a consolidation engine. Of the total weight, 159,300 pounds is carried on the driving-wheels. The cylinders are 21 inches in diameter by 28 inches in stroke, and the boiler pressure is 200 pounds.

Where heavy grades were combined with sharp curves, as on mountainous districts, the long driving-wheel bases of some of the standard types of locomotives with ten driving-wheels made them too unwieldy to handle with efficiency. In the effort to meet the demand for increased power on roads where such conditions existed, locomotive designers were forced to depart from enlargement of engines along the old lines, and in 1904 a new type of powerful locomotive was brought out by the American Locomotive Company, worked out on the principle developed by the prominent French engineer, M. Anatole Mallet. This type employed two sets of engines under one boiler; one set rigidly attached to the boiler, and the other capable of swiveling radially around a center-pin connecting the two, being thus in effect a truck. The first engine of this type, generally called the Mallet articulated compound, was built for the Baltimore and Ohio Railroad, at the Schenectady Works of the above-mentioned company. This engine, Number 2400, was designed to haul 2,500 tons up a grade of one per cent on a straight track, at a speed of ten miles per hour, and is now operating between Cumberland and Sandpatch, Md. Its enormous size and power, which exceeded anything that had before been dreamed of as possible in a single engine, was the wonder of the railway world. At first it was spoken of as "monstrous" and "freakish," and all kinds of troubles and failures were predicted for it. In working order, it weighs 334,500 pounds, and this weight is carried on twelve driving-wheels, arranged in two groups of six each. The two sets of engines are compounded together; that is, steam from the boiler is first used in the high-pressure cylinders, which are connected to the rear set of wheels, and then exhausted into the low-pressure cylinders which are connected to the front set of wheels, and there used over again. The high-pressure cylinders are 20 inches in diameter, while the low-pressure cylinders are 32 inches in diameter, the stroke in both cases being 32 inches. The boiler carries a pressure of 235 pounds, and has a total heating surface of 5,585 square feet.

Contrary to all predictions, it has proved successful from every standpoint and has supported the opinions of its designers as to convenience and economy of operation and maintenance. The success of this engine has led to the building of others of the same type of various sizes, for other roads in the country.

The most powerful engines of this type, or in the world, at the present time, are three built for the Erie Railroad by the same company. One of these, Number 2600, weighs 410,000 pounds, all of which is carried on the driving-wheels, of which there are sixteen in all, arranged in two groups of eight each. The high-pressure cylinders are 25 inches in diameter, and the low-pressure 39 inches, the stroke in both cases being 28 inches. The boiler carries a pressure of 215 pounds, and has a total heating surface of 5,313 square feet. It is capable of hauling 2,600 tons on a 1.3 per cent grade. These engines are now successfully operating on the Susquehanna hill of the above-mentioned road, between Susquehanna and Gulf Summit.

Although still but a new type in this country, the Mallet articulated compound engine promises to be the most powerful and efficient type of freight engine of the future.

THE NEW ERA JOURNAL BOX AND LID

THE desiderata in a journal box and lid are dust, grit and water exclusion, ease of opening and closing, positiveness of operation, simplicity of construction, a full and unobstructed access to the box when open and that the lid shall not be exposed to damage from adjacent objects in either the open or closed position. All these are claimed to be comprehended in the New Era box and lid, illustrated in the accompanying engraving. The box is M. C. B. standard and is made of any desired material, a clean strong casting being requisite. The lid is in one piece with a single straight steel spring to hold it in place when closed. It is so constructed in connection with the box that there is no chance for it to get loose, as the lid bears firmly on top and battery and is held in place in its closed position by the spring. The spring may vary in strength according to the wish of the user. It is a straight flat or leaf spring, having no bending or shaping after coming from the rolls and therefore no internal strains leading to fracture.

The lid and spring both run in grooves in the extended sides of the box and these grooves are so arranged as to form a cam, which presses on the spring only in its closed position, holding the lid firmly closed. When the box lid is opened, the spring is off the cam, its tension released and the lid slides easily in the groove and rests on a stop at the bottom of the groove, when the lid is fully