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CHAPTER XIII

THE STABILITY OF RAILWAY OPERATIONS

By Julius H. Parmelee

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Summary of Railway Activities.—Our steam railways comprise an industry with a total investment and value in excess of $20,000,000,000. They employ in normal times 2,000,000 men and women, expend $3,000,000,000 for wages and more than $1,500,000,000 for materials and supplies each year out of operating expenses alone. In addition to operating expenditures, there are spent annually large sums on capital account for additions, betterments, and improvements to the physical plant.

According to the latest governmental study of the national wealth of the United States, the value of the physical property of the steam railway industry was about one-tenth of the total wealth of the country. The railway industry represents the largest, most valuable, and most important concentrated industry in the United States. The only industry with anything like a comparable aggregate value is the agricultural industry, which is not concentrated but is composed of a vast number of individual and uncoordinated plants.

In 1920 the Interstate Commerce Commission fixed a tentative valuation of $18,900,000,000 on the steam railway properties of the carriers. This tentative valuation was solely for rate-making purposes and covered only the property owned by the railways which was used in the service of transportation. The present value of railway transportation property, including new investment since 1920, plus the value of railway-owned physical property not devoted to transportation, plus the value of materials and supplies on hand and the amount of necessary working capital, represents a sum far in excess of this tentative valuation. In fact, the grand total has been variously estimated at from twenty-one to twenty-five and one-half billions of dollars.

Railway activities may be considered in three aspects:

The railways are manufacturers of transportation.

They are employers.

They are purchasers.

In each of these aspects the railways play an important role, and their activities are closely intertwined with those of industry in general.

In 1921 the operating revenues of the railways of Class I[1] amounted to $5,517,000,000. Operating expenses totaled $4,563,000,000. Of this last sum, $2,590,000,000 or 56.8 per cent was expended directly for labor, and $1,656,000,000 or 36.3 per cent, for materials and supplies, including fuel and miscellaneous items. The balance of $317,000,000, or 6.9 per cent, was spent for loss and damage payments, for injuries to persons, for insurance, and for depreciation and retirements. Much of this latter figure is eventually spent for materials.

The Railways as Manufacturers.—The steam railway industry is a manufacturing industry. What a railway produces and has for sale is service, an intangible product, at prices strictly controlled and regulated by state and federal authorities.

The amount of freight and passenger service rendered by the railways each year is usually measured in terms of ton-miles and passenger-miles, namely, the equivalent of a certain number of tons carried one mile, and the equivalent of a certain number of passengers carried one mile. In addition to the transportation of freight and passengers, the railways also perform an important service in carrying mail and express. There is, however, no exact physical unit in terms of which the amount of this traffic may be measured, and while the service is vital to the country, its physical volume and the financial returns to the railways are relatively small in comparison with the freight and passenger business.

By far the most important part of railway transportation is the freight service. Second in importance only to the freight traffic is the passenger transportation service provided by the railways. The amount of the freight and passenger service, for each year from 1911 to 1922, Class I railways, is shown below:

[1] Carriers are, for statistical purposes, separated into classes based on the amount of their annual operating revenues, as follows: Class I—above $1,000,000. Class II—from $100,000 to $1,000,000. Class III—below $100,000. Class I carriers operate about 90 per cent of the total operated steam railway mileage, and handle more than 95 per cent of the traffic.

TABLE XXIX.—REVENUE TON-MILES AND REVENUE PASSENGER-MILES, 1911 to 1922

Year	Ton-miles (millions)	Passenger-miles (millions)
1911 (fiscal)	249,843	32,371
1912	259,982	32,316
1913	297,723	33,875
1914	284,925	34,567
1915	273,913	31,790
1916 (calendar)	362,444	34,586
1917	394,465	39,477
1918	405,379	42,677
1919	364,293	46,358
1920	410,306	46,849
1921	306,737	37,313
1922	339,811	35,439

In return for their services rendered—in receipt for the sale of their sole product, transportation—the Class I railways have received since 1910 annual sums varying from $2,752,000,000 in 1911 to $6,178,000,000 in 1920. These "gross receipts from sales" suffice to show the importance of the railways as manufacturers, without considering the fact that their product is essential to individual and national existence.

The manufacturing expenses of the railways in producing transportation service are a second indication of the railways' importance. In the eleven years 1911–1921 inclusive, the Class I railways spent more than $34,000,000,000 in producing transportation and maintaining their properties alone. From 90 to 95 per cent of this total, which includes operating expenses only, was expended directly for labor and materials.

The Railways as Employers.—The steam railway industry is one of the largest direct employers of labor in the United States. In the past ten years Class I railways alone have paid out more than $20,000,000,000 in direct wages to labor. The total number directly employed at any one time by these roads has risen (August, 1920) as high as 2,198,000. The average number in 1920 was 2,012,706, which was 4.8 per cent of the total number of persons reported by the Census Bureau as gainfully employed in that year.

The following table gives the number of railway employees as summarized by the Interstate Commerce Commission every five years from

1889 to 1914. The number is as of June 30 of each year. Total compensation was first reported in 1895.[1]

TABLE XXX.—NUMBER OF RAILWAY EMPLOYEES AND THEIR COMPENSATION AT FIVE-YEAR INTERVALS, 1889–1914
(Railways of Class I, II, and III)

Year	Employees on June 30	Total compensation
1889	704,743	not given
1894	779,608	not given
1899	928,924	$ 522,967,896
1904	1,296,121	817,598,810
1909	1,502,823	988,323,694
1914	1,710,296	1,381,117,292

Beginning with 1915, the number of employees has been shown as a yearly average. The statistics for the years 1915–1922, Class I railways, are given below:

TABLE XXXI.—RAILWAY EMPLOYEES AND COMPENSATION, 1915–1922
(Railways of Class I)

Year	Average number	Total compensation
1915 [a]	1,491,849	$1,236,305,000
1916 (fiscal)	1,599,158	1,366,101,000
1916 (calendar)	1,647,097	1,468,576,000
1917	1,732,876	1,739,482,000
1918	1,841,575	2,613,813,000
1919	1,913,422	2,843,128,000
1920	2,022,832	3,681,801,000
1921	1,660,617	2,765,236,000
1922	1,579,000	2,634,717,000

[a] Partially estimated to include certain Class I roads not reporting these data to the Interstate Commerce Commission.

The statistics by months from January, 1920 to December, 1922 are given below. These cover railways of Class I, including large switching and terminal companies.

[1] Because of the rather gradual development of employee and wage statistics, it is impracticable to set up a tabulation for any extended period that is comparable throughout. The statistical tables accompanying the following textual discussion are therefore general, and deal merely with total number of employees and total compensation.

TABLE XXXII.—RAILWAY EMPLOYEES AND COMPENSATION, BY MONTHS, 1920–1922
(Class I railways and large switching and terminal companies)

Month	Number of employees	Compensation
January, 1920	2,000,105	
February	1,970,525	$ 795,616,000
March	2,009,948	
April	1,952,446	
May	2,005,483	903,484,000
June	2,056,381	
July	2,111,280	
August	2,197,824	1,052,109,000
September	2,164,880	
October	2,136,259	
November	2,068,454	982,607,000
December	1,976,429	
January, 1921	1,804,822	
February	1,676,543	757,325,000
March	1,593,068	
April	1,542,716	
May	1,575,599	699,685,000
June	1,586,143	
July	1,634,872	214,339,000
August	1,679,927	227,746,000
September	1,718,330	223,973,000
October	1,754,136	237,603,000
November	1,732,353	225,304,000
December	1,637,151	214,921,000
January, 1922	1,552,014	205,179,000
February	1,545,040	194,523,000
March	1,570,158	216,704,000
April	1,578,133	203,413,000
May	1,628,228	216,672,000
June	1,685,414	222,933,000
July	1,467,824	193,571,000
August	1,594,074	224,977,000
September	1,708,591	238,735,000
October	1,804,315	255,514,000
November	1,820,463	249,287,000
December	1,787,000	247,268,000

Not only do the railways directly employ many men and women, but they are indirectly responsible for the employment of a large number through the purchase of articles produced by other industries.

The number of men employed in the manufacture and distribution of goods purchased and utilized by the railways has been variously estimated. How closely these estimates run with actual facts it is impossible to say, but they have been made by men intimately connected with the railway supply industry, and represent the careful judgment of those best qualified to know the facts.

