RAILROAD ADMINISTRATION

RAY MORRIS

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EDITED BY

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PREFACE

I AM interpreting the title of this volume broadly, to cover the executive work involved in building and operating railroads. The problems are largely those of organization. The Union and Southern Pacific railroad systems, for example, employ some eighty thousand men, directed by a single headquarters management. The means by which these eighty regiments are made to work efficiently and harmoniously, and the methods, equally arduous, of organizing the company's credit so that great expenditures can be financed at a minimum interest cost, have been made the subject of relatively little discussion outside of the technical press.

No attempt has been made to set forth, in detail, the routine part of railroad work. A complete description of the auditor's duties would become a treatise on applied accounting; an exhaustive study of the profession of the chief engineer, or of the superintendent of motive power, would involve the equivalent of a three-years' course in higher mathematics, supplemented by field work. But it is distinctly possible, within the limits of a single volume, to show how the railroad executive so organizes his forces as

to apply to the best advantage the knowledge which a dozen kinds of specialists possess. In other words, I have tried to give the non-technical reader the manager's viewpoint toward the problems of actual railroad administration in this country, with a glance at certain comparative conditions in other countries.

For constructive criticism I am specially indebted to Professor Emory R. Johnson, of the University of Pennsylvania, at whose suggestion this book was written; to William J. Harahan, assistant to the president of the Erie Railroad; to William H. Boardman, editor of the *Railway Age Gazette;* and to Neville Priestley, general manager of the South Indian Railway. Sir Charles J. Owens, general manager of the London & South Western; Fairfax Harrison, vice president of the Southern Railway; J. A. Kay, managing editor of the *Railway Gazette* (London), and many others have aided me by furnishing organization diagrams and by answering questions that have arisen in the progress of the work.

R. M.

March 31, 1910.

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RAILROAD ADMINISTRATION

CHAPTER I

THE BEGINNINGS OF A RAILROAD

Types of railroads: military, political, and commercial—The inception of a commercial railroad—Incorporation; early financing; estimated costs and traffic prospects—What the bankers want to know—Methods of estimating traffic—The maximum-and-minimum form of analogy—Differences in the outlook of a new local line and a branch of an existing railroad with established credit and through traffic connections — Construction organization; the commissary; the headquarters staff and the field staff; diplomacy *versus* the right of eminent domain — Various types of obstruction likely to be encountered—The new line finished and turned over to the operating organization.

RAILROADS are built for reasons which may be military, political, or commercial. The political and military reasons are often found in combination; so are the political and commercial ones, and it sometimes happens that all three operate together as moving causes. The Baltimore & Ohio Railroad was built for a political reason—to further the interests of the City of Baltimore—and the Cincinnati Southern Railway is still owned by the City of Cincinnati, which built the road in the '70s for commercial protection against Louisville. The Trans-Siberian Railway is an excellent example of a military road, built primarily to en-

able Russia to mobilize troops throughout the Siberian provinces, many of which were scarcely defensible against invasion until this vital line of communication was established. The Union Pacific Railroad, built to bind California to the Union, had its origin in a mixture of political and military purpose.[1] Many competent observers believed there would be two republics in this country, one east of the Rocky Mountains and one west. The construction of the railroad prevented this.

In discussing the preliminaries of railroad organization, we are concerned in the present chapter only with commercial projects, which we can define for present purposes as projects which are built for direct or indirect commer-

[1] The organization for the construction of the Union Pacific Railway was purely upon a military basis. Nearly every man working upon it had been in the Civil War; the heads of most of the engineering parties and all of the construction forces were officers in the Civil War; the chief of the track-laying force, General Casement, had been a division commander in the Civil War; and at any moment I could call into the field a thousand men, well officered, ready to meet any crisis or any emergency. There was no law in the country, and no court. We laid out the towns, officered them, kept peace, and everything went on smoothly and in harmony. Two or three times at the end of our tracks a rough crowd would gather and dispute our authority, but they were soon disposed of.

I remember one incident when I was West, near Salt Lake, of receiving a dispatch that a crowd of gamblers had taken our terminal point at Julesburg and refused to obey the local officers we had appointed over it. I wired General Casement to take back his track force, clean the place up, and sustain the officers. When I returned to Julesburg I asked Casement what he had done. He replied: "I will show you." He took me up to a little rise just beyond Julesburg and showed me a small graveyard, saying: "General, they all died in their boots, but brought peace."

—*Memoirs of Gen. Grenville M. Dodge.*

cial profit, without dependence on any external source of income. The ordinary investor, who builds and operates commercial railroads, can be induced to interest himself in a project only from hopes of prospective profit; he may be presumed to have but a moderate interest in political or in military considerations. Yet there are two broad divisions of commercial railroads: those built by people who are interested primarily in coal lands, or timber lands, or mineral lands, which seek transportation facilities, and those built for the calculated profit likely to accrue to them as common carriers, without reference to the development of any commodity. In the first instance, the question whether the railroad will be profitable or not is largely an academic one; the proprietors are making their money by the sale of the commodities which the railroad hauls to market, and they can pay out of one pocket and into the other just as much or just as little as they choose.

For the purposes of the present study, therefore, no reference is made to projects which have anything but plain, commercial railroading to depend on. The preliminary arrangements and financing of a road built solely to develop a specific tract of lumber or of coal lands pertain rather to the lumber and coal industries than to the railroad business.

Let us assume that a group of men have satisfied themselves that a railroad sixty miles long can be operated at a profit in a certain part of the state of Georgia. Their first step is likely to be that of incorporating the company and securing a charter from the state legislature. This proceeding is ordinarily simple and inexpensive. Evidences

of good faith must be presented by listing the names and residences of the incorporators and certain additional information about them which may be required, and the proposed route must be set forth. In Georgia, as in most states at the present time, incorporation is had under the general railroad law of the state, and the charter is subject to the approval and confirmation of the state Railroad Commission.[1] The certificate of incorporation gives the company the power to do business under its corporate name, and limits the liability of the incorporators to the equity which they may have in the assets of the company; the charter authorizes the railroad to build along a specified route, and to exercise the right of eminent domain, in cases where property owners along the route endeavor to obstruct the project.

Incorporating and securing a charter are the first preliminaries. Next comes the financing. If we assume, roughly, that it costs $12,000 a mile[2] to build and equip lightly a single-track line in a part of Georgia where the projected railroad is to be laid out, this totals $720,000 for a sixty-mile line; a sum which it is altogether improbable that the incorporators can raise by private means. These persons, therefore, set about their task of interesting the public in the work at hand.

[1] Some states wisely require the promoters to obtain from the railroad commission a "certificate of necessity" before they authorize them to go ahead. This may be opposed at a public hearing, so that existing roads have some protection against ill-advised competition. British practice is similar to this.

[2] Well-built roads, in hilly country, cost far more than this, but the Georgia plains permit very cheap construction.

There are several ways in which this can be done. If the counties along the route are as anxious to have the road built as counties along the route are apt to be, they may perhaps subscribe county-aid bonds[1] to cover a portion of the costs, the arrangement generally being that the county will deliver bonds at a specified rate—perhaps $6,000 per mile—after the county engineer has certified to the construction of the railroad. Towns along the route are also apt to give aid in the shape of land for terminals or station sites, and a good deal of the right-of-way can often be secured without cost, owing to the anxiety of the residents to secure railroad communications. This situation often holds good in competitive territory as well as in noncompetitive, since shippers and passengers are liable to be critical of existing transportation facilities and to encourage the promotion of new ones.

Another kind of aid is sometimes given to a new railroad project in the form of an arrangement by which the railroad contractors can hire convict labor from the state's prison at a rate materially lower than the prevailing day rate. This kind of labor has its drawbacks, as may readily be imagined, but very good results have been obtained from it in some instances. At present it is rarely seen, except in one or two of the southern states, North Carolina being among them.

It will be observed that all these forms of aid come into effect after the railroad is built in whole or in part; not before. To provide cash for current requirements in ex-

[1] County-aid bonds are now in disfavor, but are still common in the South.

cess of that which the promoters are themselves willing to put into the enterprise, and before the receipts from any county-aid or town-aid bonds are available, the railroad company ordinarily has two resources; popular subscription, and an organized financing of the project by a banking house or trust company. Popular subscription has its uses, but can be counted upon with considerable assurance to fall short of the ultimate requirements. Hence, almost all railroad construction work is now financed by financial companies. It may be that a local bank or a combination of local banks will undertake to provide construction funds. More often, however, the company's securities are underwritten by banking houses or trust companies located in relatively distant places, generally in large cities. The market for the securities in the eyes of the banking house is a consideration only secondary to the company's solvency, and bankers in New York, Philadelphia, Boston, Chicago, St. Louis, and other large cities, have learned by long experience where construction securities of a certain kind can be placed with customers.

In a year of activity, several hundred new railroad lines are apt to be promoted in the United States. Perhaps a dozen or twenty of these are short lines built under a separate corporate name in the interest of large railroads already in existence. Of the balance, representing promoters' projects unsecured by larger railroad affiliations, only the tiniest proportion are actually built. It is easy to understand, therefore, that banking houses are very chary about proposals that they shall underwrite new railroads, and the evidence needs not only to be

good, but to be extraordinarily good, to induce them to do so.

If the Georgia promoters have had experience in such matters, they will probably start by getting the best map possible of the section of the state showing the location of their proposed line, so as to make plain what the traffic connections are with other railroads. It goes without saying that the new line cannot make a living alone. It must get traffic from somewhere and deliver traffic to somewhere, and the "somewhere" in the latter case must usually be a railroad. The promoters must also secure from a reputable civil engineer an accurate estimate of costs, and they will of course endeavor to secure private subscriptions, gifts of rights of way, and signed promises of county and township aid.

It will not be hard to demonstrate to the bankers what railroads the new line can be connected with, or to convince them that the railroad can be built for a certain approximate sum, although bankers are liable to add something to the civil engineer's figures, as a margin of safety. The traffic outlook will require more demonstration. The promoters will have to show very definitely whether need for the new line exists. If it provides a short route for well-established existing industries, which now have a roundabout route, and if it can be shown that it would be to the advantage of these industries to move most or all of a large traffic over the new line, the outlook, from a banker's standpoint, will be considerably improved.

In general, bankers will not underwrite a line which has no traffic attractions other than agricultural or grazing

country. A short line with nothing but agricultural and grazing country to support it has a precarious existence, and the bankers know this well. Timber lands are better, but the quality of the timber, the market for it and its life as a traffic factor, have all to be carefully considered. Mineral and coal lands will be important traffic factors if they are good enough so that people can be got to work them. Yet the bankers know that there is a good deal of coal territory in this country, and a good deal of iron territory, which can very likely be worked at a profit forty or fifty years hence, when the raw materials become scarcer, but is not commercially profitable to operate at present. Moreover, there is a great deal of coal and iron territory which is right enough in itself, but which is located so far from the nearest open market that it falls short of commercial attractiveness. The situation may be summed up by saying that the railroad builders must demonstrate not only that a certain amount of freight traffic is possible over their line, but that it will be inevitable.

Even assuming that the promoters of the road can convince the bankers that it holds out abundant promise of traffic, and that it can be built and operated economically, the general competitive situation in the district is a factor of great weight, which must receive thorough consideration. In competitive territory traffic relations frequently arrive at a point of tension or overstrain which has no particular effect so long as a careful balance is preserved, but which is capable of serious things if that balance be disturbed. Without any specific written documents in the case, one

railroad system frequently makes it perfectly plain to another railroad system that the latter must keep out of its territory unless it expects retaliatory invasion. Sometimes this kind of warfare has been carried on at great length, and hundreds of miles of costly railroad have been built for purposes of commercial war rather than of commercial development. The fact that the short line or local road is projected as an independent project is not of very much significance, because new railroads generally are projected as independent projects, regardless of their ultimate affiliations. The important thing is that the projected new line shall not draw upon itself the lightning of disturbed traffic tension, and shall not upset existing arrangements and actually force some larger road to compete with it until it drives it into bankruptcy.

Another dangerous traffic situation which often embarasses a new railroad project is occasioned if this project is dependent upon a single through line for its connection with the rest of the world. If the management of this larger line for any reason becomes hostile, the chances are that it will be quite within its power to damage the short line to the point where the promoters and owners will find it cheaper to sell it out at a loss than to continue a losing venture. Where a local line is dependent on a single large connection in this manner, the bankers asked to underwrite its securities want to know all about the relations between the large road and the small one; even so, there is ample cause for caution. Where a short line connects two rival roads, however, and can supply traffic to either or both of them and receive some back-haul in re-

turn, this danger disappears and the situation looks better. Yet, even with the best of prospects, the bankers never forget that a tremendous proportion of short, local railroads fail through one cause or another to come up to their promoters' expectations, and either go through insolvency or are taken up by some larger system on a basis which may be well below the original construction costs.

The purpose of this chapter, however, is to deal with live railroads and live projects; not with dead ones. Hence, we will assume that the sixty-mile railroad under consideration in the state of Georgia has such excellent traffic possibilities and has so much local support that a private banking house in New York has decided to underwrite its securities. The engineer estimates that the line can be built and equipped in good enough shape to start with for $12,000 a mile, or $720,000 total. To meet this cost in part the promoters are putting up $10,000 of their own money, and have secured stock subscriptions of $12,000 more locally. They also have a signed promise of $120,000 county-aid bonds, which will become available at the rate of $2,000 per mile as fast as actual miles of completed railroad are certified by the county engineer. This leaves a net cost of $578,000 to be raised.

In cases where underwriting is difficult to secure, five or ten miles of road between two promising points are often built for a starter, to inspire confidence in the solvency of the project, and to create a basis for further subscription. In the case which we are considering, however, the bankers agree to underwrite first mortgage five per cent bonds on the line at the rate of $11,000 a mile, paying $900 for each

$1,000 bond. This process raises $594,000 of the $720,000 necessary, plus the subscriptions and county-aid contribution, a total of $736,000. To provide for interest on the bonds during the construction period, and to leave the road some working capital to begin business with, each bondholder also subscribes to one share of five per cent first preferred stock at $50 a share. This action puts $33,000 more into the treasury of the company, which now has enough to pay construction costs if they do not exceed the estimate; to pay interest on the bonds for one year, and to leave a slim margin for working capital. But the risk and uncertainty of this enterprise is very great. As part of their bargain, to give them a speculative chance at high recompense for their risk, the bankers therefore receive ten shares of the company's common stock for each bond which they have bought. Nothing has been paid on this stock; the chances of its earning a dividend for the next few years may perhaps be mathematically demonstrable on the basis of the traffic estimates, but will probably not be estimated very high by experienced underwriters.[1]

[1] In accordance with the following provisions of the Georgia law, this financial plan must then be submitted to the state railroad commission:

"SEC. 8. Each of the companies or corporations over which the authority of the railroad commission is extended by law shall be required to furnish said commission a list of any stocks and bonds the issuance of which is contemplated, and it shall be unlawful for any of said companies or corporations to issue stocks, bonds, notes, or other evidences of debt payable more than twelve months after the date thereof, except upon the approval of said railroad commission, and then only when necessary and for such amounts as may be reasonably required for the acquisition of property, the construction and equipment of power plants, car sheds, and the completion,

This type of financial organization approximates the one upon which a good many thousand miles of railroad have been built in this country, subject, of course, to many modifications of detail. The first mortgage bonds represent what the promoters believe to be a reasonably good risk; the preferred stock represents a fairly good speculative risk, while the common stock carries the voting power, and waits for the country to grow up. By the purchase of five per cent first mortgage bonds at ninety, the interest rate works out at about five and a half per cent for current

extension, or improvement of its facilities or properties, or for the improvement or maintenance of its service, or for the discharge, or lawful refunding of its obligations, or for lawful corporate purposes falling within the spirit of this provision, the decision of the commission to be final as to the validity of the issue.

"Before issuing such stock, bonds, notes, or other evidences of debt as above mentioned, such corporations or companies shall secure an order from the commission authorizing such issue, the amount thereof, and the purpose and use for which the issue is authorized.

"For the purpose of enabling the commission to determine whether such order should be issued, it shall make such inquiry or investigation, hold such hearings and examine such witnesses, books, papers, documents, or contracts as it may deem advisable or necessary. Such corporations or companies may issue notes or other evidences of indebtedness for proper corporate purposes and not in violation of any provision of this Act, or any other law, payable at periods of not more than twelve months from date, without such consent, but no such notes or other evidences of indebtedness shall, in whole or in part, directly or indirectly, be refunded by any issue of stocks or bonds or by any evidence of indebtedness, running for more than twelve months, without the consent of the commission."