A bulletin issued in 1921 by the Railway Business Association, which described itself as a "national organization of concerns making or selling railway equipment, materials and supplies," estimated that 2,000,000 men are normally employed "in the manufacture, repair and reconstruction of railway rolling stock, track, and structures, and the fabrication of all the parts and materials used therein." This estimate does not include the men engaged in the production of the basic materials used indirectly by the 2,000,000 men cited above, as, for example, the coal miners employed in furnishing coal to iron and steel mills producing railway steel, whose employment is due, although indirectly, to railway purchases. The inclusion of these workers would increase this estimate of the total number of men indirectly employed by the railways by at least 10 per cent. Although at best little more than a rough estimate, an analysis of the occupational census statistics for 1920 lends some strength to this approximation. In passing, it may be noted that this total does not include the indirect employment ascribable to the railways through the expenditure by railway employees of their wages.

Adding together the 2,000,000 men employed by the railways under normal conditions and the more than 2,000,000 men estimated as engaged in supplying equipment and materials to the railways, we have a total of over 4,000,000 men directly or indirectly depending for their livelihood on the railway industry. This is approximately 10 per cent of the total number of persons reported by the Census Bureau as gainfully employed in the United States in 1920.

The Railways as Purchasers.—In discussing the railways as purchasers, the purchase of new equipment is the logical starting point, for the reason that equipment represents the most complicated product bought by the railways, and the direct purchase of equipment means the indirect purchase of iron, steel, lumber, copper, brass, and countless other raw and semi-manufactured materials.

The following table shows the number of locomotives, passenger-train cars, freight-train cars, and company service cars installed by Class I roads during each year from 1912–1921. Some of this equipment—a relatively small percentage—was built in company shops, but this fact has little bearing upon the status of the railways as purchasers.

TABLE XXXIII.—SUMMARY OF EQUIPMENT INSTALLED, CLASS I CARRIERS
(July 1, 1911–December 31, 1921)

Period	Locomotives	Passenger-train cars	Freight-train cars	Company service cars
July 1, 1911–June 30, 1912	2,861	3,060	97,972	10,630
July 1, 1912–June 30, 1913	4,381	2,823	162,670	13,014
July 1, 1913–June 30, 1914	3,245	3,629	150,813	12,354
July 1, 1914–June 30, 1915	1,114	2,664	86,012	10,228
July 1 1915–June 30, 1916	1,475	1,261	88,254	13,086
July 1, 1916–Dec. 31, 1916[a]	993[a]	897[a]	63,426[a]	6,986[a]
Jan. 1, 1917–Dec. 31, 1917	2,148	2,535	117,210	9,445
Jan. 1, 1918–Dec. 31, 1918	2,803	1,817	65,249	9,310
Jan. 1, 1919–Dec. 31, 1919	2,062	435	76,019	5,925
Jan. 1, 1920–Dec. 31, 1920	1,017	621	36,044	6,608
Jan. 1, 1921–Dec. 31, 1921	1,330	1,629	62,351	4,273
Total	23,429	21,371	1,006,020	101,859

[a] Estimated.

These statistics give only numbers. An important development during this period has been in the direction of larger or more powerful locomotives and cars, and a gradual shifting with respect to cars from wooden to steel construction. The table on the following page shows that between 1911 and 1921 the number of locomotives increased only 12 per cent, whereas their aggregate tractive power increased 45 per cent; that the number of freight cars increased only 9 per cent, whereas their aggregate capacity increased 26 per cent. Comparative statistics of passenger-car capacity are not available, but the average size, length, and carrying capacity of passenger equipment have been increasing, as well as their safety and comfort through the installation of steam heat, electric light, and safety devices. Complicated safety devices are also being installed on locomotives and freight cars. These developments mean that more material is required per unit of equipment built, and consequently, that a falling off in number of units bought does not necessarily cause a corresponding decrease in indirect purchases of the basic materials.

A comparison of these two tables vividly illustrates the necessity of large annual railway purchases, because of the wearing out and retirement of equipment. From July 1, 1911 to December 31, 1921, 23,429 locomotives were installed, yet because of retirements, there was a net increase of only 6,860 locomotives in service. Similarly, a gross installation of 1,006,020 freight cars and of 21,371 passenger cars meant only the net addition of 198,056 freight and 7,426 passenger cars.

TABLE XXXIV.—EQUIPMENT IN SERVICE, CLASS I RAILWAYS.

Item	June 30, 1911	Dec. 31, 1921	Increase	
			Amount	Per cent
Number of locomotives	58,071	64,931	6,860	11.8
Aggregate tractive power (lbs.)	1,643,700,000	2,376,176,000	732,476,000	44.6
Average tractive power (lbs.)	28,305	36,803	8,498	30.0
Number of freight carrying cars	2,117,644	2,315,700	198,056	9.4
Aggregate capacity (tons)	78,100,000	98,020,000	20,432,000	26.2
Average capacity (tons)	36.9	42.5	5.6	15.2
Number of passenger cars	46,905	54,331	7,426	15.8

A second important field of railway purchases lies in the construction of new trackage—main line, secondary and passing tracks, yard tracks, and sidings. Rails, ties, ballast, tie plates, spikes, joints, all these and many other materials are fundamental essentials for the construction of a mile of track. The following figures[1] show the amounts of the more important materials required to build one mile of certain types of single track, and with these figures in mind some idea may be formed of what the appended figures of railway mileage construction mean when converted into terms of purchases.

TABLE XXXV.—AMOUNTS OF MATERIAL TO ONE MILE OF SINGLE TRACK

Cross ties (24″ center to center)	2,640
Spikes (5½″ × 9/16″, 4 per tie) (lbs.)	5,632
Rock ballast (cu. yds.) Class A track	3,488
Rock ballast (cu. yds.) Class B track	2,692
Cementing gravel (cu. yds.) Class A track	2,747
Cementing gravel (cu. yds.) Class B track	2,291
Rail (gross tons), 80 lbs. per yd.	125.7
Rail (gross tons), 90 lbs. per yd.	141.4
Rail (gross tons), 100 lbs. per yd.	157.1
Rail (gross tons), 110 lbs. per yd.	172.9
Rail (gross tons), 120 lbs. per yd.	188.6

There appear below the number of miles of railway track constructed in the United States by decades from 1850 to 1910 and by years from 1910 to date. Consibered in connection with the foregoing figures, they help to illustrate the great importance of the railways as purchasers.

[1] Prior, F. J., "Construction and Maintenance of Railway Roadbed and Track," 1908, pp. 256–7. 287, 293.

TABLE XXXVI.—MILES OF LINE CONSTRUCTED IN THE UNITED STATES[a]

Period	Miles	Period	Miles
1851–1860	21,605	1914	1,532
1861–1870	22,096	1915	933
1871–1880	40,382	1916	1,098
1881–1890	75,724	1917	979
1891–1900	32,001	1918	721
1901–1910	47,185	1919	686
1911	3,066	1920	314
1912	2,997	1921	475
1913	3,071	1922	324

[a] Prior to 1881, figures represent net increase in mileage.

Railway growth during the past ten years has proceeded along a line somewhat different from new construction. This line has been the intensive development of existing facilities, representing additions to equipment, construction of second, third, fourth, fifth, and sixth main tracks, and increases in such subsidiary tracks as yard tracks, industrial tracks, passing tracks, and the like. The relative increase since 1900 in mainline mileage operated, and in the other forms of operated trackage, is indicated in the following table:

TABLE XXXVII.—INCREASE IN OPERATED TRACKAGE, 1900–1920

	Miles	Per cent
Main line	67,026	35
Other main tracks	22,582	160
Yard track and sidings	57,439	110
All tracks	147,047	57

Still a third general field of railway purchases is the construction of new bridges, station and office buildings, terminals and the like. In this field lie also the improvement of such facilities as large terminals, both freight and passenger, and of large shops equipped with better tools and better working facilities for employees; the electrification of tunnels, terminals, and many miles of suburban and main lines; the reduction of grades, elimination of curves, introduction of signals and safety devices.

A large part of the work of new construction and improvement is done by outside companies under contracts for which statistics are not

available; but indirectly the railways are the motivating force—the "ultimate purchasers."