The commission has recognized the fact that new railroads cannot well be built in Georgia without some form of a stock bonus, and has asked the legislature to inform it what constitutes a reasonable bonus. At time of writing, the legislature has not yet shed any new light on this delicate question.

holdings, and at a larger rate if the bonds are held until maturity and retired by the company at par. This is not a large return for a risky investment, but the promoters have also $100 worth (par value) of preferred stock for each bond, and have only paid $50 for this stock, which they hope will pay them at the rate of ten per cent on their actual investment in it, and they have an additional ten shares of common stock which did not cost anything, for each bond which they hold.

Walter L. Webb, in his "Railroad Construction,"[1] mentions three ways of estimating probable volume of traffic and the probable growth of a projected road. By his first method he divides the actual gross revenue derived by all the railroads in that section of the country by the total population of the section, thus determining the average annual transportation expenditure per head of population. Then he multiplies this annual contribution by the population which may be considered as tributary, and thereby obtains a valuation of the possible traffic. Mr. Webb points out, however, that such an estimate is unreliable, because the average annual contribution may not fit that particular locality, and because it is very difficult to estimate the real tributary population, especially where other railroads are working in the same general territory.

Mr. Webb's second method is to take some road whose circumstances are as nearly as possible identical with the road to be considered, and assume its actual revenue, mile for mile, as the revenue of the projected road. This

[1] "Railroad Construction—Theory and Practice," by Walter L. Webb, C. E.

method also is faulty, because it is quite sure to err in assuming that the character of the two roads is identical, or else does not estimate correctly the differences between the old road and the projected one.

His third method is that of the laborious calculation from an actual study of the route—determining the possible output of all factories, mines, etc., the amount of farm produce and of lumber that might be shipped, together with an estimate of probable passenger traffic based on that of like towns similarly situated. Mr. Webb considers this the best method when properly done, but points out that there is always danger of leaving out sources of income and of overestimating various kinds of traffic from expected sources.

Both the first and third methods mentioned by Mr. Webb are apt to produce results which vary widely from the subsequent experience of projected roads. The first method is open to the objection of mixing the returns from the main line mileage of through railroad systems with the returns of short lines that have only their small, originating business to support them, while the third method is almost certain to err widely from the optimism of the promoter.

A good check on the prospects of a proposed railroad can be obtained by a comparatively slight variation of Mr. Webb's second method. The method of estimating the maximum and minimum probable results from the operation of the new railroad by analogy to the results of all similar railroads operating in the same territory under comparable conditions gives perhaps the safest check of all, and it is the method which bankers who underwrite

the securities of new railroads are apt to like best. The advantage of this method of calculation is that it deals in probabilities instead of in possibilities.

It is easy to illustrate what may be termed the maximum-and-minimum form of analogy.[1] We will suppose

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1 W. J. Harahan makes the following interesting comment on this method of estimate: "I note what you suggest as being the proper method, and the reasons you give therefor. I agree with you, except that it has seemed to me that the country through which the prospective railroad is to be built should also be looked over to determine whether the conditions are above or below the average which the result which you suggest would produce. It seems to me that the great trouble with many estimates that are made of prospective traffic is that they are made by people who do not know how to do such things, and who are optimistic from the fact that they are not acquainted with the difficulties arising in the actual operation of a railroad. I have in my mind an actual example in my own experience, where a man made an estimate of the probable traffic of a railroad running through a territory in which there was a large amount of stone business developed on the line of an existing railroad. He found out how much business this railroad was doing at that time and estimated that the new railroad would do an amount equal to at least half of the business that the exising line was doing. He did not discover, however, that the field was quite solidly taken up by the existing quarries, and that the existing railroad had side tracks into these quarries in such a way that in almost every case the ground was occupied in such a manner that another railroad could not get into them, and also that the existing railroad owned the side tracks so that when the new railroad was put in operation it got an extremely small amount of this business because of the reasons herein shown.

"A great many people think that all that is necessary to do is to get to a big city where there is a large amount of traffic and that they will then be enabled to depend on that traffic. There is nothing more fallacious, because of the necessity of getting into the industries where the business originates. Simply putting in a depot or team tracks in the heart of a large city does not mean that a large traffic will be enjoyed from that city."

that a new railroad is projected to be built reaching timber, sawmill and agricultural country in Wisconsin. The projectors plan, first of all, to build thirty miles of road. The country is easy, and the construction can be done very cheaply. The projectors estimate that they can build and equip the line for $18,000 a mile; that it will earn $3,000 per mile of road from forest products, grain, hay, and miscellaneous traffic, and that it can be operated for fifty per cent.

To demonstrate the improbability of these premises, compare them with the statement in Table I of a group of the most successful short-line railroads now doing business in Wisconsin.

This table tells its own story pretty well. It excludes certain short-line railroads, such as the Chicago, Lake Shore & Eastern, which are controlled by larger systems or by outside concerns, and are thereby enabled to do an extraordinary amount of business, and it illustrates the operations of a group of short-line railroads which are among the most successful in the state. Some of them have been established for many years, and all but one have connections with at least two entirely distinct railroad systems, so that they cannot well be cornered, or forced to accept divisions of rates below what may be termed the ordinary commercial basis for their locality.

It will be observed that not one of these roads earns $3,000 per mile, gross.[1] The Stanley, Merrill & Phillips, forty-five miles long, comes closest to it, with $2,595 a mile,

[1] Of course 1908 was a poor year. Operations for 1909, not reported at time of writing, would be somewhat better.

TABLE I—Operations for the Year 1908

Road.	Miles.	Connections.	Gross per Mile.	Net per Mile.	Oper. Ratio.	Traffic.
Abbotsford & North Eastern	15	1	$2,281	$804	65%	Forest products....90% Miscellaneous.....10%
Ahnapee & Western	34	2	2,210	970	56%	Grain.....22.18% Hay.....19.78% Forest products.....14.00% Merchandise.....13.00% Coal.....9.29% Fruit and vegetables 6.77% Miscellaneous.....14.98%
Chippewa Valley & Northern	15½	3	1,452	342	77%	Forest products....99% Miscellaneous..... 1%
Mineral Point & Northern	26½	2	2,517	778	70%	Ores.....30.70% Bituminous coal....22.09% Anthracite coal....20.54% Miscellaneous.....26.67%
Stanley, Merrill & Phillips	45	2	2,595	554	79%	Forest products....95.41% Bituminous coal.... 1.40% Miscellaneous..... 3.19%
Wisconsin & Northern	Under construction.	2	256	134 deficit	152%	Forest products.....91.18% Stone, sand, etc.....4.08% Cement, brick, and lime.....2.11% Miscellaneous.....2.63%

but seventy-nine per cent of this is absorbed in operating expenses, leaving only $554 per mile net.

The highest net earnings are shown by the Ahnapee & Western, thirty-four miles long, which is really part of the Green Bay & Western system, and has a well diversified business, with a high proportion of merchandise and miscellaneous, and hence manages to operate for fifty-six per cent of gross, and shows net earnings of $970 a mile. The poorest showing in the group (except for the road under construction) is that of the Chippewa Valley & Northern, fifteen and a half miles long, which has three railroad connections, but is purely a lumber road, and earns only $1,452 per mile gross and $342 net.

Suppose we apply some of these results to the projected railroad which is before the bankers for consideration. The average net earnings per mile of the four of these roads which are most successful is approximately $777. This sum, multiplied by thirty, gives $23,310 as the probable net earnings per year of a projected line thirty miles long, if it has as good success as the more successful of the existing Wisconsin short lines. It may safely be assumed, therefore, that the bankers will be very slow to find funds for the construction of any such road, over and above the capital sum which can be carried by $23,310 as annual interest. If we assume, rather rashly, that the nature of the project is such that the underwriters will be willing to furnish funds for it on a six per cent basis, it is apparent that what may be called the prognosis of this road allows a capital expenditure of only $388,500 since six per cent interest on $388,500 is $23,310. But this capital sum will

provide for a construction and equipment cost of only $12,950 a mile—and the promoters in this case have estimated their probable cost at $18,000.

It is obvious that the road here outlined has very little chance of being built as a straight transportation project, and it may be added that the outlook for independent short line is hazardous to-day in any part of this country, unless the people who provide the funds for them are sufficiently interested in the production of the commodities which the short line is built to haul, so that it does not have to rest on its own showing as a transportation machine.

Under present conditions in this country, much the greatest amount of new railroad mileage is built in the form of extensions or branch lines to existing systems. In this case the new mileage is almost invariably built on the credit of the existing mileage, either directly or indirectly, and the task of obtaining the necessary funds is greatly simplified. It does not follow that a new branch line will be able, technically, to carry itself mile for mile, on its division of the rate on the traffic which it originates, but it is not necessarily important that it should do so. It is only necessary for it to supply enough additional traffic to the system as a whole so that the fixed charges on the capital used in building the branch can be more than met from the new traffic, after the operating expenses of the branch have been paid. Nevertheless, the railroad management likes to see each extension and branch stand on its own feet, because the acquisition of weak branch lines in the hope of ultimately getting enough traffic from them to be worth while, has been the origin of more than one receivership.

Certain great railroad systems at the present day, notably the St. Louis & San Francisco, are suffering from their branch line mileage, and the company's borrowing power is seriously affected thereby.

A railroad with good credit and a good reputation for conservatism seldom has much difficulty in financing extensions into productive territory, and the analogies on which branch lines, or new extensions of through systems, are apt to be based, look very different from the short-line analogies, quoted above. To illustrate this, Table II affords a comparison of the operations during 1908 of certain through systems with mileage in Wisconsin.

The foregoing figures are derived from the report of the Wisconsin State Railroad Commission. State commission statistics should always be received with some suspicion, and scrutinized carefully before they are accepted; nevertheless, these serve well enough to illustrate the difference in the earning power, and in traffic conditions, between the through system and the local line. The through system sends business originating and destined hundreds of miles away over specific divisions; it has the advantage, always, in passenger business; nearly always, in diversity of traffic; nearly always, in the percentage which manufactured articles and merchandise, taking the highest rates, bear to the total traffic movement. It is a better buyer and sells in a wider market; it can so pro-rate expenses that relatively short divisions get the best management in the country, at a nominal cost. Moreover, from the banker's standpoint, the established credit of an old, solvent road, is worth more than all the theoretic advantages put

TABLE II—Operations for the Year 1908

Road.	Miles in Wisc.	Gross per Mile in Wisc.*	Net per Mile in Wisc.	Oper. Ratio in Wisc.	Traffic Percentages.							
					Grain.	Flour.	Coal.	Stone, Sand, etc.	Forest Prod.	Mfrs. and Mdse.	All Others.	Total.
Chicago & North Western	1,974	$8,283	$2,837	66%	3.75	1.00	12.89	6.96	33.65	16.98	24.77	100.00
Chicago, St. Paul, Minneapolis & Omaha (controlled by Chicago & North Western)	757	7,947	2,437	69%	7.33	1.56	8.72	1.35	51.55	13.54	15.95	100.00
Chicago, Milwaukee & St. Paul	1,774	9,483	3,849	60%	4.12	2.00	13.84	8.54	19.87	32.20	19.43	100.00
Duluth, South Shore & Atlantic	112	3,076	†159	105%	3.09	4.82	2.09	12.31	46.62	13.78	17.29	100.00
Minneapolis, St. Paul & Sault Ste. Marie (controlled by Canadian Pacific Railway)	353	4,734	1,592	66%	5.45	17.77	8.33	0.35	44.06	8.25	15.79	100.00
Wisconsin Central (controlled by Soo Line)	858	7,008	1,928	73%	3.31	4.82	9.93	2.60	27.18	10.06	‡42.10	100.00

* Rail operations only. † Deficit. ‡ Including 18 per cent. of ores.

together, although this credit actually rests, to a surprising degree, upon theory.

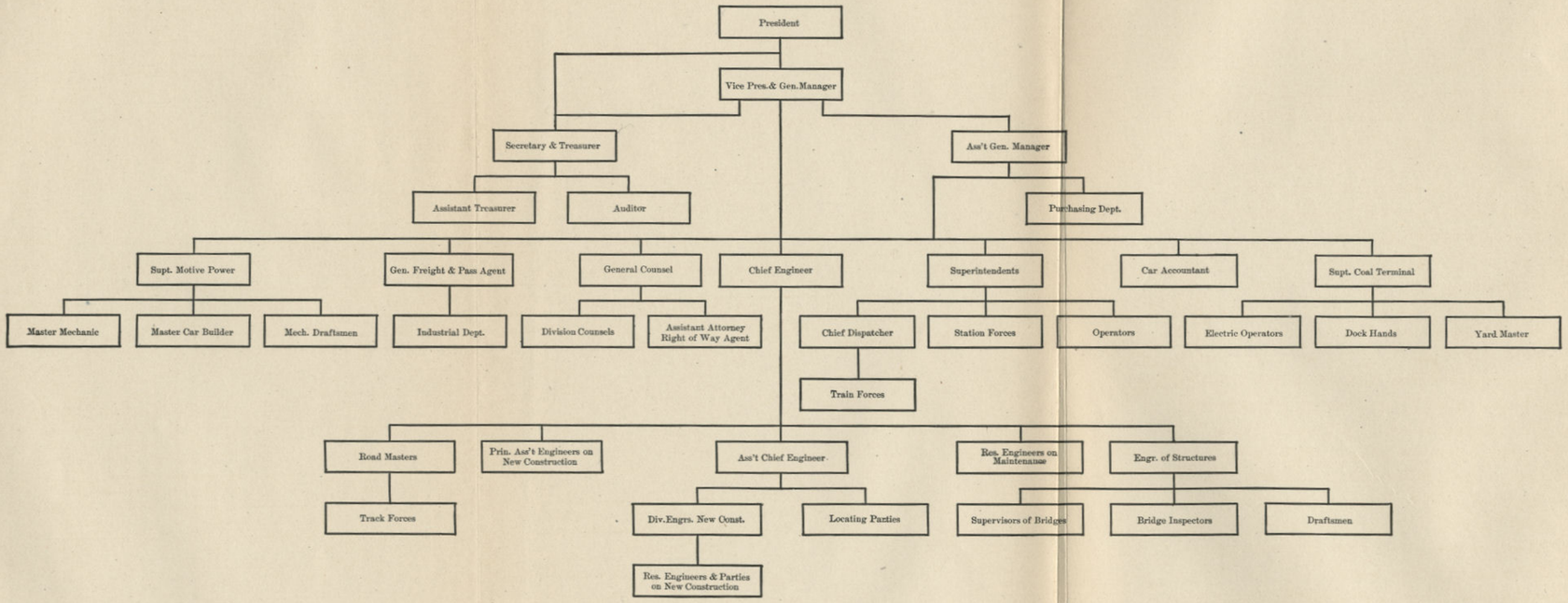
After the project for building a new railroad or for extending an old one has gotten through its preliminaries successfully, and has been financed, the construction organization is next to be considered. It is needless to enlarge on the basic similarity between the railroad construction camp and the army of invasion; in both cases a large body of men must be fed, protected from special dangers, and kept healthy. No army and no railroad camp will work at its maximum if hunger or typhoid fever are added to the difficulties of the pioneering—a rule which was known and acted upon by Japanese army officers in the war with Russia, but was largely ignored in our own war with Spain.

Railroad construction may take place where commissary and disease-preventing arrangements are of the simplest, as, for example, in New England, or it may be carried on where the greatest of all the problems confronting the engineer is to feed his men and keep them in condition to work. The Madeira-Mamore Railroad, in equatorial Brazil, has been building its short but important line for a generation and has not completed it yet because the two problems of supplies and of the prevention of wholesale sickness were too big for the engineers who successively attempted it. The work is now going forward again, with its best hope in the exceedingly efficient medical department which has been organized. Certain stretches of road in west Africa have been built at fearful cost of human life because these things have been neglected, yet it is distinctly

TABLE III

THE VIRGINIAN RAILWAY

ORGANIZATION CHART



within the power of the construction engineers to make bad natural conditions better, and they can frequently overcome them entirely, or almost entirely. As regards the commissary, a railroad is better off than an army because it can usually, though not always, maintain unbroken rail communications with its base, and nobody is trying to cut its supply chain.

A characteristic construction organization is that of the Virginian Railway, shown herewith. The Virginian Railway runs from the bituminous coal fields of West Virginia to Norfolk and Sewalls Point, Virginia, a distance of 441 miles, through mountainous country; the main line was completed in 1908. The diagram as shown in Table III is really a combination construction and operation one, but the division will not confuse anybody.