An approach from a slightly different angle serves to emphasize even more strongly the magnitude of the railways in the buying field. Exact statistics of consumption do not exist for most of the articles purchased directly by the railways, but an effort has been made to arrive at more accurate figures for the present report than have heretofore been ascertained. The larger railways of the United States have been requested to report the total number of physical units of various commodities purchased by them during each year from 1910 to 1915, a fairly normal prewar period. The reports made by thirty-nine of the principal railways have been consolidated, and the totals so derived have been increased in the ratio which the trackage or operating expenses of these thirty-nine railways bear to the total trackage or operating expenses, respectively, of all steam railways. The average operating expenses and trackage of these thirty-nine railways were approximately 51 per cent of the totals of all railroads. Ties and rails have been increased in the ratio of trackage, and the other commodities in the ratio of operating expenses. In the case of coal and fuel oil, official statistics are available for all railways. The railway aggregates thus ascertained have been compared on a percentage basis with the total production or output of the several commodities in the United States.

This method omits, it is plain, the considerable amounts of materials used indirectly by the railways and directly and indirectly by railway employees. On the basis of the best information available, estimates have been made of the quantities of various materials used indirectly "at first hand" by the roads, and these estimates are included below. But due to endless ramifications, no attempt has been made to include either the goods used indirectly by the railways "at second hand"—the coal, for example, used by the iron and steel mills in producing railway steel—or the goods used directly or indirectly by railway employees. The results which appear below are thus incomplete, nor are they held out as exact, for they are based on certain assumptions admittedly open to question. However, they are offered as the result of a more nearly accurate investigation into the subject than has heretofore been made.[1]

[1] The leading details of this investigation are as follows:

Coal.—Not only is the transportation of coal the most important factor in railway freight traffic, about one-third of the total tonnage handled each year, but the railways are also the largest single group of coal purchasers in the United States. According to the United States Geological Survey, the average production of bituminous coal during the six calendar years 1915–1920 was 515,158,000 net tons of 2,000 pounds. Of this total production, the steam railways of the United States consumed an annual average of 143,290,000 net tons. The average annual production of anthracite coal during the same period was 92,034,000 net tons, of which the railways consumed 5,428,000 net tons annually. The percentage of total output consumed by

It appears that the railways purchase directly one-quarter of the ɔtal output of coal in the United States and one-ninth of the total etroleum production. Directly and indirectly they purchase approxiıately 30 per cent of the iron and steel output, at least 25 per cent of the ımber produced, a considerable but indeterminable percentage of the opper and brass output, and smaller percentages of many other products.

II. RELATIVE STABILITY OF RAILWAY EMPLOYMENT

Census returns show a gradual increase in the proportion of the ɔopulation and of those gainfully occupied who were in railway employ. 'or example, the percentage of the gainfully occupied who were in railvay service rose from 3.2 per cent in 1890 to 4.8 per cent in 1920.

It is a generally accepted theory that railway service, compared with ɔther industries, offers fairly steady employment. It is true that in the

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he railways was 27.8 per cent with respect to bituminous coal, 5.9 per cent with ɜspect to anthracite coal, and 24.5 per cent with respect to bituminous and anthracite oal combined. In other words, the railways purchase and consume a quarter of the ɔtal output of coal in the United States.

Fuel Oil.—According to the Geological Survey, the average annual output of etroleum from 1910 to 1920 was 305,183,000 barrels. The amount of fuel oil consumed y oil-burning railway locomotives during that decade was 36,064,000 barrels per ear, or 11.8 per cent of the total output of petroleum. Of fuel oil alone, the Geologıal Survey estimates the annual average consumption in the years 1910, 1911, 1914, nd 1915 at 62,750,000 barrels, of which railway consumption was 30,327,000, or 8.3 per cent. That is, the railways use almost as much fuel oil as all other industries nd individuals combined.

Iron and Steel.—The average production of pig iron during the years 1910–915, as reported by the American Iron and Steel Institute, was 30,780,000 net tons ınnually. Of this production, the railways purchased and utilized 2,580,000 net tons ı steel rails each year and 2,565,000 net tons of other iron and steel products. The otal iron and steel product, including steel rails, utilized by the railways was ,145,000 net tons. Allowing for the use of scrap steel in production, the railways ɔurchase directly from 12 to 15 per cent of the annual iron and steel output of the ountry. (An indeterminable amount of steel is produced from scrap, which does not ɔpear in the annual pig iron production figure.)

These figures take no account of the iron and steel products that go into locoıotives, passenger cars, and freight cars built for the railways in outside shops, or f iron and steel used in new construction work which is handled under contract. nto this class falls such construction work as the building of new railway line, of ɔridges and other large structures, of large stations, office buildings and the like, and ıany other forms of improvement work handled through outside contractors for a ıxed sum. In cases of this kind, of course, the materials involved are purchased by he contractor, not by the railways, and do not enter into the supply records of the ailway companies.

It seems reasonable to assume that at least as much iron and steel is used for the ailways by outside contractors and construction companies as is purchased directly ɔy the railways. It has been estimated, for example, that nearly 10 per cent of the ron and steel production goes into locomotives and cars alone. This would make

summer extra section hands and other laborers are taken on and that a times of heavy business, all forces are somewhat increased. But th railway employee who has a year or two of continuous service, and thu gains a seniority standing, generally escapes a lay-off except in times o unusual depression.

Although the relative stability of employment in railway service i generally regarded as greater than in other lines of industry, little informa tion exists on the subject.

The United States Employment Service has compiled since January 1921, monthly data concerning the number of employees in 1,428 indus

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the total percentage of the iron and steel output consumed directly or indirectly b railways not less than 30 per cent.

Lumber.—It is impossible to ascertain exactly the proportion of lumber outpu used by the railways, because so much lumber goes into new equipment, large struc tures, and buildings constructed by outside contracts.

It appears from a careful study of lumber purchases reported by the larger railwa companies for 1910–1915 that the total number of cross ties purchased by the railway was 130,000,000 per year, equivalent to 4,814,000 M feet; also 345,000 M feet o bridge and switch ties, and 2,141,000 M feet of other lumber. The aggregate lumbe purchased by the railways is thus 7,300,000 M feet per year, which is equivalent t 17.5 per cent of the total saw-mill lumber output during that period.

How much additional lumber goes into railway equipment and structures of variou kinds built under contract it is difficult to say, but assuming that it is only one-half th amount purchased directly by the railways for their own use, the percentage of lumbe output utilized directly or indirectly by the railways would be at least 25 per cent

Other Products.—Of copper and brass products of various kinds the railways dur ing the period 1910–1915 purchased an average of 74,000 net tons per annum. Th copper production of the mines of the United States during the same period average 598,600 net tons, while the output of the refineries was 767,250 net tons annually. correct percentage of the railway use of copper cannot be computed from these figures for the purchases reported by the railways include the zinc and tin in the brass an bronze they bought, but it is clear that the railways of the United States play a important part in the copper business. Also it is certain that the data reported by th railways fall short of the full magnitude of their demand for this metal, inasmuch a equipment bought by the railways, such as locomotives and cars, contains a larg amount of copper.

Other metals, chiefly aluminum, lead, zinc, and tinplate, are purchased directl by the railways in amounts averaging less than 1 per cent of the total output eac year. Including the quantities used to build equipment and manufacture tool implements, and machinery for the railways, the total percentages are much highe Cotton is bought by the railways in the form of cotton waste and other articles. Thei average purchases compared with the total production are somewhat less than 1 pe cent.

For cement, figures are available in a rather small way for the years 1911–191 During this period the railways purchased directly about 3 per cent of the total output Including cement used by contractors in railway construction, the total percentag consumed directly or indirectly by the railways must run well above 5 per cent, an the percentage is probably increasing with the development of concrete work i railway construction.

trial establishments, with a total of approximately 1,600,000 men. A comparison of the results of this compilation with the number of railway employees month by month during the same period seems to indicate greater fluctuation in railway than in other employments.

On the other hand for a number of years, Massachusetts has summarized the unemployment situation within the state. The results from 1917 to 1921 show a lower and more constant percentage of unemployment among transportation employees than in other industries, throughout almost the whole of the period. But neither this study, nor that of the Department of Labor, is conclusive. The periods covered are short, and the conditions pictured were abnormal.

III. FLUCTUATIONS IN RAILWAY ACTIVITIES

Railway activity fluctuates in three distinct ways: seasonally, secularly, and cyclically. The four principal factors of traffic, revenues, expenses, employees, are all subject to these definite variations. Traffic may be taken as the most reliable measure of railway activity and the most sensitive barometer of change; first, because it is a controlling factor—because it is a prerequisite for that continued activity—and second, because its unit of measure remains constant.