In general, a construction organization consists of two main parts: the headquarters staff, which is responsible for finances, plans, standards, and supplies, including both materials and the commissary; and the field staff, which carries out the work outlined by the headquarters staff. The chief engineer is the connecting link between the two; he may be located either at headquarters or in the field, but wherever he is, he is ordinarily responsible for the field work. He is apt to have two kinds of officers reporting to him, and these—to use a figure derived from army practice—may be described as staff officers and line officers. The staff officers are specialists who prepare plans or work out problems or act as eyes and ears for the chief engineer; the line officers command forces in the field and see to it that the work of these forces is done properly. It has been

well said that the staff is responsible for things, the line for men.

In a small organization the locating engineers report to the chief engineer direct; in a large organization they usually do the same, but occasionally report to the headquarters staff. Where the new construction is of an exceptionally heavy and important character, or where it crosses a number of states with strict statutory requirements regarding the construction of new railroads, the job is often broken up into a number of component parts, tied together by the control which is exercised over them by the general officers of the headquarters company.

An example of this has recently been shown in the construction of the Pacific coast extension of the Chicago, Milwaukee & St. Paul. In building the new line west from the Missouri River to Seattle and Tacoma, a number of subsidiary companies were formed, including the Chicago, Milwaukee & St. Paul Railway Company of South Dakota, the Chicago, Milwaukee & St. Paul Railway Company of Montana, and then the Chicago, Milwaukee & Puget Sound Railway, which proceeded to absorb the construction companies.

Since the chief engineer is usually the authority to whom both staff and line officers report, he is apt to have an assistant chief engineer, as in the case of the Virginian Railway, who carries on the actual field construction work. The assistant chief engineer is reported to by division engineers of new construction, or by engineers with some equivalent title. The division engineers are reported to by resident engineers, and the territory of these men is such

that they can personally supervise the work of grading, track laying, etc. The bridges are apt to be assigned to the direct supervision of a bridge engineer's gang, and there is not infrequently an engineer who devotes his entire time to the study of the future supply of water for the locomotives, and proceeds with his own forces to build reservoirs and to erect and pipe water tanks.

While the construction work is going on, the headquarters staff has a large number of important questions to work out, some of which are quite complex in their environment and require skilled legal counsel and the exercise of much diplomacy. This is particularly true before the final location of certain parts of the work is decided upon. A railway, by virtue of its charter, has the right of eminent domain; that is to say, it may acquire necessary rights of way by the exercise of condemnation proceedings. It is a well-known fact, however, that land bought under condemnation costs a great deal more than land acquired by private purchase, and the diplomatic forces of the new railroad labor long and earnestly to obtain their rights-of-way without going to the courts for them.

The attitude of different communities toward a new railroad varies widely. As a general rule, all localities are extremely anxious to get new railroad facilities and are willing to do a good deal of coöperative bargaining to secure that end. Consequently, a good deal of the right-of-way costs nothing, and, in some cases, as we have seen, the railroad not only gets its right-of-way free, but has important gifts of cash or of land given to it. Among the chief inducements to our early transcontinental railroad

builders were large grants of adjacent lands, in alternate sections, deeded to the railroad companies by the government.[1]

It frequently happens, however, particularly in well settled parts of the country, that an individual or a group of individuals of speculative tendencies make a shrewd guess where a projected line is likely to go and obtain important holdings of land across its path, at prices far below those which they feel confident the courts will give them if the condemnation privilege is exercised. In cases like this, the diplomatic forces of the new railroad must use their best ingenuity. Sometimes the course of the road is altered radically because of these hold-ups; sometimes, again, such strong local pressure is brought to bear by boards of trade and other public-spirited bodies that the speculators are frightened out of their positions, but it may be assumed as a matter of course that every railroad will have to pay a great deal more than it ought for certain portions of its right-of-way, and it is the duty of the headquarters department to see to it that these portions are reduced to a minimum.

In these days, a more frequent kind of obstruction is that interposed by an existing railroad whose territory is being invaded. Here both parties are shrewd and determined; both are well advised and both are apt to have large capital behind them. The importance of actual possession of certain coveted locations is so great that this

[1] The governments of Canada and Mexico are now giving important aid to new transcontinental lines in the form of a direct cash subsidy.

possession is often obtained by force of arms, and the disputed points are left for final determination by the courts, possibly months afterwards. An example of this has recently been shown in the desperate struggle between the Hill lines and the Harriman lines for the control of the best locations in the cañon of the Des Chutes River in central Oregon. Similarly, the Western Pacific had a struggle in the courts and with armed forces which lasted more than a year for the possession of certain rights-of-way in Oakland, California.

The headquarters forces in charge of construction must be prepared to cope with such emergencies rapidly and effectively, for time is an all-important element. Even apart from the effect of days and hours in a race for the possession of a low-grade route through a mountain pass where there is room for only one such, the headquarters staff has always in mind the fact that a vast sum of money —it may be ten or fifty or a hundred million dollars—is tied up in the work, paying from five to seven or eight per cent interest, and utterly unproductive until the road can be opened for business. Every day that this opening is delayed means an absolute loss of the interest on this capital, which can never be recovered, and will stand as a charge against the project in perpetuity. Hence, every one of the thousand things which can cause delay to a new construction enterprise must be attacked promptly and with vigor, and somehow gotten out of the way.

When the line is built, the chief engineer turns it over to the operating forces, and thereafter the rails and the ties and the ballast and the cuts and the fills are primarily

under the supervision of the engineer of maintenance. On a small road it is probable that the same man is chief engineer and engineer of maintenance; on a large road the duties are certain to be divided.

No matter how well the new road is built, a long time must elapse after its completion by the chief engineer's forces before it is in shape for safe operation at high speeds. New banks do a good deal of settling, especially in wet weather, and it is difficult, if not impossible, to tell how the drainage of certain cuts is going to work out until heavy rains or snows occur. A new line is subject to washouts and to holes in the sub-grade which occasion low spots in the track and lead to broken rails and derailments. The organization for watching over the new railroad during these troubled days is apt to be divided between the operating forces and the construction forces; between the division superintendent and the division engineer, but as soon as trains begin to be operated carrying freight or passengers, the general character of the organization changes; the army of invasion has given place to the army of occupation.

CHAPTER II

THE ORGANIZATION REQUIRED FOR THE MANAGEMENT OF A SMALL RAILROAD

The four principal kinds of railroad officers—A typical organization for a small road—The Hearne & Brazos Valley organization—The Salt Lake & Ogden organization—The operating, traffic, and treasury departments on a road fifty miles long—General Order No. 1 of the Gulf Line Railway, seventy-eight miles long, outlining the duties of all officers and employees of that road and illustrating the principles of organization control.

As a broad classification, it takes four kinds of officers to run a railroad, and their duties are, in the main, entirely unlike. It is customary to group under one head executive, financial, and legal officers, since these deal with the property as a whole, appoint secondary officers, are directly in charge of capital and current funds, and are answerable to the directors on the one hand, and to municipal, state, and national authorities, on the other. The other three classifications provide for operation, engineering, and the solicitation of traffic.

A properly constructed organization diagram begins with the stockholders at the top, followed by the directors, whom the stockholders elect to represent them. The directors in turn appoint a president of the company, who

usually sits on the board, and to whom, theoretically at least, is given the power to fill, or use large influence in filling, the entire operating force. In practice this power is much modified by conditions, as will subsequently be shown, but the railroad organization in its simplest form can be plotted on a diagram shaped like an hour glass; the stockholders concentrating their authority, through the directors, upon the president, whose own powers are delegated through vice-presidents, the general manager, the superintendents, etc., over progressively widening areas. The treasury officers who have their places in the same group are, in the simplest form of organization, merely the president's office staff, and the legal officers do not exist at all in the case of the very small concern. When the president wants frequent aid from his legal advisers, however, the position of general counsel or general attorney is created, and the law department of a large railroad acquires great importance and is often headed by a vice president. The secretary also belongs in this first group, the characteristic of which is that it deals with and directs the property as a whole, while each of the other groups deal with a department of the property, considered as a going machine.

In the case of the smallest roads of all—little isolated lines built to develop a known kind of traffic in a definite locality, with the underlying hope or expectation of ultimate sale to the larger railroad which they feed—it frequently happens that the principal owner becomes president, even though he may have no operating duties whatever, and may live a thousand miles away from his property. Then executive responsibility is centered upon a resident general manager or vice president.

The Hearne & Brazos Valley Railroad gives an illustration of this. The road is eighteen and a half miles long, running from Hearne to Stone City, Texas, and owns one locomotive, two passenger cars and three freight cars. The president lives in New York. Actual executive power is concentrated upon the vice president and general manager, who lives at Hearne, Texas, and has two officers on his staff: a secretary-treasurer, and a general freight and passenger agent, who is also auditor. In such a case, the duties of the president may be assumed to be largely confined to decisions about any tentative sale, lease or extension of the property (subject to the approval of his directors); to judgment on important purchases, and to general supervision of the work of his general manager as indicated in the current returns from the property. If any new financing is to be done, the president is in charge of it, whether he is resident or nonresident, and he makes recommendations to his directors about dividend payments.

The vice president and general manager of the Hearne & Brazos Valley, having officers in the traffic and auditing departments to assist him, will naturally supervise their work, but will take direct responsibility for the three other departments—operation, maintenance of way and structures, and maintenance of equipment. In operating the road, he is assisted by the following staff:

One locomotive engineer,
One fireman,

One train dispatcher,
Thirteen telegraph operators (who are joint employees of the traffic department, since they are station agents as well as operators),
One passenger conductor,
One freight conductor,
One passenger brakeman,
Two freight brakemen.

In maintaining the road, the general manager of the Hearne & Brazos Valley is assisted by a roadmaster, a foreman, and a more or less permanent track gang of four men. Additional men are brought in for special work, as they may be needed. The roadmaster is also capable of making necessary repairs to bridges, culverts and structures, with temporary assistance when necessary.

For purposes of maintaining the rolling stock, the company has a small shop, in charge of a master mechanic, who employs such machinists and carpenters as may from time to time be necessary. The general manager sees the master mechanic frequently, and is advised by him about all equipment that is being repaired or that needs to be.

The general manager is in close touch with the treasury and traffic departments; he has a daily statement of tickets sold and of cars moved, and watches, either in person or by proxy, the business done by all the other roads in his territory, so as to be sure that his road is getting its share. It is his duty to decide on the rates which will induce new

business, and to see to it that his regular customers are satisfied.

The Salt Lake & Ogden Railway, in Utah, fifty miles long, is a type of the next stage in transition. This is a busy line, with ten locomotives and one hundred and one cars. In this case, the president is the active executive head, and, being general manager as well, it may be said that he combines static and dynamic functions in relation to the property. He is assisted by a vice president, a secretary, a treasurer, an auditor, a purchasing agent, a general passenger agent, a general freight agent, a superintendent, a master mechanic, and a chief engineer, each of whom is reported to by his own force. The chief engineer has charge of maintaining track and structures. The master mechanic is in charge of the company's shops, and is responsible for the physical condition of the cars and engines, reporting to the superintendent. The superintendent is the busiest man in the employ. Responsibility for the actual operation and maintenance of the line is in his hands, except when he refers important decisions to the president and general manager.

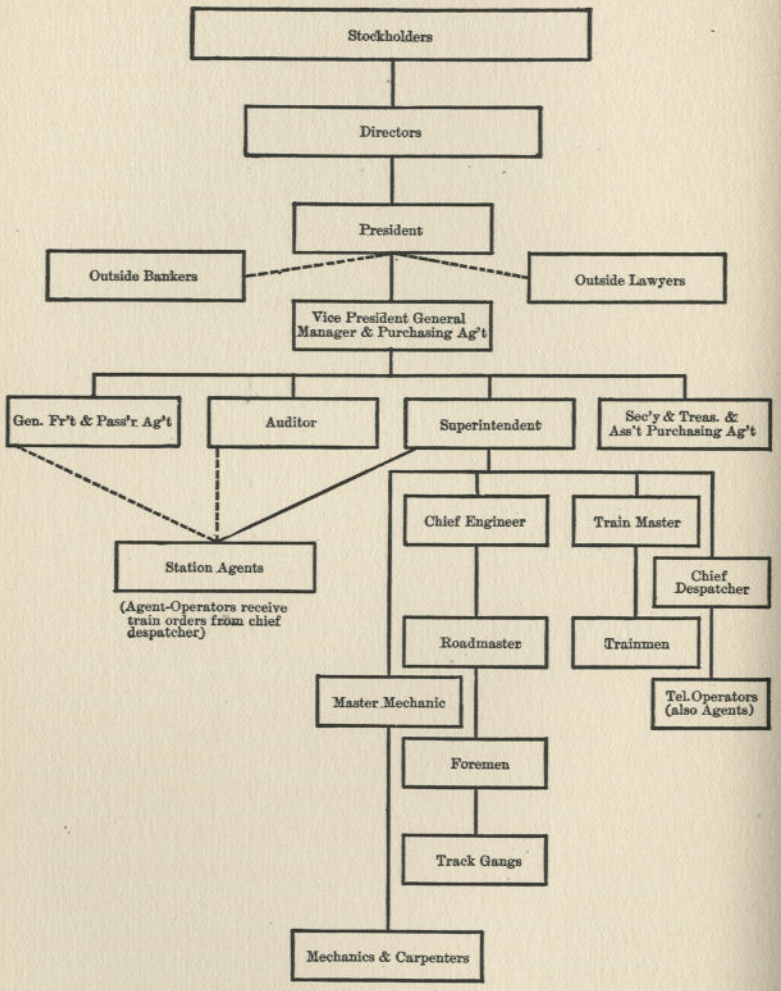
These three officers—superintendent, master mechanic, and chief engineer—work more or less closely together, their duties, though subdivided, uniting in the basic fact that they must provide for the business which the traffic department gets. The traffic department on the Salt Lake & Ogden Railway is represented officially by the general passenger agent and the general freight agent, who are neither superior nor inferior in authority to the superintendent, but who report, as he does, to the president. Their

business, concisely stated, is to sell the transportation which the superintendent furnishes. A certain amount of business will come to the road whether there are any traffic officers or not. A great deal more can be gotten if these officers are alert. The general freight agent of the Salt Lake & Ogden Railway must see to it that shippers are made satisfied with the accommodations he furnishes them for moving goods; he must make rate schedules, and study the needs of special industries, which can be induced to build along his road if freight rates from their factories to their place of market can be quoted which are more favorable than those they are now receiving; he must be perfectly informed about the natural advantages offered to certain kinds of manufacture or agriculture along his line. Besides securing new business, he must see to it that existing business is conducted smoothly; that the station agents are performing their work with integrity and efficiency, and that the clerical force in his department keeps the work in thoroughly good shape without blunders and without unnecessary expense.

The general passenger agent is responsible for the local ticket agents and the headquarters' clerical force; he must ask for additional trains when he needs them, and must coöperate with the superintendent in laying out the passenger time table. On a small line, his opportunities for creating new business will be less than those of the general freight agent, but he must be watchful for opportunities to run special excursions, to secure and advertise fairs, conventions, etc., and to encourage suburban development along his line. Whether his railroad be large or small, he

TABLE IV

ORGANIZATION FOR A ROAD 50 MILES LONG



Note that station agents are usually telegraph operators also. In that case they report primarily to the superintendent, but take train orders from the chief despatcher.

is likely to spend a good deal of time in answering people who are not satisfied with the quality or the speed of the service, or who want additional trains run.

The auditor bears somewhat the relation to the treasurer that the traffic department does to the operating department. The treasurer is custodian of the company's funds; the auditor brings him the funds. On a large railroad, the machinery for getting *all* the money, which the agents collect, into the auditor's hands is exceedingly elaborate; on the Salt Lake & Ogden it is comparatively simple. In brief, any auditor checks the agents by tissue copies of all waybills issued and by the stubs of the tickets, and collects for the sums indicated.

The accompanying diagram (Table IV) will illustrate what may be termed a characteristic organization for a reasonably busy road about fifty miles long. Authority is concentrated from a large body of stockholders on about a dozen directors, and these directors, who may or may not delegate responsibility to an executive committee, elect a president. The president is generally a member of the board, *ex officio,* and reports to his associates at each meeting. His active work lies principally along three lines: in supervising the direct responsibilities of the vice president and general manager and in dealing with outside bankers when the road wants to raise any new funds, and with outside lawyers when it wants to do extension work, when it is involved in any difficulty with constituted authorities, with customers or with claimants, and when legal questions of any sort arise.

The chances are that a road fifty miles long makes habitual calls for legal aid on the same adviser or firm of

advisers; but these gentlemen very likely have no title in connection with the road, and their services are sporadic and are paid on the basis of professional work done, with possibly a small retainer, to keep them from being employed against the road.

The vice president and general manager is in direct charge of the work of the road through the four officers who report to him. It will be seen by the diagram that two of these officers in the case of a small road are not apt to have many people with distinctive titles reporting to them. The secretary and treasurer has his cashier and stenographer, and the auditor has quite an office force, but the clerks are under his constant supervision; they do not do independent work, and their work is more or less variable, according to the needs of the day.

The general freight and passenger agent is the head of the traffic department of a small road, unless traffic happens to be the special training of the vice president and general manager. The general freight and passenger agent is the salesman for the road; he gets just as much freight shipped over it as he can, and must induce as many passengers and excursions to travel over it as possible. The station agents receive various circulars of instruction from him relating to the conduct of their work. The station agents account to the auditor for tickets and waybills sold, as has been stated. They are also responsible to the superintendent on questions of general conduct.

The four branches of service reporting directly to the superintendent are represented by the master mechanic, who has charge of the mechanical force; by the chief engineer, who has charge of the maintenance force and also of the new construction (though all roads let much new construction to outside contractors); by the trainmaster, who supervises the actual performance of work by the train crews, and by the chief dispatcher, who deals directly with the telegraph operators. In ordinary practice the master mechanic, the chief engineer, and the chief dispatcher keep pretty close to their headquarters, while the roadmaster, reporting to the chief engineer or division engineer, according to the size of the property, and the trainmaster, keep pretty constantly on the road. The superintendent generally arranges his time so that he spends something like half of it on the road and half in his office.

Considerable space has been devoted to this characteristic small-road organization, because the organization of the largest railroad systems is founded directly on the principles here outlined, the differences arising mainly through subdivisions of authority. All roads alike, great and small, are apt to be subdivided into operating divisions of from fifty to four hundred miles, and each operating division is pretty sure to have an organization very much like that shown as reporting to the superintendent in the diagram. In a larger system, of course, the higher executive, financial, and legal officers deal with the entire property; but the work of the superintendent actually in charge of a division has definite physical limitations. Only in the case of the departmental organization, rare in American practice, is immediate authority over the workers on a division, or part of them vested in an officer higher up than the superintendent.

The working organization of a short line, as independent roads less than one hundred miles long are often called, is well shown in the following excerpts from general order No. 1 of the Gulf Line Railway. The Gulf Line Railway is seventy-eight miles long, running from Hawkinsville to Bridgeboro, Ga., and is not a part of any larger railroad. Its principal commodities are cotton, cotton products, fertilizer for cotton growing, etc., and lumber.

The traffic manager has charge of all freight, passenger and baggage traffic; commercial and soliciting agents report to him and conductors and station agents observe his instructions as regards rates and as regards the handling of freight, passenger, and baggage traffic. The soliciting and commercial agents make frequent reports, daily if necessary, to the traffic manager as to the condition of moving and prospective movements of freight and passengers at all points on the line, inward and outward. The commercial, soliciting, and station agents are expected to keep themselves fully informed as to all prospective shipments of freight and passengers, when they are moving in any unusual volume or number and when one or more carloads of freight are to be moved in territory within the jurisdiction of the station agent. If the agents are not satisfied that they can control the routing themselves, they are expected to call on the commercial agent or any other officer of the company who can help them to secure the routing over their own line. The traffic manager and the commercial agents also keep before them a revised list of all the soliciting agents of the connecting lines, and they communicate with them freely by letter and wire, to secure

routing on all shipments destined to points on their line or to points which may be reached with their line as a part of the through routing. The traffic manager is also responsible for a small industrial department under the direction of the president. He is expected to be informed well in advance about probable new movements and new shipments, and to establish routings, rates, divisions and connections on all manufactured and other products that it may be necessary to handle, if these are not taken care of already. The traffic manager reports direct to the president.

In the operating department the general superintendent reports direct to the president, and he has charge of permanent way and structures. He receives reports direct from the trainmaster and from the dispatchers, station agents and trainmen. His responsibility is extended over the ordinary operations of the equipment and over the supply of water, and he has physical charge of the telephone and the telegraph lines.

The general superintendent is required to systematize the track work of each foreman, dividing it into periods and apportioning specified periods for each class of work. That is to say, for surfacing, ditching, renewing ties, etc., he must keep himself informed of the progress which each foreman is making, and must report progress to the president at frequent intervals. The section foremen are expected to keep themselves fully informed about their own local track conditions, and to consult with each other and exchange ideas with the general superintendent and the management from time to time. They are encouraged to feel

that they are in line of promotion to be roadmasters, or for further advancement. Their general orders outline for them the standards of maintenance to which it is desired that they shall conform, these standards being determined by the president and general superintendent.

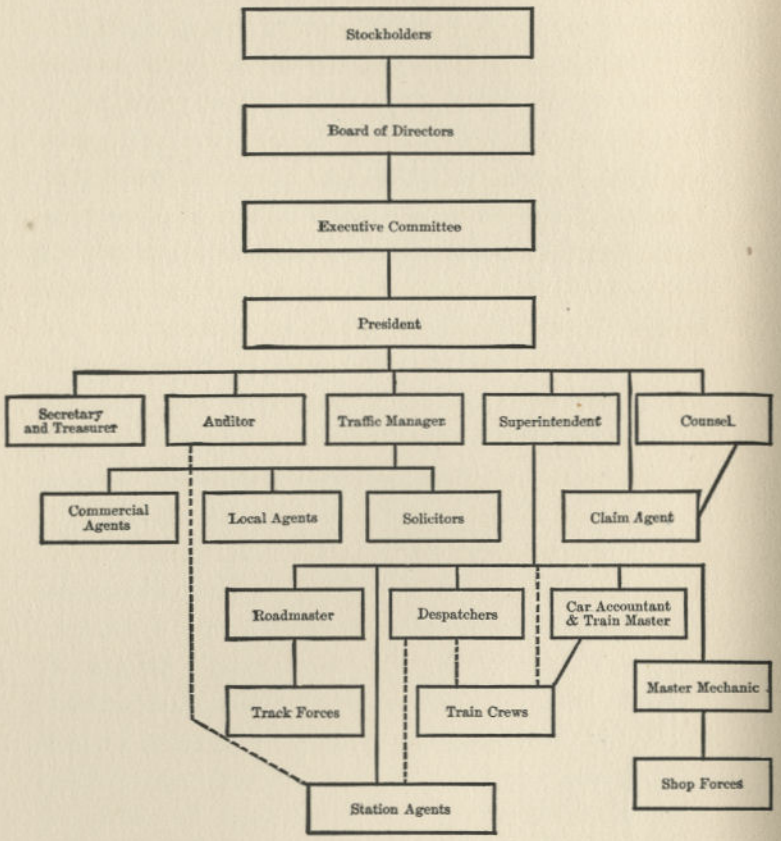
Station agents report jointly to the general superintendent, to the traffic manager, and to the auditor. They are expected to be active traffic soliciting agents at all times; they are required to remit their cash to the auditor daily when they have ten dollars or more on hand; they must use great care in keeping their passenger stations and freight houses in order and in serving the public and, in addition, they are required to report each instance where they see trainmen damaging freight by careless handling. They are specially admonished to keep in mind the fact that they have a dual task to perform; they must be faithful and courteous attendants to the customers of the road, and they must be efficient and faithful in the exercise of their specific duties to the company.

Trainmen report to the trainmaster on operating details and to the mechanical foreman on mechanical details, the mechanical foreman and the trainmaster alike reporting to the general superintendent. Their current actions in performing the business of the road are fully covered by the book of rules with which they are supplied, and they are aided in operating trains safely by the car inspectors, who look after the condition of the equipment in service and report on defects at once to the mechanical foreman or to the general superintendent.

Once a month there is held in the company's general

TABLE V

WORKING ORGANIZATION OF GULF LINE RAILWAY



office a management meeting, at which the president, the traffic manager, and commercial agents, the general superintendent, the trainmaster, and the counsel discuss the entire affairs of the company and exchange ideas.

The essential workings of this organization in detail are shown on the accompanying diagram (Table V). It will be seen that in actual daily practice the president has direct control over the workings of the treasurer, accounting and law departments, and indirect control over the operating and traffic departments. The general superintendent, who reports to the president, has entire charge of the civil and mechanical engineering work, as well as of operation, except where this work involves a change in the existing status. In that case the details are pretty sure to be handled directly by the president. The traffic manager, who reports to the president, has entire charge of getting the business, except where the problems are so difficult that he calls on the president for advice and coöperation.

It should be noted that the diagram of the Gulf Line Railway has been simplified somewhat, but fairly represents actual conditions.

CHAPTER III

THE ORGANIZATION OF A LARGE RAILROAD

Charles E. Perkins's comments on the work of the general manager—The organization of the Norfolk & Western Railway, with a graphic diagram and excerpts from the general rules—On the Norfolk & Western the third vice president gets the business, the second vice president moves it, the first vice president is the head of the treasury and accounting departments, and the president coördinates all departments and is the connecting link between the owners and the operating forces—Extension of these principles on larger systems; the Atchison, Topeka & Santa Fé; the Harriman lines—Details of the organization of the Union Pacific and Southern Pacific; Mr. Kruttschnitt's comments—The part which statistics play—A defect—Two contrasting types of large railroad organization, the Pennsylvania and the New York Central—The organization of the Pennsylvania compared with the organization of an army—Advantages and disadvantages of the departmental organization of the New York Central—Mechanical department organizations shown in detail—What good organization means, and how teamplay is brought about—Few roads really know whether their mechnical departments operate at a profit or at a loss—The manager and the labor unions.

PERHAPS as clear a statement of the work of the manager of a large railroad as was ever made, is that contained among the economic papers of the late Charles E. Perkins, formerly president of the Chicago, Burlington & Quincy.

Mr. Perkins was not merely a highly successful railroad president, but had the unusual gift of being able to analyze his own work and to tell why he did things, as well as how. His memorandum on the subject of railroad organization is reprinted herewith.[1]

"The question, what is the best organization for the management of a large railroad property, is one which will admit of so much discussion, and of such wide differences of opinion in the end, that it would be presumptuous to say that any given or particular plan is the correct one. It is, nevertheless, very necessary that there should be a well-defined organization of some kind, in order to produce the best results; and it is obvious that, the form of the organization being determined upon, it cannot, and should not, be changed without the most careful consideration by those who are primarily responsible for the management of the property.

"When the property to be managed is small, the question of organization is tolerably simple; and it may vary to suit the varying tastes, and whims if you choose, of different managers. The president of a company, or vice president, may himself act as general manager, and general superintendent, and chief engineer, when his road is two or three hundred miles long; and, if the traffic is not too heavy, he may find it good economy to combine all these offices in himself. But the great railroad systems are confronted with new and quite different situations; the one-man power in matters of detail must cease, and straight

[1] By courtesy of Mr. Perkins's daughter, Mrs. Edward Cunningham, Jr.

lines must be drawn. They must provide for obtaining the advantages of the large property and large organization, without losing the advantages of the small property and small organization. A company owning five thousand miles of railroad, and consuming correspondingly of all kinds of material and supplies, ought to buy cheaper, and can afford to inspect more scientifically and rigidly, than a company with only five hundred miles, and ought also to carry less stock in hand, in proportion to the extent of its property, than the smaller concern. Again, the large concern, employing thousands of men, and needing constantly to replace men in places of responsibility and trust, can afford to, and should, have more regard to some system for preparing and educating men, than would be practicable or necessary in the management of a small property.

"On the other hand, the great advantage which the manager of a small property possesses, is in being able to look after details himself, and how to organize the large concern so as to get the same economy and efficiency in these details, is the most difficult, as well as the most important, part of this question of organization.

"There are two essentially different methods practiced by the large railroad systems. One method is, to spread the working organization, so to speak, over the entire system; while the other makes a number of different working organizations, or units of management, each complete in itself. The latter method is the one which I have concluded to recommend for adoption by the C. B. & Q. Company. It seems to me to possess great advantages, which I

think a careful reading of the plans I propose will tend to make apparent. It involves a somewhat more expensive management; but I believe this is far more than made up by the great efficiency and economy in the details. To spread one working organization over the entire property gives heads of departments too large a field for anything like careful attention to details, and makes necessary their dependence on subordinates who are far removed from their immediate oversight, while the plan of separate and distinct units of management, on the other hand, confines heads of departments to smaller fields, and makes them directly responsible to a local head, or manager, who has general charge of the service within his jurisdiction of limit."

The two principal methods referred to by Mr. Perkins have been the subject of much earnest discussion for a great many years, in view of the rapid growth of railroad properties and the consequent responsibilities placed in the hands of the central administration. The method which Mr. Perkins refers to as that of spreading the working organization over the entire railroad is known as the departmental system, and has always been the prevalent system of organization in Great Britain and in countries where the railroads are operated by Englishmen, although this tendency has been much modified in recent years.

The other method of organization referred to by Mr. Perkins, which he describes as making a number of different working organizations or units of management each complete in itself, is known as the divisional, and is the characteristic form in use in the United States, as will be

seen by reference to the accompanying diagrams. The characteristics of these two general kinds of railroad organization will be discussed more fully in Chapter IV. At present, we are dealing rather with the concrete workings of a number of American railroad organizations as we find them.

The first diagram (Table VI) covers the organization of the Norfolk & Western Railway, which is 1,942 miles long and has approximately 950 locomotives and 37,000 cars. About seventy per cent of the total freight traffic of this road consists of coal, coke, ores, and other mine products; the other traffic of the road is well diversified and the boundaries of the property are Columbus and Cincinnati, Ohio; Norton, Ky.; Bristol, Tenn.; Winston-Salem and Durham, N. C.; Norfolk, Richmond, and City Point, Va., and Hagerstown, Md. It will be observed that this organization is neither clearly divisional nor clearly departmental. The division superintendent has direct supervision over the track maintenance forces, but not over the mechanical forces.

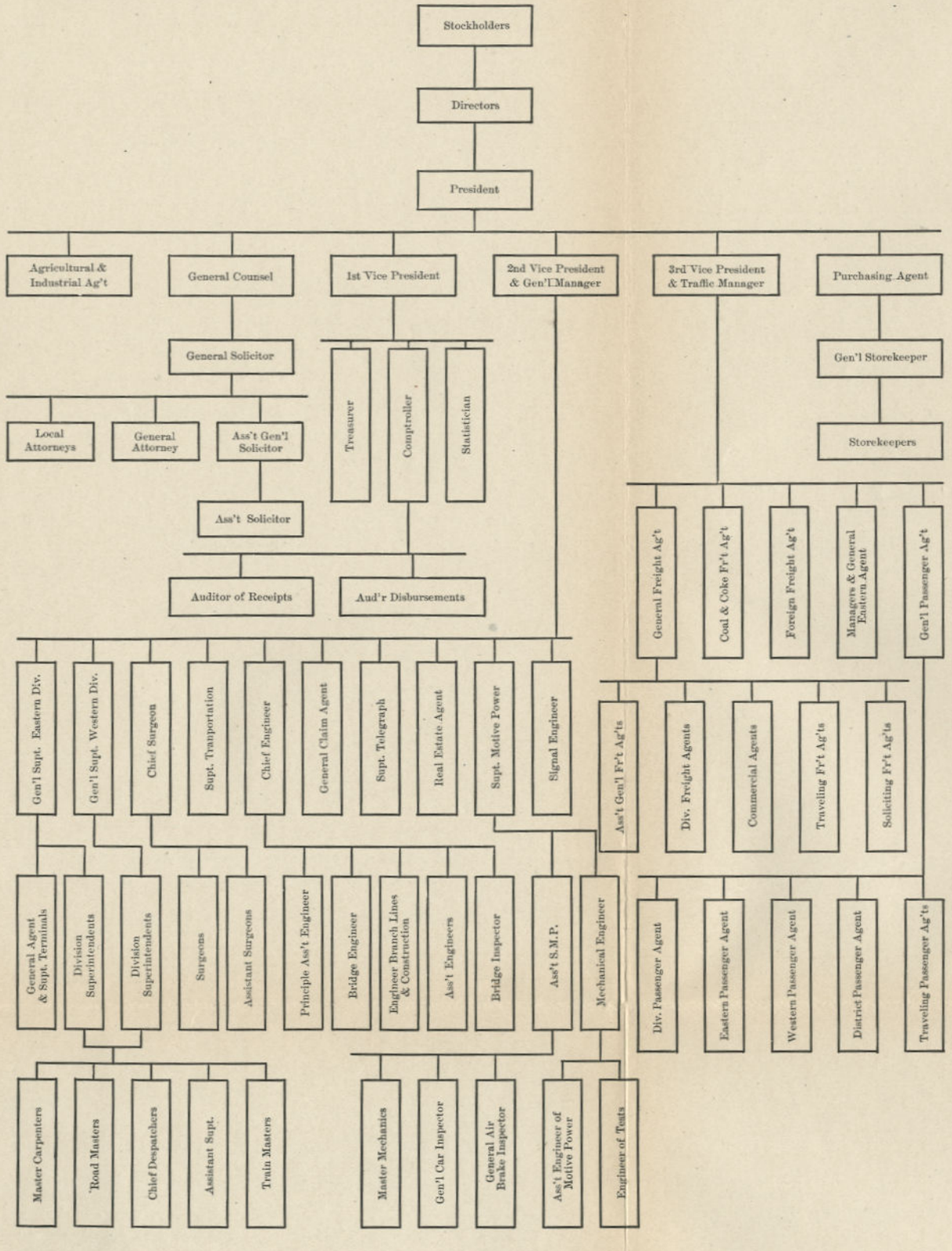
The rules of the Norfolk & Western Railway define the duties of the executive officers [1] as follows:

President.—Subject to the control of the board, the president shall have general charge, control and supervision of all business and operations of the company and over all its officers, agents, and employees; he shall, in the absence of the chairman of the board, preside at all meetings of the board of directors and shall be *ex-officio* a member of

[1] A more extended discussion of railroad officers' work is contained in Chapter V.