Seasonally, there is a normal month to month variation in the amount of traffic offered to and transported by the railways. Revenues, expenses, and employees vary accordingly, the latter two being affected, in addition, by the fact that much of railway maintenance work can be performed only at certain seasons of the year.

Secularly, there is a continual upward trend in traffic caused by the increase in population, the increased demands of industry for transportation, and finally, by the trend toward a generally higher standard of living, and toward centralization of population, both of which are continually requiring more and more transportation service per individual. The number of employees has the same general trend as traffic; revenues and expenses are complicated by rate, wage, and price levels.

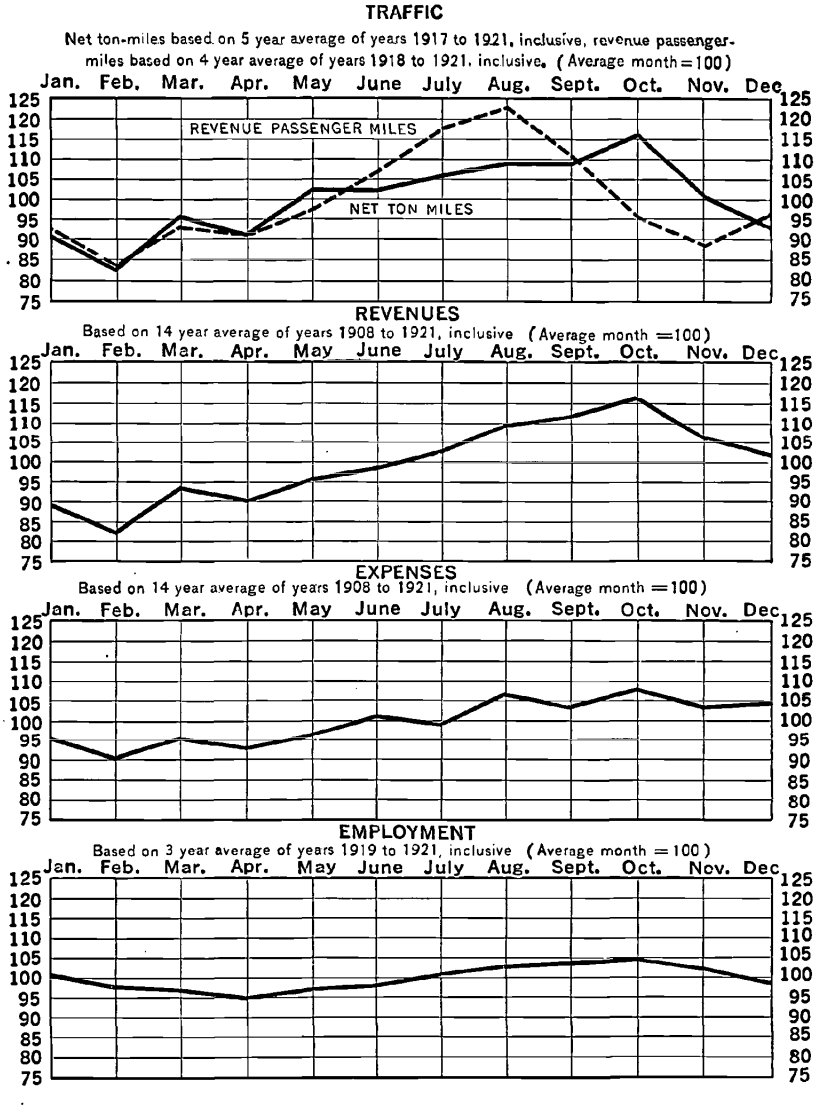
Cyclically, there are peaks and valleys in all four factors, following closely the fluctuations of general business.

Seasonal Fluctuations.—Railway activity is in a sense the reflex action of all other industries. Certain industries are highly seasonal in nature, and their traffic comes onto the railway lines at well defined periods of the year. The ruling seasons, however, vary from industry to industry. Railway traffic, therefore, reflects in a composite way the seasonal characteristics of all industries served by the railways. In addition railway traffic has some seasonal features of its own. The passenger business, for example, is greatest in the summer months.

As a result the changes in railway traffic, revenues, expenses, and number of employees are markedly seasonal in character.

Chart 48 shows the monthly fluctuations in railway traffic, revenues, expenses, and employment. In each case the average month of the

CHART 48.—SEASONAL FLUCTUATIONS IN RAILWAY TRAFFIC, REVENUES, EXPENSES, AND EMPLOYMENT.



period covered is regarded as equivalent to 100 and the individual months are related to that average on an index number or percentage basis. As noted on the chart, the periods for which data are available differ from item to item.

It appears that the low month for both freight and passenger traffic is February, that there is a fairly constant upward trend to August for passenger traffic, and to October for freight traffic; the curves then turn downward until February, except that holiday travel raises the passenger traffic temporarily in December and January.

Railway revenues naturally follow the traffic. They vary from a low point in February to a high point in October, and the trend is almost consistently up or down between the extremes. The curve for expenses also runs from February to October and back again, but is influenced by the seasonal nature of maintenance expenses, which will be shown in some detail in a later chart.

The number of railway employees fluctuates seasonally and in sympathy with the traffic fluctuations but to a much less degree. Thus the low point comes in April, and the peak in October, after which the curve declines again to April. It should be noted that the three-year period on which this curve is based was unusual in many ways, and that the employee curve is not fully representative of normal conditions. The number of employees in January, 1921 was unusually large, because the full effect of the decline in traffic had not yet been realized. The three-year average shown for January is above 100, whereas it is normally several points below. April, on the other hand, is unusually depressed because of the yardmen's strike of April, 1920. The principal use of the chart is to show that there is a definite relationship between seasonal fluctuations in railway traffic and in the number of railway employees.

Some light on this subject may be had from another source. A tabulation covering approximately three-quarters of the employees of Class I roads shows the following seasonal fluctuation for each of the years 1916–1918. In this table, the average for each year is taken as 100.

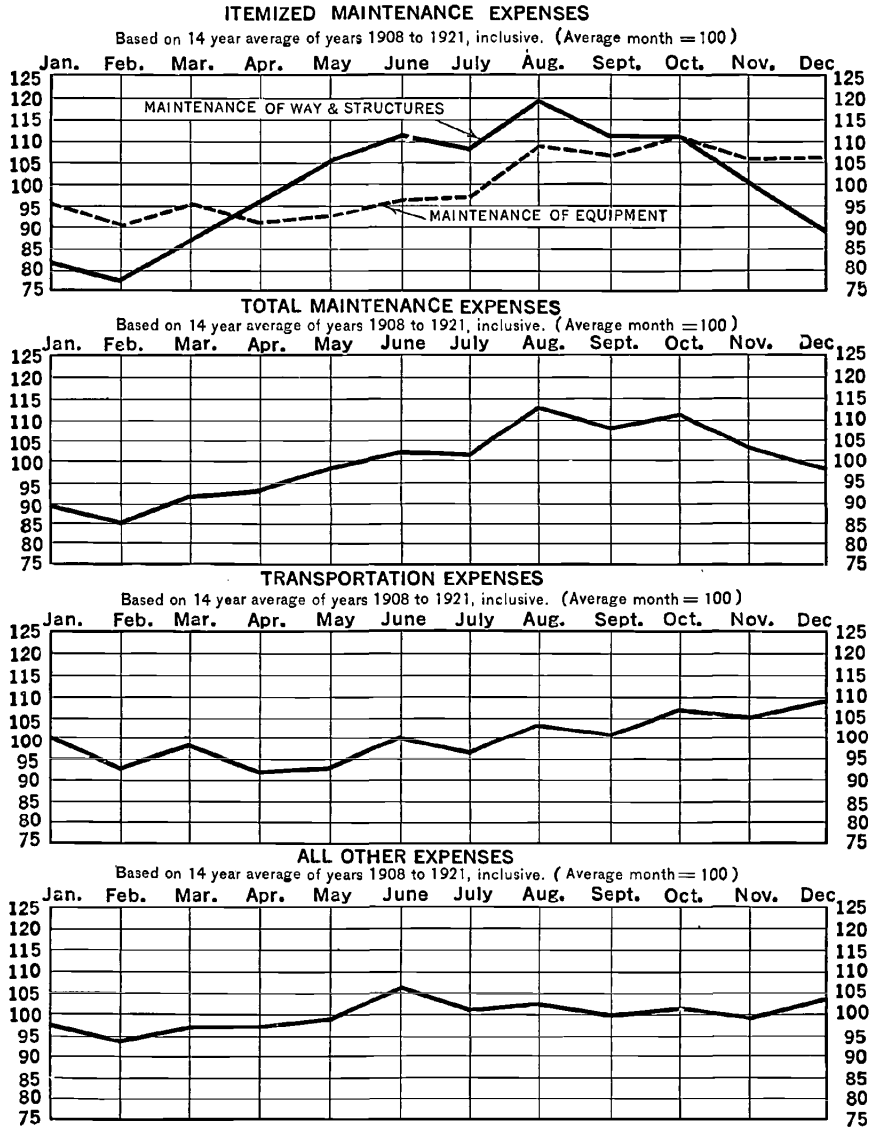
TABLE XXXVIII.—SEASONAL FLUCTUATION IN RAILWAY EMPLOYMENT, 1916–1918

	1916	1917	1918	Three-year average
Average for year	100.0	100.0	100 0	100.0
January	93.0	96.1	97.2	95.5
April	100.4	98.6	98.4	99.1
July	102.4	103.3	101.0	102 2
October	104.1	102.1	103.4	103.2