TABLE VI

ORGANIZATION OF THE NORFOLK & WESTERN RAILWAY, 1910



the executive and finance committees; he shall preside, in the absence of the chairman of the board, at meetings of the stockholders, and he shall, unless directed by the board, attend in person or by substitute appointed by him and act and vote on behalf of the company at the meetings of any corporation in which the company holds stock.

First Vice President.—Shall supervise the treasury and accounting departments.

Second Vice President and General Manager.—Shall, under the direction of the president, have charge of the operations of the transportation department; shall have general supervision of the railroads and property of the company and shall be responsible for the safe and economical management of the same.

Third Vice President and Traffic Manager.—Shall, under direction of the president, have general control and direction of the traffic department and shall be specially charged with the development of traffic upon the lines of the company and with the traffic relations with connecting and competing companies.

The Norfolk & Western is a good example of the organization of a large railroad in its simplest form. It will be seen that there are three main departments; one, headed by the first vice president, is entirely fiduciary and statistical, dealing with the company's current revenues and keeping exact record of those revenues and of the statistics of train movement, commodity movement, etc. The second vice president is also general manager, and has all the direct operation of the road in his hands, including the chief engineer's department and the whole civil engineering forces

of the road, and the superintendent of motive power's department and the whole mechanical forces of the road. The third vice president is responsible for getting the business, both passenger and freight.

In brief, on the Norfolk & Western it may be said that the third vice president gets the business, the second vice president moves it, and the first vice president collects and pays the bills and keeps the records. It is the duty of the president to see to it that the three broad divisions of the work are all conducted in harmony; on the Norfolk & Western he also receives a report from the purchasing agent direct, although this is rather unusual, and the general counsel and the agricultural and industrial agent also report to him. Moreover, as a member of the executive and financial committees of the board of directors, he is the essential connecting link between the representatives of the owners and the men in direct contact with the work done; he knows the point of view of both. The stockholders or proprietors of the road elect a board of directors to carry out their ideas. The board of directors, being itself somewhat too large for efficient administration, elects an executive committee, which has full authority in the conduct of ordinary business. The president sits in the executive committee and thus the ideas, first of the stockholders, then of the directors and then of the executive committee, center on him, and he puts them into execution through his three vice presidents, each of whom has his own staff and attendant organization.

The organization of the Atchison, Topeka & Santa Fé is an excellent example of the administration of a road

materially larger than the Norfolk & Western, and yet handled in very much the same way. The Atchison, Topeka & Santa Fé is a railroad 9,792 miles long, and on June 30, 1909, it had about 1,872 locomotives, 1,176 passenger train cars and 54,698 freight train cars. It runs from Chicago to San Francisco with a long branch from its main lines in Kansas to Galveston, Tex., and it also reaches Denver, Colo., and El Paso, and has an extremely large and important branch line mileage in the grain states of the central West and elsewhere. The company does a large transcontinental freight and passenger business, and its tonnage is unusually well diversified; coal and other mine products amounted, in the year ending June 30, 1909, to 28.39 per cent of the total freight moved; agricultural products to 23.08 per cent; manufactures to 19.81 per cent; forest products to 13.67 per cent; products of animals to 8.24 per cent; grain, distinguished from general agricultural products, to 8.37 per cent, and merchandise to 6.81 per cent. Chief in authority are, of course, the stockholders; then the directors, then the executive committee, and then the president. On the Santa Fé, the general counsel, whose work is very voluminous, reports to the executive committee instead of to the president, as is generally the case. The Norfolk & Western has three vice presidents; the Santa Fé has five. Three of these we recognize at once, since they have charge of the broad divisions into which the administration of all railroads must fall—operation, traffic, and accounting. On the Santa Fé, however, the vice president in charge of accounting has also added to his responsibilities the land and tax

department, the affairs of the subsidiary companies, and the timber and fuel properties.

The purchasing department on a railroad as large as the Santa Fé has enormous possibilities of careful or of careless administration, as the case may be, and the man in charge of that department is very properly a vice president. New construction also has its department, with a vice president at the head. The Atchison, Topeka & Santa Fé has been doing an enormous amount of new construction in the last ten years, and it would obviously be unwise to expect the vice president in charge of operation to cover this entirely different field also. In the case of the Norfolk & Western it was perfectly possible to arrange matters this way, because, while constantly engaged in grade revision and improvement work of this kind, the property is sufficiently compact so that the president himself can keep in personal contact with this work. On the larger systems, however, the construction department is often organized separately, with a vice president at the top. It should be noted that on both these roads, and indeed on almost all roads, what may be called the static civil engineering—the maintenance of the property as it exists at a given period—is largely controlled by the division superintendent, who directs the work of the roadmasters and their gangs.

The greatest company-worked railroad organization in the world, in point of miles of line and of diversity of conditions as well, is that of the Union Pacific and Southern Pacific systems, built up by the late E. H. Harriman. Mr. Harriman placed 18,600 miles of rail lines and 35,600 miles

of steamer lines under a single, highly efficient administration, which has been conspicuously successful in getting things done in an orderly and systematic fashion, and in keeping a working record of the conditions of the property and of the business. Mr. Harriman himself was president of both roads, and the leading spirit in both executive committees. Since his death, the same positions have been ably filled by his associate, Judge Robert S. Lovett.

Reporting to the president, the Harriman organization provides for a director of maintenance and operation, and a director of traffic. All the other current business departments except the fiduciary are subordinated to those two, which may be adjudged equal in importance—one getting the business, the other moving it. Of course, it was essential in so huge an administration that the exceedingly responsible managers should be relieved of detail; otherwise their time would be frittered away on minor matters, or on the affairs of one road or one division, and the property as a whole would not be managed at all. To effect this, an enormous amount of subdivision was essential, with the responsibility carefully graded, and placed in the hands of thoroughly competent men.

The traffic end of the business naturally subdivides more readily than the operating end. The traffic director has his headquarters staff of capable assistants; he has traffic managers located at all important strategic points, and these managers in turn direct the host of local agents, solicitors, etc., keeping their chief fully informed of all that is happening, and working out problems in accordance with his instructions.

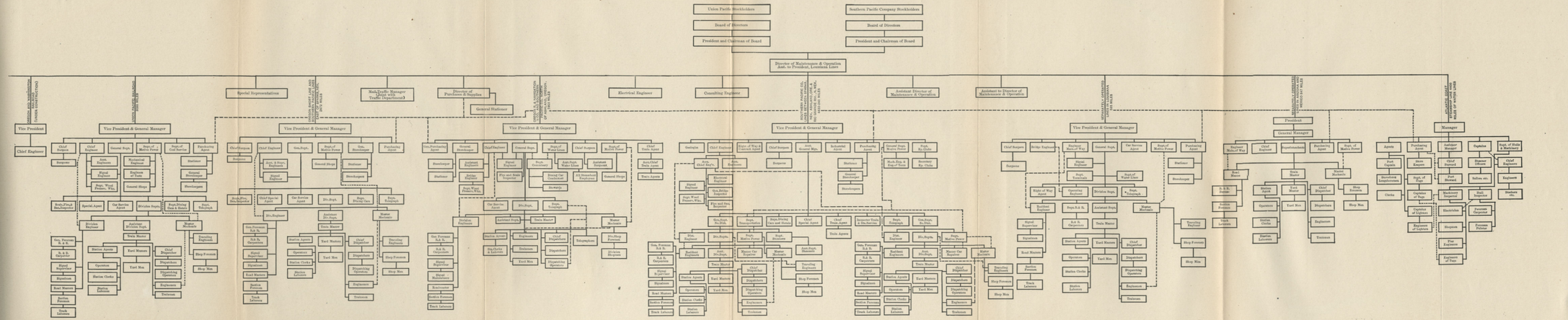
The operating organization was a much more complicated matter, because it embraced such a diversity of things, including not only the operation of a multitude of train services, but the effective maintenance of way, structures and equipment; purchases; new construction; electrical equipment; marine equipment and operation; signaling, etc. The working out of this is shown in the accompanying diagram (Table VII). The director of maintenance and operation is reported to by six operating vice presidents, one subsidiary president, a manager of water lines, a director of purchases and supplies (also a vice president), a consulting engineer, an electrical engineer, a mail traffic manager (jointly with the director of traffic), two staff assistants, and a special representative—fifteen persons in all, of whom ten are the heads of large organizations, and five are staff specialists and assistants.

Each of the operating vice presidents, and the subsidiary president, is at the head of what is in effect a complete railroad. The vice president in charge of the operation of the Union Pacific Railroad, for example, has jurisdiction over 4,000 miles of line—an operating entity just about double the size of the Norfolk & Western. He has his own chief engineer, superintendent of motive power, purchasing agent, and general superintendent, and the subsidiary organization reporting to each of these officers is in no important respect different from what it would be if the Union Pacific were operated as an independent railroad.

As Julius Kruttschnitt, director of maintenance and operation, expresses it, "The theory of the organization is

TABLE VII

OPERATING ORGANIZATION OF THE UNION PACIFIC AND SOUTHERN PACIFIC SYSTEMS



that the different properties must be brought into close relationship with each other, yet preserve a full measure of autonomy. It is intended that a superintendent shall be the general manager of his division; and the general manager, in turn, be the responsible operating head for the property. The director of maintenance and operation has charge of all new construction. The general managers are responsible for new construction in their respective territories. In the building of new branch lines, location and grading are usually under the immediate direction of the respective chief engineers. The superintendents do not become responsible until the track-laying stage is reached, and sometimes not until the track is completed. . . . The office of the director of maintenance and operation standardizes and correlates, supervises and investigates, commends and criticises, equalizes and differentiates as among different properties, but leaves each to work out its own problems of administration. Its noninterference with details is shown by the fact that comparatively few positive instructions have to be given.

" The management of the properties is vested in seven operating vice presidents,[1] each of whom, with his corps of assistants, is working out solutions of problems on his lines which are common to all. A study of seven solutions of the same problem must necessarily demonstrate that one of the solutions is the best.

" . . . With a view to systematic working out of details for standard practices and uniform devices, the gen-

[1] This number includes the president of one subsidiary company.

eral superintendents, the superintendents of motive power, the chief engineers and the signal engineers meet in semi-annual conferences. These meetings, while separately organized for each branch of work, occur simultaneously in the same city, so that some joint sessions may be held to discuss overlapping subjects of common interest. Appropriate committees are appointed to initiate or consider details. The minutes of the various parent bodies have the force of recommendations, and contain a recorded vote of the members whenever action is not unanimous. These minutes are forwarded through the various general managers, who append their own frank comments and criticisms. The director of maintenance and operation approves these minutes wholly or in part. Recommendations so approved become the standard, and remain the standard until otherwise ordered. After a fair trial, any officer or employee is at liberty to reopen the subject and to suggest through the proper channels a substitute or modification. Initiative is preserved by leaving the meetings untrammeled. They are legislative bodies assisted by the individual general managers as expert advisers and subject to the approval or veto of the director of maintenance and operation. A very large percentage of such actions of the director are confirmatory; only a slight portion is nugatory. Still another part consists in referring back for further consideration questions on which there is too marked a divergence of opinion. When time does not permit awaiting the semiannual meeting, a mail vote is taken through the general managers. . . . Our officers appreciate that they are working out an experiment in railroad operation,

and the knowledge that a new idea or successful device of any sort, if proven successful, will be adopted as standard practice on all of the associated lines acts as a powerful stimulus to originality and initiative.

"The coördination of so many units in so great a variety of territory, the maintenance of discipline among an army averaging over 80,000 officers and employees, the conduct of affairs which of necessity overlap jurisdictions of general managers, the duty of reporting conditions and results to the president in New York, all demand the utmost possible legitimate information promptly reaching the responsible head, the director of maintenance and operation. His office is administered upon the theory of a minimum of direct action made possible by a maximum of information, he assisting each one of the units below from the bounteous lessons of experience furnished by all."

This long extract from a recent address by Mr. Kruttschnitt before the New York Railroad Club is given *verbatim,* because it shows so clearly the general administrative theory upon which, by preserving local autonomy and relieving the director of maintenance and operation of an 18,000-mile system of direct management, he is able indirectly to produce the highest kind of operative efficiency, and to make the best practice the practice of all the lines. The part which statistics bear in this work is immense. They cover all vital facts relative to the business done and the facilities for doing it; they are so arranged as to be comparable readily, division with division, and present period with past periods, and they include in their scope a series of competent estimates of the business likely

to be done in the near future, so that adequate provision for it can be made.

A single illustration[1] will show at once the value of applied statistics of a certain sort and the possibilities of economy through centralized administration of great properties. The assistant director of maintenance and operation, among other duties, handles the larger movements of the equipment of the system, which is pooled. He has a daily statistical record of the location of the 75,000 freight cars under his jurisdiction, showing loaded and empty cars on hand at an enormous number of points; cars in transit; orders for loading; cars interchanged with foreign lines; bad order cars, etc. With this information at hand, he can move cars from regions where there is a surplus to regions where there is a shortage, and the Harriman car pool, in two years after its inauguration, brought about a reduction of fifty-four million miles movement of empty freight cars!

The economies effected in some other departments are comparable with this, though they cannot all be shown so graphically. It is easy to understand that the centralized purchasing department of the Harriman lines, for example, has a huge advantage over small roads, and is in position to get the best materials at bottom prices, working in conjunction with the policy of standardization already described.

The only material defect which the writer has observed in the working of the Harriman organization is one arising

[1] See also Chapter X, dealing with Control Through Statistics.

directly from the size of the property and from the conscientiousness of its chief organizer. Mr. Harriman had a prodigious grasp of facts and circumstances; it used to be said of him that he knew the location of every side track on the system and the record of every roadmaster. At all events, he scrutinized personally nearly every recommendation for a physical change in any part of his properties. This close personal attention to detail kept him almost perfectly in touch with all that was going on; it also produced delays, sometimes vexatious ones, in the conduct of the work.

Recommendations for minor grade revision; for the construction of new passing tracks; for laying heavier rail on certain sections, would come up through Mr. Mohler, or Mr. Calvin, or some other one of the vice presidents acting as general managers of the main operating entities. They would be passed upon by Mr. Kruttschnitt, in Chicago, and then forwarded, with his approval, to Mr. Harriman, in New York. There the secretary of the associated companies would take them in charge, and present them in batches to Mr. Harriman, who would review them with great rapidity, note the comments of the director of maintenance and operation, and add his own judgment, which was partly the opinion of a critical observer with the whole plan of the properties fresh in his mind, and partly the opinion of the financier, deciding whether the present time was favorable for the suggested improvement work. Mr. Harriman would thus review and accept plans for perhaps a million dollars' worth of work in half an hour, forming an actual opinion on each project as it came up. The

wisdom of these decisions was seldom questioned, but then the papers had to be referred back to Mr. Kruttschnitt, and he, in turn, had to note the action of his chief and communicate it to the local general manager, who had no authority, until that moment, to organize his engineering forces and proceed with the work.

This plan was not perfect. The actual time required to pass documents up and down this official flight of stairs was considerable, and in the meantime, if the situation was a competitive one, there was always the danger that an opportunity would be lost, or that some important shipper in noncompetitive territory would be alienated from cordial relations with the road because of the delays in providing needed facilities of one sort or another. The tremendous advantage of having all betterment work passed on by a financier in close touch with the whole property and with the money markets of the world was, to a degree, offset by the essential slowness of the process, and if the chief executive had been less capable, a situation analogous to the operations of a governmental bureau might easily have arisen. There is no obvious reason why the final authority in these cases, up to a large, specified limit, should not be vested in the director of maintenance and operation, since that officer is in frequent touch with the president, in New York, and would probably not be less efficient if he added close watchfulness of the current financial situation to his other responsibilities. The president would then have greater freedom to consider the inter-relation of the properties, physical problems and traffic problems of unusual magnitude, and new financing and refunding.

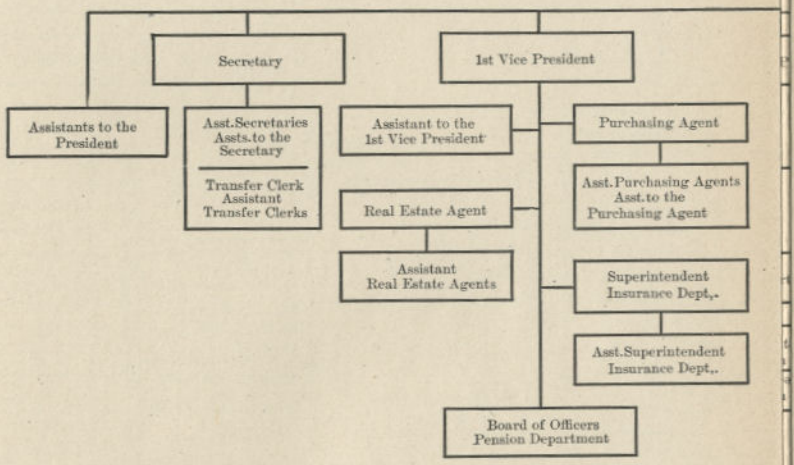
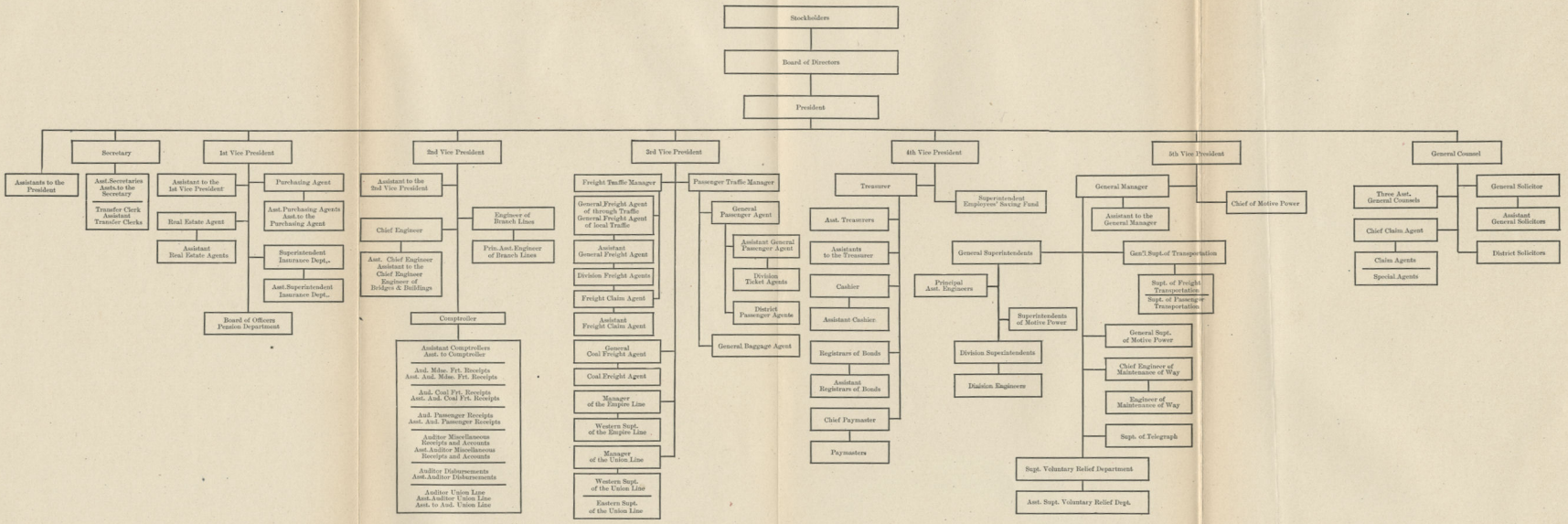


TABLE VIII

ORGANIZATION OF THE PENNSYLVANIA RAILROAD COMPANY, 1909



Under Judge Lovett's administration, the executive committee performs much of the work which formerly was really done by Mr. Harriman personally, and there is observable a wholesome tendency to reflect authority back to the two chiefs in Chicago, responsible to the executive committee for maintenance and operation and traffic.[1]

Two contrasting types of large railroad organizations are furnished by the Pennsylvania and the New York Central. The lines directly operated in the Pennsylvania system are divided into three main groups, including the Pennsylvania Railroad, and the Northwest and Southwest systems of the Pennsylvania Lines west of Pittsburg and Erie. To show the respective organizations of two large and exceedingly busy railroads operating in Trunk Line territory, we are here comparing the Pennsylvania Railroad proper with the New York Central & Hudson River Railroad proper, exeluding the western lines affiliated with both systems.

The Pennsylvania organization has been well termed a military one, since it clearly differentiates line and staff officers, and full power of meeting present conditions is vested in the line officer in command. As may be seen from the accompanying diagram (Table VIII), there are five vice presidents, one in charge of the purchasing, real estate, insurance, and pension departments; one in charge of new construction and also of the comptroller's department; one in charge of traffic; one of the treasury, and one of operation.

[1] For details of an important change in unit organization which is being tried out on the Harriman lines, see the Appendix.

The general manager and the chief of motive power report to the vice president in charge of operation. The general manager is a line officer, the chief of motive power a staff officer, responsible to the fifth vice president for the company's mechanical standards. Reporting to the general manager are the general superintendents and the general superintendents of transportation, the former line officers, in charge of operation, the latter staff officers, harmonizing the work of the operating department to the needs of the traffic department, and specifically in charge of car supply.

Each general superintendent likewise has staff and line subordinates, the principal assistant engineers and the superintendents of motive power being staff officers, in charge of *things;* the division superintendents being line officers, in charge of *men.* The actual responsibility of operating the road, division by division, rests with the division superintendents, each of whom has his master mechanic, his division engineer, trainmaster, roadmasters, and dispatchers. The staff officers instruct the mechanical and civil engineering forces *how* to do their work; the division superintendent tells them *when* to do it, so far as it relates to current operation. Thus the staff officers build bridges, shops, and branch lines with their own organizations, and then turn them over to the division superintendent to operate and maintain. The general superintendent supervises several divisions; the general manager, the whole road.

Let us see how this compares with the organization of an army. The board of directors is the war council, or

general staff; the president is field marshal or general; the vice presidents are major generals; the general manager corresponds well enough to a brigadier general. Each general superintendent compares with a colonel; his principal assistant engineer and superintendent of motive power would be majors of engineers, and his division superintendents would be captains, each with his own subordinate officers and company of privates. There are many departments of the army which do not fall within the scope of the captain's duties. He need not know how to use a transit, or calculate the stresses in a bridge, or set the valve gear on a locomotive, but he must be able to command his company, and he must accept all current responsibility for his position; technical assistance of every sort needed will be furnished him by the brigadier general and his staff.

This is a good working organization. Armies and railroads alike have to be prepared always to meet emergencies involving rapid, clear-headed action under all sorts of difficulties; they both must include a staff of the best obtainable experts to decide the details of procedure so long as there is time to decide them. The army and the railroad have nearly the same need for civil engineers; the military commander's need for engineers of ordnance, or of sanitation, is balanced by the railroad's need for mechanical engineers and a traffic organization.

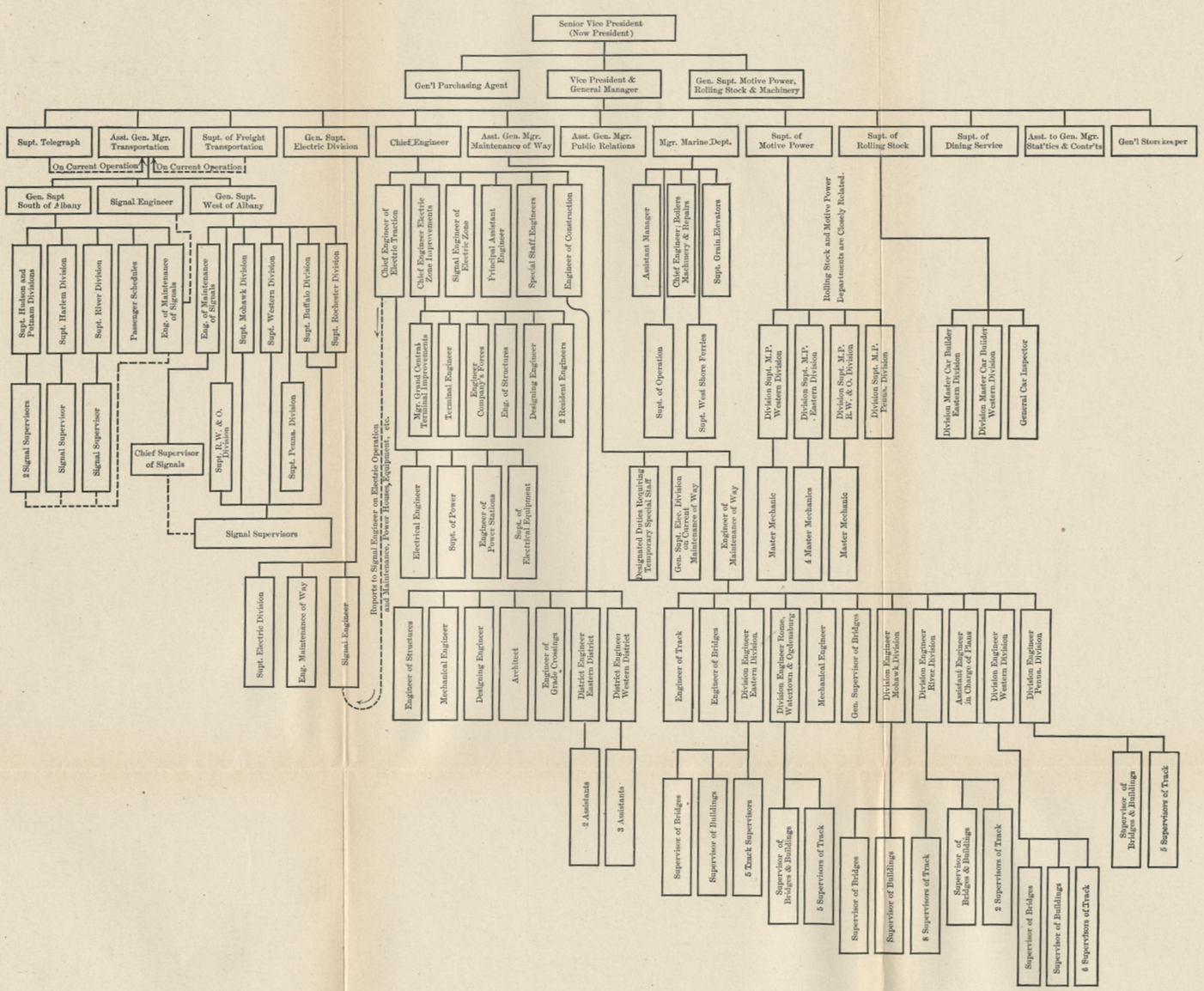
A railroad managed on the departmental plan, however, is not comparable to an army. The company, or division, here has several partial commanders, reporting to headquarters through different channels; the lines of authority

do not concentrate short of the general superintendent or of the general manager. Such a situation would be created in an army if one lieutenant in each company was in charge, let us say, of small-arms practice, reporting neither to the captain nor to the colonel, but to an adjutant on the brigadier general's staff, while the other lieutenant was a lieutenant of engineers, reporting likewise to the brigadier general's staff. With a mobile unit, like a military company, such an organization is unthinkable; with a fixed unit, like a railroad division, it can be managed, though the results are questionable.

The New York Central organization is more or less like this as is shown in Table IX. It will be observed that the senior vice president (who has become president since this diagram was constructed) is reported to in the operating department by a vice president and general manager, and by two staff officers. The vice president and general manager is reported to by thirteen officers. His direct operating aide is an assistant general manager, who is reported to by two general superintendents and a signal engineer, also by a superintendent of telegraph and a superintendent of freight transportation, on current operation. But the unit of operation is the division; let us compare the authority of the division superintendent on the Pennsylvania and the New York Central. The Pennsylvania division superintendent is reported to by a master mechanic, a division engineer, a trainmaster, roadmasters, yardmasters and dispatchers. That is to say, he has full control of operating his division, and of current maintenance of way, structures and equipment. On the New York Central, the

TABLE IX

DEPARTMENTAL OPERATING ORGANIZATION OF THE LEASED AND OPERATED LINES OF THE NEW YORK CENTRAL & HUDSON RIVER RAILROAD, MARCH 1, 1908



division superintendent has charge of train movement only, and the functions of the general superintendents are no greater; the maintenance forces, civil and mechanical, do not unite short of the vice president and general manager.

It is quite true that the New York Central manual states that " in the event of accidents or other emergencies the division superintendent is authorized to direct the employees of all departments as he may deem necessary for the best interests of the company, and will promptly advise heads of departments of action taken." But this rule gives the division superintendent unaccustomed work to do and to think about, at the precise time when he most needs to be able to work automatically, with forces accustomed to obey his orders. Moreover, the concentration of all departments, mechanical, civil engineering, and operating, in the office of the vice president and general manager means that a greater amount of work is put up to that office than any one man can handle. It means, in short, that an unduly large proportion of business, both current and emergency, must be administered by chief clerks, instead of by principals.

Added to these difficulties is the ever-present likelihood of departmental rivalry, where there is no common authority short of the general manager. If an accident occurs at a point where the division superintendent has been complaining of the track to the maintenance department, the superintendent is going to take good care to evade personal responsibility, while the engineering department, finding itself in a corner, will do its best to fix the blame on the

operating department. This engenders a state of mind which makes it particularly difficult for these two departments to work together efficiently so as to prevent another accident.

These objections do not necessarily hold true on a road small enough so that the central office can really exercise personal supervision over all departments and keep them coördinated. The Delaware, Lackawanna & Western, and the Buffalo, Rochester & Pittsburg may be cited as examples of highly efficient organization on the departmental basis, but these properties neither of them have more mileage than a general division or district on a large system, and the jurisdiction of the president is comparable to that of a full-powered general superintendent, on questions of current operation. The specific form of the operating organization of the Buffalo, Rochester & Pittsburg is shown in the following chapter.

The discussion has rested, up to this point, on the main framework used to render efficient and harmonious the work of different departments. But each department must also have its special organization, worked out with much detail. As an illustration of this, the following diagrams have been taken from the *American Engineer and Railroad Journal* to show the organization of the master mechanic's or locomotive operating department on the western division of the Lake Shore & Michigan Southern Railway. The general organization of the motive power department is shown in Table X.

On the Lake Shore & Michigan proper there are two main divisions and two master mechanics; the organization

TABLE X

ORGANIZATION OF MECHANICAL DEPARTMENT;
LAKE SHORE & MICHIGAN SOUTHERN RY.