The upward trend from the earlier to the later months of the year is clearly discernible in the average figures.

Chart 49 shows the monthly maintenance, transportation, and other operating expenses of railways of Class I, averaged over the fourteen-year period 1908–1921. Again the average month is taken in each

CHART 49.—SEASONAL FLUCTUATIONS IN RAILWAY EXPENSES.



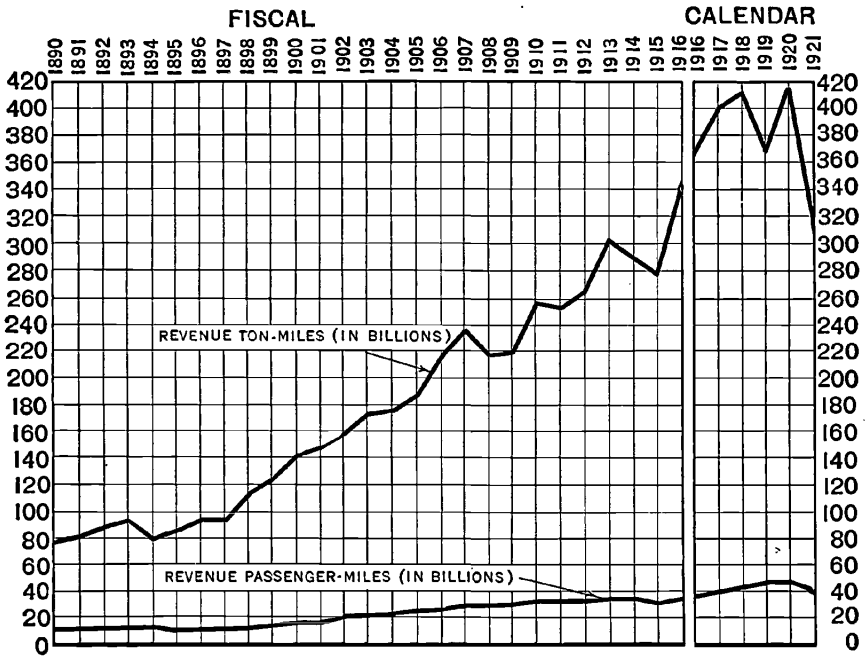
case as equivalent to 100. This chart shows a more sharply defined, seasonal fluctuation in maintenance of way expenses than in any other class. The high months are June to October, when the bulk of outdoor maintenance work is done. This fluctuation is the more marked,

because many railway companies, in accordance with the prescribed accounting rules of the Interstate Commerce Commission, charge their maintenance expenses to the appropriate accounts on a program basis, regardless of the actual work done each month.

Maintenance of equipment expenses have their peak in August, September, and October, but in general closely follow the curve for total expenses. When the two maintenance accounts are combined, the fluctuations are less marked.

Secular Fluctuations.—The secular trend in railway activities, while ever present and as marked as the seasonal fluctuation, differs from

CHART 50.—GROWTH OF RAILWAY TRAFFIC.



it in a fundamental aspect. The seasonal fluctuation is rhythmical; that is, in any year, it has consistent and well defined crests and troughs, and the monthly figures for a number of years appear as a fairly regular succession of waves when charted. The secular trend, however, is a straight line or a regular curve continually moving in an upward direction.

The secular trend represents the normal growth of railway activity caused by the economic and social development of the country. It may best be illustrated, perhaps, by the growth of railway traffic. On Chart 50 there are shown the revenue ton- and passenger-miles, by years, from 1890 to 1921. No attempt has been made to draw the smoothed line of the secular trend as the continual rising tendency is clear despite

a few minor drops. There is a similar general upward trend in railway revenues and expenses and in the number of men employed. This trend appears in the following figures showing the growth of railway revenues, expenses, and employment.

TABLE XXXIX.—RAILWAY REVENUES, EXPENSES, AND EMPLOYMENT

Year	Operating revenues (millions)	Operating expenses (millions)	Number of employees (thousands)
1890 (fiscal)	$1,052	$ 692	749
1895	1,075	726	785
1900	1,487	961	1,018
1905	2,082	1,291	1,382
1910	2,812	1,882	1,699
1915	2,956	2,089	1,525[b]
1916 (calendar)	3,691	2,426	1,701
1917	4,115	2,906	1,733[a]
1918	4,985	4,072	1,842[a]
1919	5,250	4,499	1,913[a]
1920	6,310	5,957	2,023[a]
1921	5,517[a]	4,563[a]	1,661[a]
1922	5,558[a]	4,417[a]	1,579[a]

[a] Class I roads only.

[b] Partially estimated to include certain roads not reporting these data to the Interstate Commerce Commission.

Cyclical Fluctuations.—The cyclical feature of railway traffic is very marked, following automatically from the fact that the railway business, as already indicated, is a composite reflection of business in general.

The oscillations of railway activity over a period of years may be shown by means of the four factors already enumerated: number of employees, traffic, revenues, and expenses.

During the years 1890–1921, it will be recalled, there were four periods of severe financial and business depression: 1893–1896, 1907–1908, 1914–1915, and 1921. Charts 51 and 52 present the factors of traffic and employees, and of revenues and expenses, for each year since 1890. As before, the actual amounts are reduced to a relative basis, the annual average of the whole period being taken as equivalent to 100.

In 1921, the final year of the period, the relatives were as follows:

Number of employees	124
Passenger-miles	147
Ton-miles	145
Railway revenues	219
Railway expenses	249

CHART 51.—FLUCTUATIONS IN RAILWAY OPERATIONS. NUMBER OF EMPLOYEES, REVENUE PASSENGER-MILES, AND REVENUE TON-MILES, 1890–1921. (AVERAGE YEAR OF PERIOD = 100)