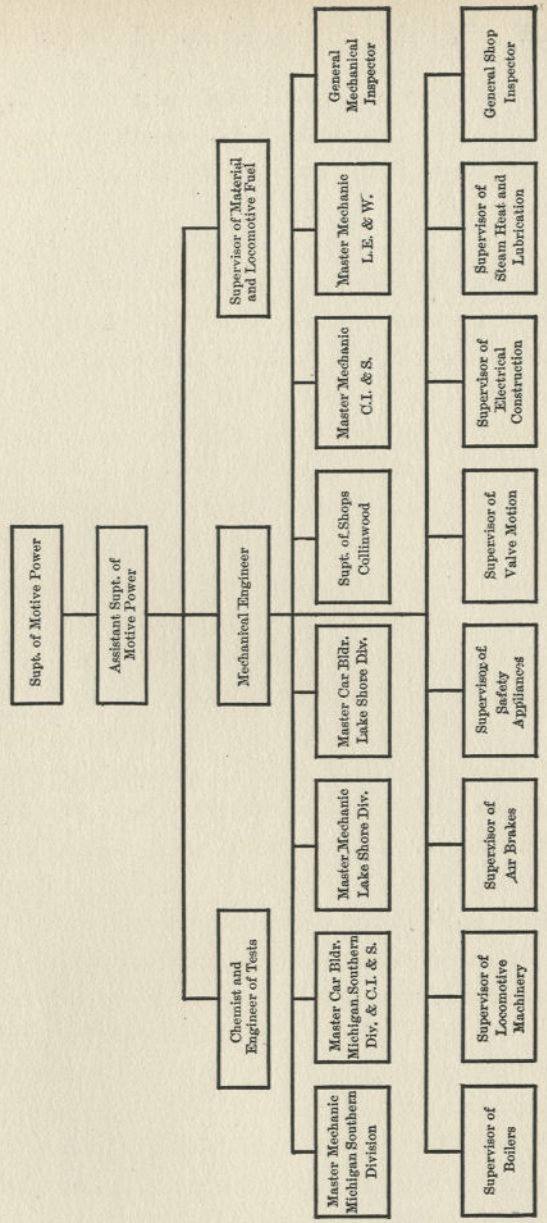
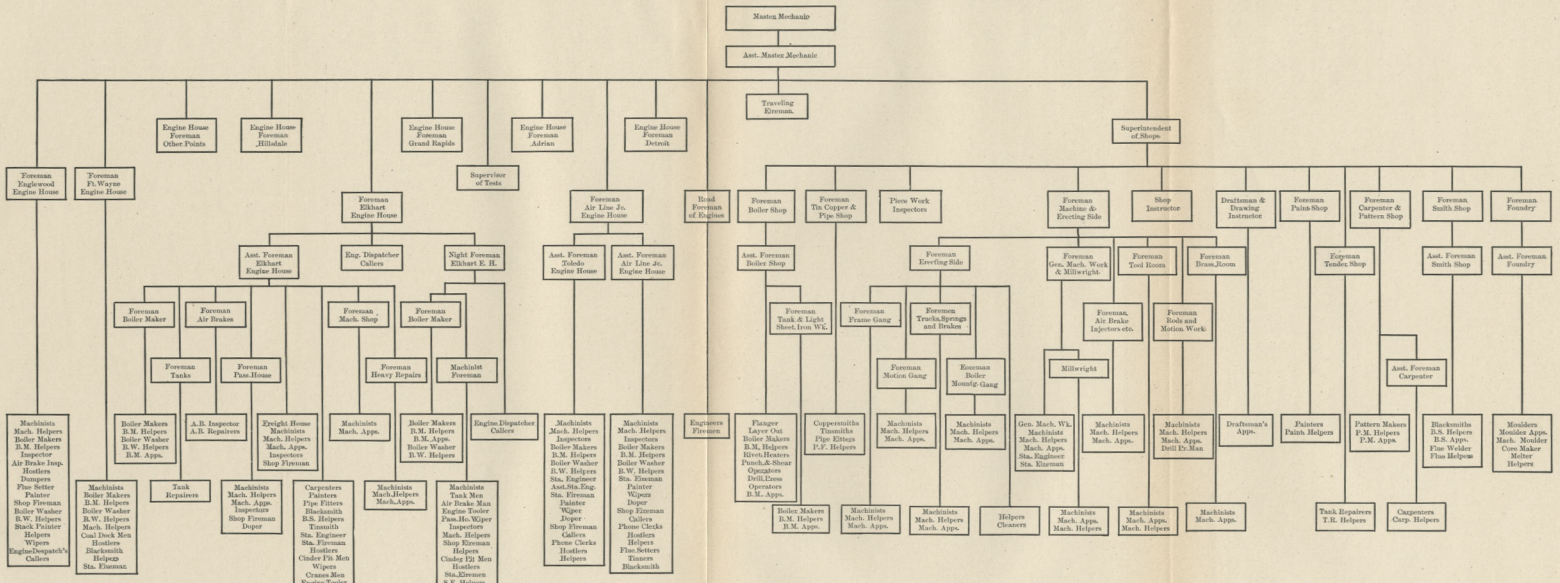


TABLE XI

LAKE SHORE & MICHIGAN SOUTHERN

ORGANIZATION OF THE MASTER MECHANIC'S OR LOCOMOTIVE OPERATING DEPARTMENT; WESTERN DIVISION



reporting to the master mechanic of the western division, selected as typical, is shown in Table XI.

The following excerpts are also quoted from this same excellent paper in the *American Engineer* (December, 1908):

"The effectiveness of an organization must be judged by its ability to increase the efficiency of the department, or concern, as a whole. This result can only be obtained by improving the efficiency of each individual in the organization, from its head to the least important employee. This requires ample supervision working along definite lines and based on certain important fundamental principles.

"It is possible for a strong and gifted leader, by pure force of personality and with a poor organization to back him, to bring about a fair result; but let him leave it even for a short time, and the efficiency immediately falls off. It is further true that in a large organization of this class he cannot bring the efficiency above a certain point because he will be swamped by details, even though he is of exceptional capacity, and cannot give sufficient thought and attention to the larger problems which must be solved to guide it properly.

"One of the cardinal principles of a good organization is that every officer and foreman in it should see that he has under him a man who can successfully take his place, either temporarily or permanently. A test of a good organization is whether the efficiency is appreciably affected by the absence of any one man.

"Good organization means that there is team work and

coöperation between its different branches or departments, in fact, that department lines are practically lost sight of, and the men press on enthusiastically, shoulder to shoulder, not for the success of any one department, but for the success of the organization as a whole.

" . . . The master mechanic has in his desk what is known as an efficiency card for every fireman and engine-house employee. Eventually, he will have a card for every man under his charge. One of the fundamental principles of good organization is that the efficiency of each man be increased to the maximum. The efficiency of such men as work under piece work is automatically increased, but necessarily a large proportion of the men do not come under this head, so that gauge must be placed on them. . . . By thus locating the poor and weak men they can be encouraged to improve, and if they do not show the necessary improvement, they may be dropped from the service. . . . Every three months a power meeting is held in the office of the master mechanic, at which the road foreman of engines, engine-house foreman, shop superintendent and his assistant, and general foreman are present. The master mechanic has a card index before him showing the condition of each locomotive boiler when last reported. As the engine number is called out, the road foreman of engines under whose jurisdiction it comes, reports on the condition of machinery. If the conditions are such that it will be necessary to make repairs during the next three months, the class of repairs and the month during which the engine will be shopped are decided upon."

This meeting is one of a number of stated gatherings

for the direct purpose of promoting efficiency. The staff officers meet frequently with their chiefs to discuss standards, or the kinds of things that are to be done; the line officers are held strictly accountable for the way these agreed methods are put into practice.

Thus a railroad organization is not merely a device for insuring that specific tasks are accomplished; it must also insure that they are accomplished as cheaply as is consistent with agreed standards of excellence. Rather more railroad mechanical departments than otherwise are defective, in that the management never really knows what specific pieces of work are costing it. Many items enter into cost, and unless both the line supervision and the staff supervision are carried out with a high degree of orderliness and efficiency, the elements of petty waste all through the organization will add up to an appalling total.

This fact has peculiar weight in the organization of a great railroad. An industrial concern, manufacturing car wheels, or repairing locomotives by contract, is always certain to know whether it is operating at a profit or a loss. But a railroad mechanical department is engaged in the simultaneous performance of many manufacturing jobs, using the same plant and the same force of employees for tasks which differ widely from day to day, and the finished product is not sold to the public, but is turned over to the operating department for company use. It is obvious that a large amount of such work must be done on every railroad, hence shops and employees must be provided. It is the duty of the organization to make sure, not only that the work is done when it should be and in the required

manner, but that nothing is manufactured in the company's shops which the company could better afford to buy elsewhere, when all circumstances are taken into account. This can only be accomplished by the strictest and most intelligent kind of cost keeping; by constant comparisons with the most efficient outside organizations for doing the same kind of work, and by incessant effort to increase the efficiency of the individual employee.

Without going very far into the intricacies of this subject, it is sufficient for our purpose to note that the shop manager seeking to promote efficiency is apt to find himself constantly at odds with the labor union. The labor union is the great leveler; it fights sturdily for a standard wage, and wants that wage to be measured by time rather than by output. If it is measured by output, the control of the union over its members is by that much lessened, since the best men get a rate of pay dependent upon what they are doing for themselves, and higher than the rate which the coöperative effort of the union can get for them.

Labor is often suspicious of piece work, or premium work, in its varying forms, because of the unfortunate fact that payments on an individual effort basis have not always been free from an attendant disposition on the part of shop managers to make the exceptional record of one season the minimum standard of the next, so that the only result of brilliant work was to make it progressively harder for the average worker to earn his living. Needless to say, this is shortsighted practice. It is generally recognized now that a premium must not turn out to be a punishment for somebody else; if it is to produce any useful result it

must be a genuine reward for ability, with no strings tied to it. Otherwise, the pressure exerted by the fellow workers will be so great that the most skillful will deliberately curtail their output.

The hardest problem confronting any railroad management is the task of dealing with its own employees in such a manner that the employee will clearly see that his interests are the same as the interests of the company. This is a task of the first magnitude, because the individual employee cares only that his personal share be as large as possible, while the railroad is equally concerned in keeping the whole expense account as small as possible. The solution, so far as there is one, evidently lies in paying for *things* instead of for *hours,* but in practical application this requires an amount of fairness on both sides that is not always attainable. Real progress has been made in the last ten years, especially in the mechanical department, where conditions used to be nearly, if not quite, the worst. But the road is long.

CHAPTER IV

DIVISIONAL *VERSUS* DEPARTMENTAL ORGANIZATION

The seven divisions of work which must somehow be done—In a pure departmental organization these divisions would not meet short of the board of directors—But on a large railroad there must be subdivision somewhere; in a departmental organization it is based on the kind of work; in a divisional the subdivision is largely territorial—This does not apply to the traffic or accounting departments, which are more or less uniform on all roads—American practice tends strongly to divisional organization, British practice to departmental—Departmental organization on the Lackawanna, the Buffalo, Rochester & Pittsburg, and the Rock Island—Arthur Hale's comments; the departmental organization the best training school for specialists; the divisional organization the best school for all-around railroad men.

We have seen that a railroad has four main kinds of work to do. But the work subdivides naturally into seven distinct parts. The business must be brought in, and this is performed by the traffic department; it must be moved, and this is performed by the operating department. The civil engineering department has to do with the track, roadbed, bridges, tunnels, and stations; the mechanical engineering department handles the construction and maintenance of the locomotives and cars that move over the roadbed; the financial department is responsible for the

collection and disbursement of all funds however received, whether from current income or from capital; the purchasing department does the railroad's shopping, and the law department must judge of every contract entered into by the company, and must be the ultimate authority on questions arising from tenure of land, claims made by individuals, government orders, etc. Of course, in the conduct of a large railroad there are many minor departments also, as, for example, the insurance department, which is closely allied to the financial department, and the industrial department, which is closely allied to the traffic department. But the seven subdivisions of work enumerated above are common to all railroads, and are entirely unlike, although in the case of a small road the functions of two or more of them may be discharged by the same officer.

In a purely departmental organization, these seven departments would meet nowhere short of the board of directors; there would be a responsible head for each one of them, and each would carry on its share of the work of the road, observing the requirements of fellow officers engaged in different branches, but not being under their direct authority.

It is obvious, however, that no general manager, however competent he may be, can actually attend to the details of operation of a railroad, say, 5,000 miles long; he must delegate authority to a great many helpers. The natural way this delegation works out is the creation of the division. This division may be long or short; a busy railroad terminal in a large city is often made a division by itself with its own division superintendent; while, on the

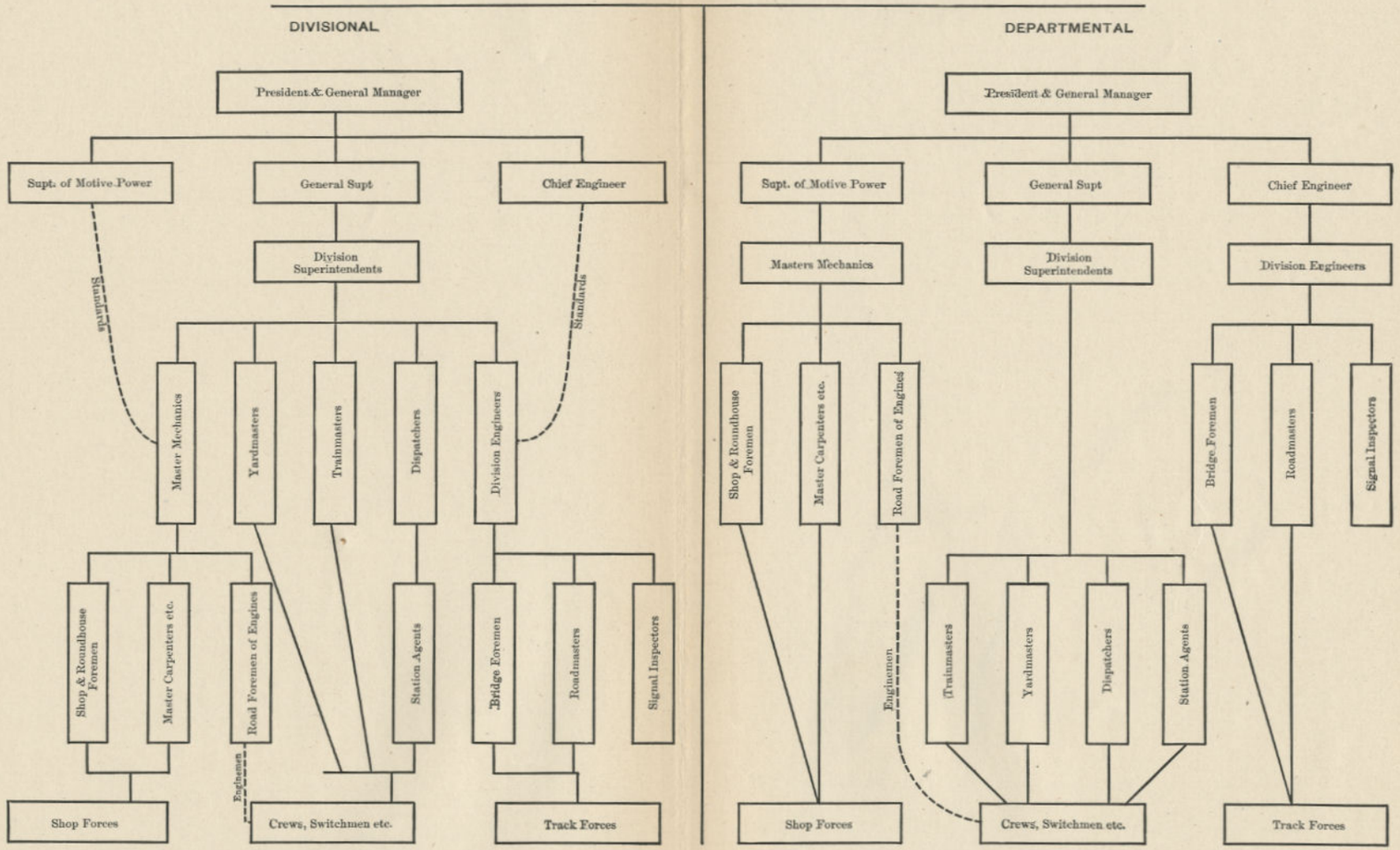
other hand, a division superintendent may handle successfully several hundred miles of track in the open country and generally has more than 100 miles to take care of. The Northern Pacific Railway, 5,700 miles long, has sixteen division superintendents, or one for approximately every 350 miles of line, on the average; the Southern Railway, 7,500 miles long, has twenty-three superintendents, or one for every 325 miles, on the average; the Pennsylvania Railroad, operating 6,200 miles east of Pittsburg, has twenty-four division superintendents, one for every 250 miles, approximately. No matter what the theory of organization be, there must be a man in actual direct charge of the operation of each designated section of the property.

From this fact has arisen the divisional organization. It is obvious that the division superintendent must, in any case, have large authority. The operation of trains carrying goods and passengers—passengers who must at all costs be protected in life and limb, and goods which are often perishable, usually valuable, and for which the railroad company is at all events liable as a common carrier—means that the authority of some executive who has almost indefinite powers to deal with emergencies, must be felt by everybody. In the pure divisional organization this executive officer, the division superintendent, is made a little king over his small domain. He does not solicit traffic nor does he collect or disburse funds, nor is he a lawyer nor primarily an engineer, but everybody actually employed on the division reports to him on questions of current operation.