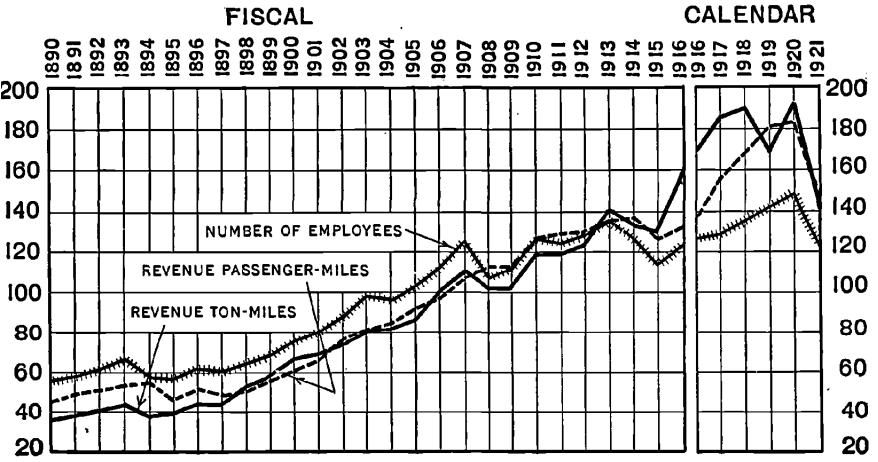
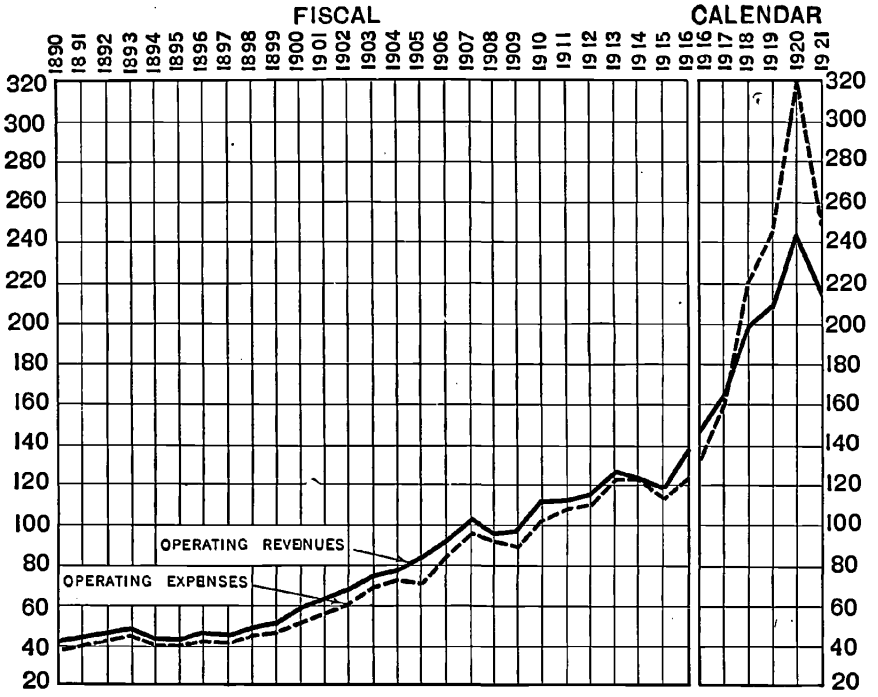


CHART 52.—FLUCTUATIONS IN RAILWAY OPERATIONS. RAILWAY OPERATING REVENUES AND EXPENSES, 1890–1921. (AVERAGE YEAR OF PERIOD = 100)



Thus the several factors showed widely varying rates of increase, and it is a significant comment on the railway problem that operating expenses show the highest relative.

The charts bring out clearly the cyclical fluctuations about the secular trend of each factor. Generally speaking, the curves rise from 1890 to 1893, show a decline in 1894 and to some extent in 1895, then rise almost steadily to 1907. The sharp drop in 1908 was the result of the financial panic of 1907. The year 1909 showed a slight improvement over 1908, and there was a further gain in 1910, which with a slight recession in 1911 continued to 1913. The drop in 1914 to some extent foreshadowed, while the further drop in 1915 clearly reflected, the European war. The sharp turn upward in 1916 was also due to war conditions, while the continued rise to 1918 grew out of our own war activities. Ton-miles broke sharply in 1919, but all the curves reached their peak in 1920. Then came the unprecedented decline of 1921.

The principal conclusion to be drawn from the charts is that railway activity, however measured, is in fact cyclical, and that it closely follows the trend of business in general. This was to be expected from the nature of the railway industry, but the charts establish the relationship beyond question.

IV. THE RELATION OF RAILWAY PURCHASES TO BUSINESS

That there exists a relationship between railway purchases and general business has been emphasized many times and by many observers.

In 1908, for example, W. R. Taylor, Vice-President of the Reading Company, made the following statement:

> An examination of the statistics would seem to justify the opinion that if the influence of the railroad companies did not predominate (in industrial activity) it, at least, set in motion the means that produced that activity. This conclusion would seem to be negatively proved by the fact that the industrial depression began immediately upon the suspension by the railroad companies of their construction work and the completion or withdrawal of their orders for equipment late in 1907.

Judge A. C. Spencer, General Attorney of the Oregon-Washington Railroad and Navigation Company in 1914 expressed the same thought as follows:[1]

> Railway purchases are the initial impetus, or force, in starting and sustaining the current of general business.

The statistics already presented, showing how large a proportion of the output of the more important industrial products is used by the railway industry, serve to emphasize the statement (and others which might

[1] *Oregon Manufacturer*, February, 1914, p. 21.

be quoted to the same effect), that the steam railway as a purchaser is a factor to be dealt with in any survey of market conditions.

The claim is sometimes made that purchases by the railways measure business prosperity. Some go farther, and argue that prosperity actually depends on railway purchases.

Statement of this doctrine is usually coupled with the plea that the railways should come into the market in times of depression, so as to encourage manufacturing and construction companies, and furnish labor to men who need employment most at that time. It is pointed out that railway orders for equipment, for example, will mean business for locomotive and car companies, which in turn will spell orders for steel companies, for machine and implement manufacturers, for lumber men, and so on back to the producers of raw material. Railway orders create business activity, and activity provides employment.

Perhaps the best statement of the case is contained in an open letter written by E. B. Leigh, President of the Chicago Railway Equipment Company, to Secretary Hoover in September, 1921, at the time of the President's Unemployment Conference. This letter read in part as follows:

> Restoration of national prosperity can be started on its way by just one factor—purchasing power. All substitutes are bootstraps or phantoms.
>
> Among the sources of purchasing power the largest and most definitely available is the power of the railroads to buy material and labor for maintenance, additions, and betterments. In normal years, the railways directly and indirectly have consumed from 40 to 50 per cent of the iron and steel production, admittedly the 'barometer of business.'
>
> It is the history of depressions that recovery is always accompanied by resumption of large railroad buying, and never comes without it, the only exception being the war period. The business so initiated flushes the channels of all industry and trade, including agriculture, and favorably affects every inhabitant of every community.
>
> However it starts, a resumption of general business is strengthened and hastened by railroad buying and cannot be permanent without it.

It has been pointed out furthermore that there is usually either a feast or a famine in the railway supply industry.

The railways are themselves poor in times of depression. They are forced because of this to stay out of the supply market at the very time when that market needs help. Then when they do begin to buy after the volume of business increases, prices have begun to rise and deliveries are slow. The very fact that railways begin to buy tends to increase the price; in other words the financial condition of the railways, brought about by the limitation of their earnings, forces them to stay out of the market when it would be helpful for them to go in and then when they do go in, it sometimes causes excessive increases in price.

V. STABILIZATION OF RAILWAY ACTIVITIES

In their role of manufacturers of transportation the railways have little opportunity to control the amount of their product. Unlike other manufacturing industries, when business falls off, the railways are not able to stabilize their operations by the manufacture of their commodity —transportation service—for stock, or by attempting to develop a subordinate by-product. Transportation is a "current" commodity, produced only when demanded and there are no stabilizing by-products. Individual railway companies maintain traffic bureaus, outside agencies, and advertising organizations to attract traffic to their own lines, which in a degree may affect the amount of traffic offered to them. To some extent, however, what new traffic is secured by one railway is at the expense of other railways. In the aggregate, the railways themselves create only such traffic as represents the transportation of their own supplies, or of the equipment and other items they purchase. This is not the bulk of their traffic considered as a whole. They handle the traffic that is offered them by other industries the amount of which is controlled in turn by the business situation and by circumstances generally beyond railway control.

It appears therefore that the transportation service of the railways is controlled in large measure by the demand of the general public for freight and passenger service. There is a fixed minimum demand below which the service will not go, and there is also a maximum demand which is frequently affected by temporary circumstances. During the past five years, the largest number of revenue and non-revenue ton-miles handled by the railways in any one month was 42,734,000,000 in the month of August, 1920, while the smallest number was 24,723,000,000 ton-miles, in the month of April, 1922. The difference between these two extremes is very great, the maximum being 73 per cent above the minimum.[1]

With reference to the passenger service, there has also been a wide variation, indicated by the fact that the largest number of passenger-miles handled in any one month during the past five years was 5,004,000,000, in the month of August, 1920, while the smallest number was 2,396,000,000, in the month of February, 1922. The high mark was here more than 109 per cent above the low mark.

Seasonal variations of traffic, such as have been described, produce some variations in railway employment, particularly among those groups of employees whose service is directly related to transportation. Little

[1] One reason why the month of August, 1920 was the largest freight traffic month in the history of the railways is that the increased freight rates put into effect by the Interstate Commerce Commission on August 26 of that year were known to shippers thirty days in advance, and a great amount of traffic was rushed onto the rails in advance of the increase. On the other hand, the low freight traffic of April, 1922 was largely due to the coal strike.

constructive planning is possible with respect to this form of railway service, which is dependent almost entirely on business and public demands. Traffic frequently increases with but little warning, with the result that the number of employees does not immediately increase in proportion to the increase of traffic. Freight and passenger trains may be loaded to greater capacity, and more frequent schedules may be inaugurated, bringing heavier duties onto the shoulders of the train employees and giving them more compensation on account of overtime, but perhaps adding little to the number of men on the pay-roll.

On the other hand, it frequently happens that traffic falls off almost over night. This was the case in the early part of 1921 when traffic declined rapidly after several months of the heaviest movement of freight and passengers on record. It took time for the railways to adjust themselves to this change, with the result that several months were consumed in getting the number of men on their pay-rolls and the compensation paid to them onto a lower level in sympathy with the decline in traffic. The relative decreases in the number of employees in service, and in revenue ton-miles each month from August, 1920, the month with the heaviest traffic and the greatest number of employees ever recorded, to April, 1921, when the tide finally turned, appear below. It will be noticed that the reduction in the number of employees lagged decidedly behind the falling off in traffic.

TABLE XL.—PERCENTAGE DECLINE IN RAILWAY EMPLOYMENT AND REVENUE TON-MILES

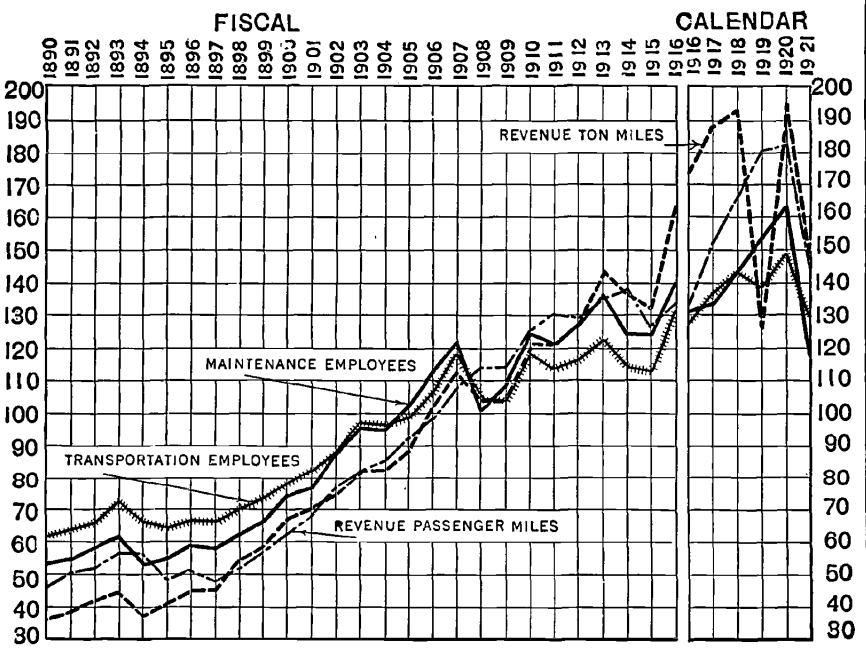
Month	Percentage decline from August, 1920	
	Employees in service	Revenue ton-miles
September, 1920	1.5	3.4
October	2.8	0.2
November	5.9	11.5
December	10.1	19.3
January, 1921	17.9	32.0
February	23.7	43.3
March	27.5	38.2
April	29.8	41.1

If the railways have only partial control over their traffic, it follows that they have only partial control over the number of employees engaged in transportation. This assumption is borne out by Chart 53 which shows the relationship between ton-miles, passenger-miles, and number of transportation employees from 1890 to 1921. For comparison a curve is

also included for maintenance employees. The annual average of the period is taken in each case as 100, and every year in the period is related to that average on a percentage basis.

The number of employees engaged in transportation shows a close relationship to the amount of traffic. The number of maintenance employees increased more rapidly than those engaged in transportation, but showed a tendency to decline more sharply in times of depression. This is noticeable in 1894, 1908, 1914, and 1921. While the basic employment figures supplied by the Interstate Commerce Commission for the

CHART 53.—RAILWAY TRAFFIC AND RAILWAY EMPLOYEES. REVENUE TON-MILES, REVENUE PASSENGER-MILES, AND NUMBER OF MAINTENANCE AND TRANSPORTATION EMPLOYEES, 1890–1921. (AVERAGE YEAR OF PERIOD = 100)



years prior to 1915 are none too reliable, whatever conclusion can be drawn from Chart 53 indicates that the number of maintenance employees has been controllable to a greater extent than the number engaged in transportation. This tallies with the prevailing impression with respect to railway maintenance—that there is a margin within which railway managements have some opportunity to exercise discretionary powers.

In their capacity as purchasers, which brings in the influence exerted on employment in other industries, the railways have somewhat greater freedom of action than they have as manufacturers of transportation. It is for the boards of directors of individual railways to decide whether

or not their traffic needs call for more equipment, for enlargement of their shops, or for additions to trackage facilities and other parts of the railway plant. In times of low traffic and reduced earnings, everything tends toward the cutting down of new construction and improvement work, as well as maintenance of way and of equipment. How far the maintenance of railway property can be postponed or deferred with safety, and to what extent omissions must be made up at some future time with perhaps added expense and difficulty, is a much mooted question. In particular, it has been the subject of debate between the United States Railroad Administration and many railway companies, because the Railroad Administration during the period of federal control reduced the amount of railway maintenance below the normal level.

Construction and New Equipment.—In times of low earnings, the railways are naturally forced to retire very largely from the equipment market. The reasons are two: In the first place, low earnings do not furnish a sufficient margin of return to warrant the railways in seeking enlarged credits for new equipment, and they may even find their cash in hand inadequate to make the necessary first payments on equipment trust obligations. In the second place, their traffic is low and the equipment in service at the time may be more than sufficient to meet current demands. Under such conditions it is not strange that the need for new equipment does not press for attention. With hundreds of thousands of idle freight cars on hand, and with no prophetic knowledge of the future, it is not surprising that the railways hesitate to invest their scanty funds in new equipment for which there is no immediate need, and which may not yield any return for an indefinite period upon the money invested.

During the year 1921 there was a continuing condition of car surplusage, or idle cars, and the number idle at the close of the year was much larger than at the beginning. In the face of a discouraging situation of this sort, it was to be expected that orders for new freight cars would be at a low point in 1921. During that year orders were placed by the railways for only 23,346 freight-cars, with one exception the lowest number on record. Since the beginning of 1922, however, railway managements have thought they foresaw a period of slowly returning prosperity, and during that year orders were placed for more than seven times the number of new freight cars that were ordered during the year 1921. A large measure of faith entered into their policy, for the idle-car situation during the first six months of the year was far from satisfactory, even though it exhibited some improvement over 1921. But with the belief that better traffic conditions were bound to come, the railways took a leaf out of their own past record, and prepared for the future. This indicates the extent to which the psychological element in the railway situation tends to guide the policy of the railways as to new equipment and other improvements in plant.

With respect to new locomotives and passenger cars, the situation was much the same. The number of new locomotives ordered in 1921 was 239, and the number of passenger cars ordered 246. In each case this was the lowest in more than twenty years with but a single exception. During 1922, however, orders were placed for more than ten times as many locomotives as during the year 1921, and for more than nine times as many passenger cars.

With respect to improvements other than new equipment, such as enlargement of terminal facilities, provision of additional trackage, and the like, exact statistics are more difficult to secure. The same principles apply here, however, as in the case of equipment. A period of low traffic and reduced earnings keeps the railways out of the market for new facilities and improvements, both because their treasuries and their credit are restricted, and because the traffic needs do not at the time call for additional facilities.

Railway Maintenance.—Maintenance work, like new construction or equipment purchase, is regulated to some extent by policies of management, although to a much less degree than in the case of new construction. The railway plant must be kept up to a certain level of physical condition, regardless of traffic or revenue. This is the minimum below which no management dare go. Traffic conditions are also a factor in maintenance; the more train-miles produced upon a given section of track, the greater the wear and tear on roadway, rails, and ties. The more locomotive-miles and car-miles, the greater the need for repairs to those classes of equipment.

Above these requirements of safety and of traffic, there is, however, some margin for the play of discretion on the part of the managements.

As to maintenance of way, carefully outlined programs are adopted by many railway companies at the beginning of each year. These programs are determined in part by the maintenance requirements and in part by the best estimate that can then be made as to the probable earnings of the year.[1] Programs are frequently modified as the year draws on, being sometimes increased and sometimes decreased, in sympathy with traffic and revenue changes. During 1921, largely because of the unfavorable financial results of operation, there was some tendency to reduce maintenance programs as the year went on.

Expenditures for maintenance of equipment are also controllable to some extent, for there is no call immediately to repair locomotives and cars classified as in need of repairs, unless there is urgent demand for them. Here again, while safety and traffic conditions set the minimum standard, there is also a margin for the play of policy.

[1] For a detailed discussion of this subject, see WM. C. WILLARD, "Maintenance of Way and Structures," 1915, Chap. XXI, pp. 417–424, entitled, Annual Program for Maintenance of Way and Structures.

There is a field for long-range planning with respect to maintenance work, and a larger field with respect to construction of new equipment and other facilities. The control over maintenance is exercised directly through the medium of the employment of greater or lesser forces of maintenance workers, while the control over new construction operates indirectly, and tends to increase or decrease employment in other industries.

VI. PROPOSALS LOOKING TOWARD GREATER STABILIZATION

While the subject of stabilization of railway employment has been discussed for years, but few definite proposals have been made looking toward any program or policy that would increase stability.

The Committee on Economics of Railway Labor of the American Railway Engineering Association in 1920 made the following comment on seasonal fluctuations in railway employment:

> There appears to be an almost universal appreciation by the roads of the serious effect that intermittent labor has on their organization and efficiency in maintaining the railways of the country. There is also a general feeling on the part of a majority of the roads that this can only be corrected, or at least minimized, by working out a more scientific method of arranging the maintenance of way program whereby large armies of workers will not be made idle during a very considerable part of the year. The annual man-hours remain about the same, but due to the fact that it is not scientifically arranged, a great many excess workers remain frequently on furlough, creating an economic condition that is hurtful to all concerned.

In 1921 the same committee set forth the difficulties of a definite labor program in the following words:

> The problem of furnishing labor for railway service is complicated by fluctuations in the available supply in labor markets, by the seasonal nature of track work, and especially by that class of extensive improvements usually termed construction work.
>
> Weather conditions determine the months in which outside work can most economically be done for practically all railroads in the United States. In the northern states, both east and west, this work is difficult and expensive if undertaken during the months December to March inclusive, while the ground is frozen or covered with snow. In the southern states it is expensive if done during the rainy season.
>
> For this reason, it seems impracticable to recommend a country-wide plan for the permanent employment of laborers in the maintenance of way department, but consideration is recommended for a much broader, all-year program of maintenance work and permanent force wherever conditions permit.

With respect to long-range planning by railway companies, the subject has received but little treatment. Alba B. Johnson, formerly president of

the Baldwin Locomotive Works, appeared before the House Committee on Interstate and Foreign Commerce on August 25, 1919 and, speaking for the Railway Business Association, made the following comment on railway practice:

> The greatest railroad genius America has produced, the late E. H. Harriman, pursued the well-settled policy of liberal buying in depressions with the two-fold motive of relieving the depression and of obtaining goods at bargain prices. A similar policy has been characteristic of the Pennsylvania system. The principle was coming to be understood and gradually brought into application in the period before 1906.

Proposals for railway construction budgets on a wide scale have been made in other countries than the United States, notably in France. There was published in 1907 a document[1] prepared by Georges Villain, Director of Commercial Control of Railroads in the French Ministry of Public Works, recommending such procedure on the French railways as would avoid the effects of recurring business crises. Two proposals were made: (*a*) establishment of a yearly budget by the railway companies, instead of making additions and betterments in years when receipts are heavy, and curtailing them in years when finances are low, and (*b*) establishment of a five-year program of expenditures for rolling stock, terminal improvements, and other forms of extensions and improvements.

In recommending the establishment of a long-term program of orders for rolling stock and material, M. Villain observed that periods of industrial activity generally found the railroads unable to handle the shipments offered them, because of lack of cars and tractive power, or because of insufficient terminal facilities. The companies at such times immediately placed large orders, necessarily paying peak prices not only for manufactured articles but also for the raw materials and for labor, and deliveries were not usually made before depressions had set in. French factories, M. Villain pointed out, were unable to increase their production suddenly, and many of the rush orders went to foreign countries at greater prices, increased delay, and loss to French trade. If the proposed long-term program were adopted, French factories would have the benefit of the orders, their labor the benefit of steady employment, and the railroad companies the benefit of lower prices.

This French doctrine has striking similarities to that laid down by some American observers.

That there is planning on the American railways with respect to their maintenance work and their construction work (including equipment orders) is unquestionable. The number of transportation employees

[1] *Notice sur la périodicité des crises economiques et ses rapports avec l'exploitation des chemins de fer français. Paris, Ministry of Public Works,* 1907.

needed at any time depends almost wholly on the state of traffic. Maintenance work follows the traffic to some extent, but there is a margin above the level fixed by traffic requirements that must be, and usually is, governed by the current situation as to railway revenue. If traffic is heavy and receipts are large, there is every incentive for conscientious and efficient managements to keep up the plant, and even to improve its condition wherever possible. If revenues are low, then it is a matter of necessity—not choice—that maintenance expenditures be reduced. There is more play for fluctuation here than in the case of transportation expenses.

Much of the maintenance work is necessarily seasonal in character, and little of it can be handled in a long-range program. Even so, if the farms, mines, and mills keep their production and shipments uniform and on a steady scale, and the railways can avoid labor difficulties, they could measurably be assured of giving steady employment even on road maintenance, for notwithstanding seasonal variations, railway expenses follow the trend of revenues very closely.

As to improvements, orders for new equipment, and new construction, the prime question is that of adequate and continuous credit. This credit depends in part on the state of current railway earnings, but it rests basically on the history of each railway company, which in turn is a composite of many factors, some dependent on the efficiency and foresight of management, some on the psychology of the current business situation, and many on the result of conditions beyond railway control. These conditions are the policy of public regulation—the control of rates by the Interstate Commerce Commission, of wages, rules and working conditions by the Railroad Labor Board, and of many other features of railway operation by state and local authorities—the state of business in general, the concentration or decentralization of industry, shifts in the currents of traffic, and many others.

But behind all these factors lies the question of railway finances. The small return upon the value of their property which the railways have had for years has had a depressing effect on the credit of nearly all companies, and has made it difficult either to lay down or to carry out a long-range program. The railways have earned as much as 6 per cent on their investment in only one year of recent history. Under federal control they were assured slightly over 5 per cent, and during the guaranty period of 1920, a little over 4 per cent. From the close of the guaranty period through December, 1922, their net income averaged 3.6 per cent per annum.

A railway executive has recently expressed this idea of the relationship between railway credit and stabilization in the following words:

> Railroad managers are anxious to make money for their companies and naturally desire to buy material and equipment and make repairs under the most economical conditions, but when, as in recent years, the railroads have been

obliged to make every possible economy in order to get through and maintain their interest and dividend payments—and many have failed to maintain dividend payments—they have not been able because of their financial condition to take advantage at all times of periods of depression in order to build up and extend their plant. Everyone recognizes the desirability of such a policy. Mr. Harriman was able to do it with his system because in the first place the financial condition of his properties was so strong that he was able to take advantage of the situation, while other managers equally anxious to do so were prevented because of their financial circumstances.

There are other obstacles to the establishment of long-range programs. Changes in accounting practice would become necessary, the attitude of regulatory commissions toward the policy of building up maintenance or other reserves would become a factor, and the relation between such a policy and the working of the "recapture" clause of the Transportation Act would be a matter for public consideration. But these obstacles, important as they are, are subordinate to the outstanding factor of railway net income. Its adequacy is what must underlie any consistent effort, on the part either of individual railways or the railways as a whole, to carry out a consistent policy or program of railway maintenance and railway improvement.

Elimination of waste in railway operation, wherever such waste may exist, is one step toward an increase in net income. Driven by the necessities of their financial situation, stimulated by the provisions of the Transportation Act that railway operation shall be "efficient and economical," and influenced by other social forces, the railways individually and collectively are giving much consideration to this problem. Their efforts are bearing, and will continue to bear, fruit. But, assuming the continuance of private operation of the railroads, only the establishment of a stable policy of public regulation will furnish the railways with a financial basis that will enable them to plan for the future, and thus to stabilize railway employment and railway purchases.