Even in the strictest form of divisional organization,

TABLE XII

OPERATING ORGANIZATIONS IN THEIR SIMPLEST FORM



however, there is some division of this authority. The station agent, for example, reports to the traffic department on questions involving rates and tariffs; the roadmaster expects to maintain the road according to standards which the division superintendent himself has received from the chief engineer or the engineer of maintenance of way. But in the strict divisional organization nobody can question the orders which the division superintendent issues to the gangs actually at work, or to train crews, or to station agents; in cases of personal injustice they have some right of appeal afterwards if they want it, but they must first do what they are told.

The accompanying diagram (Table XII) shows, in condensed form, the contrast between the two types of organizations in the operating department. Outside the operating department, the distinction does not exist.

Chapter III, dealing with the working organization of large railroads, showed examples of pure divisional organizations in the case of the Pennsylvania and of the Harriman lines. The vice president and general manager of each one of the main operating divisions of the Union Pacific and Southern Pacific is responsible for the conduct of normal business on his division, and he delegates his responsibility directly through the general superintendents to the division superintendents, each one of whom has large power on his own division to get things done the way he wants them done, subject to general instructions from his chief.

Of course, it is obvious that no large railroad could carry out the idea of the divisional organization in its extreme application; that is to say, it would not equip every

division superintendent with a chief engineer reporting to him only, or with a division treasurer and comptroller, or with a private law department. In actual working, roads organized on the divisional plan have a headquarters organization which is in effect departmental, but they separate the functions of the staff and the line, placing as much line control as possible in the hands of the division superintendent.

The departmental organization, however, proceeds on a different theory. Its advocates say, in effect, " a division superintendent, no matter how good an operating man he may be, will not be an expert in civil engineering and mechanical engineering as well. Therefore, we will procure the best civil engineer and the best mechanical engineer that are to be had anywhere, and we will extend their functions right down into the department of the division superintendent. The division superintendent shall operate trains, but if there is a washout he shall leave it to the engineer of maintenance of way to direct the forces working under the immediate authority of the roadmaster. And if the division superintendent wants to hurry through the shops a couple of engines that have been sent in for their annual overhaul, he must make his request to the superintendent of motive power, who will take the matter up with the master mechanic in the division superintendent's territory." In brief, the departmental point of view is that it is economy to have and to use the best in all branches of service, and that if the mechanical forces do all their work under the direct supervision of a $10,000 superintendent of motive power, the results will be better

than if they do half of it under the supervision of a $2,500 division superintendent.

In spite of two or three noteworthy attempts to introduce a pretty thorough system of departmental organization in this country, American practice leans very strongly to divisional working, under the technical guidance of a headquarters staff. In England, as has been said, the traditional organization has been strongly departmental; only in recent years have important efforts been made to change somewhat the old tradition. One of these traditions, most strange to American observers, was that the chief mechanical officer of the road was on a parallel with the general manager (a British railway has no president), the result being that the mechanical head and the operating head, receiving about the same pay and reporting coordinately to their nontechnical board of directors, were not always in as close harmony as might have been wished; the mechanical officer was sometimes more interested in his own special kind of records of efficiency than he was in the general conduct of the business of the road. Several examples of this type of organization are shown in another chapter.

The comparison attempted in Chapter III of the respective working organizations of the Pennsylvania Railroad and the New York Central showed that the departmental organization of the New York Central had a number of grave theoretical defects to offset some of its theoretical excellencies. In this discussion attention was also called to the fact that the important objections to the operation of a large railroad on a strict departmental plan do not

apply to the operation of a small railroad; that, in fact, a railroad having no more mileage than is embraced ordinarily in a general division of a large railroad system can operate very successfully in this way. The organization by far the most frequently found, however, in American practice, is the pure divisional, whether the road be large or small. It has been found advisable to concentrate as much authority as possible in the hands of the division superintendent, in spite of the fact that the division superintendent is not at all likely to be a first-class expert in more than one of the entirely distinct kinds of work that have to be done on his division.

It is interesting to observe some of the attempts that have been made in this country to conduct organizations on the departmental plan.

On the Delaware, Lackawanna & Western Railroad there are three vice presidents, one in charge of operation, one of traffic, and one of the law department. The mechanical department is headed by the superintendent of motive power and equipment, the civil engineering department by the chief engineer, and each one of these departments is kept quite distinct from all the others. The general superintendent has no direct authority over either the mechanical or the civil engineering department, and since he has not, of course the division superintendents have not, either.

But the Lackawanna is only 958 miles long, so that the general superintendent has not quite two thirds as much territory as is assigned, on the average, to a general superintendent on the Chicago, Burlington & Quincy, for example.

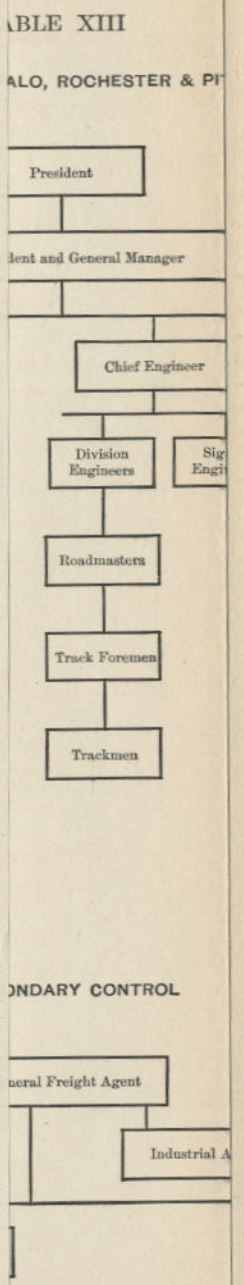
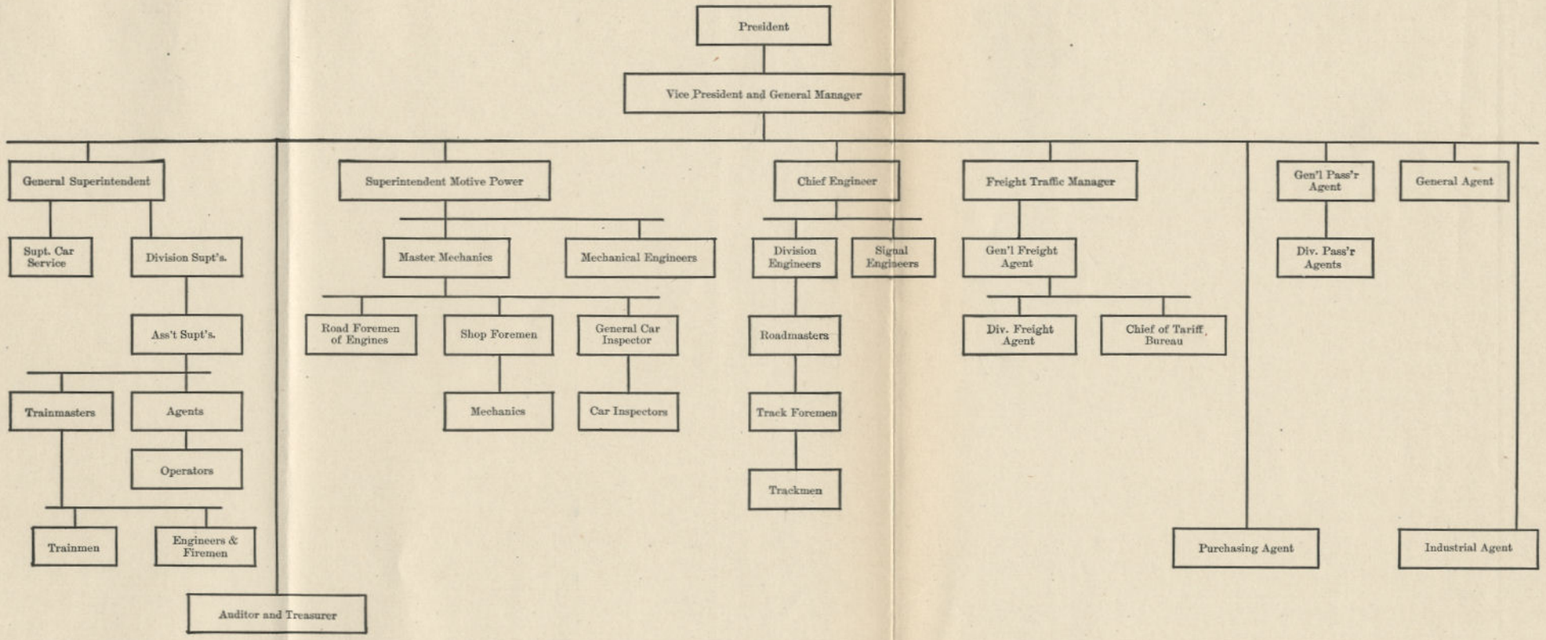
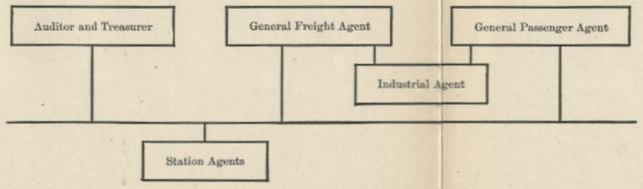


TABLE XIII

ORGANIZATION OF THE BUFFALO, ROCHESTER & PITTSBURG, 1910.



SECONDARY CONTROL



Moreover, the general superintendent and the superintendent of motive power and equipment are both located at Scranton, so they can readily keep in touch with each other. The president is located in New York, and the chief engineer in Hoboken, N. J.; but in spite of this separation of the executive and civil engineering forces, on one hand, and the operating and mechanical engineering forces on the other, the operation runs very smoothly.

The organization diagram (Table XIII) of the Buffalo, Rochester & Pittsburg illustrates an organization almost identical in its principal features; that is to say, the mechanical superintendent and the general superintendent in charge of operation are tied together, whereas the civil engineering department reports beyond the general superintendent to the general manager. The division superintendents on the Buffalo, Rochester & Pittsburg have not much authority, but the divisions on this road are so short that the general superintendent can come closer than usual to the desired state of being everywhere at once. Consequently, the actual operating control of the division is not paralyzed by concentrating power higher up, and the whole road is small enough (568 miles) so that the separation of the track forces from the operating forces does not produce serious complications.

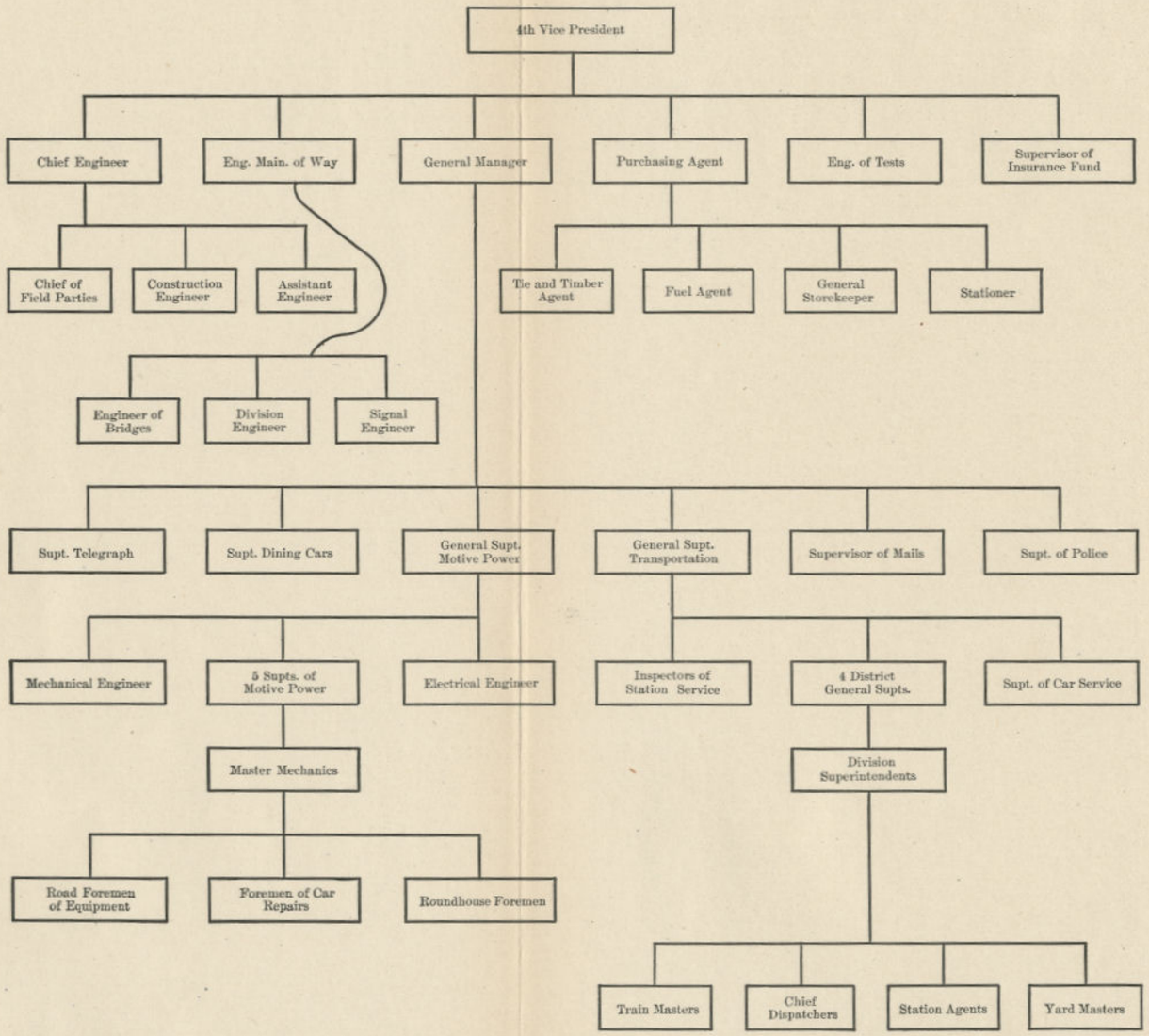
When L. F. Loree became president of the Rock Island system, at the close of 1903, he felt strongly that with the great traffic increases of recent years, involving the constant solution of new problems in operation, and at the same time demanding a very rapid strengthening and rebuilding of the lines, it was almost impossible to find men

sufficiently well trained by their previous experience to achieve the highest kind of results simultaneously in both kinds of work. It is obviously true that a man whose training has been in one branch of the service under conditions of fairly strong competition between departments, may not only miss opportunities of general development outside his own specialty, but may almost be disposed to regard some of these developments with a feeling akin to hostility.

Therefore, Mr. Loree changed the organization of the Rock Island from a fairly consistent divisional to a purely departmental one. The fourth vice president was placed at the head of the operating department, and to him six men reported: the chief engineer, the engineer of maintenance of way, the general manager, the purchasing agent, the engineer of tests, and the supervisor of the insurance fund. The mechanical department and the operating department converged at the general manager, but below the general manager they were entirely separated. The active head of the operating department, the general superintendent of transportation, who supervised car service as well as operation, was reported to by the car service superintendent, by inspectors of station service, who were staff officers corresponding to a certain extent to the superintendent of passenger transportation and his staff on the Pennsylvania, and by four general superintendents, each of whom was reported to in turn by the division superintendents. The division superintendents were responsible for operation only. They had no direct authority over the division engineers, or the roadmasters, or the

TABLE XIV

OPERATING ORGANIZATION OF THE ROCK ISLAND IN 1904



master carpenters, or the master mechanics, or the roundhouse foremen, except in emergencies.

The organization which Mr. Loree placed on the Rock Island was very much like that now in use on the New York Central. It had a short life, however, and it is impossible to draw general conclusions from the results obtained. The changes were radical, and before the responsible officers had become thoroughly trained in their parts and had attained general harmony in the working of the big transportation machine, Mr. Loree resigned from the presidency, and the new incumbent at once put the management back on a divisional basis. It is on many accounts unfortunate that the Rock Island organization could not have been given a trial by the chief officer especially interested in it, since the first important change which Mr. Loree made after assuming the presidency of the Baltimore & Ohio three years before, was to change the organization of that road from a clumsy departmental one to a very clear-cut divisional one, in which all the track forces and all the mechanical forces reported to the general superintendents on current operation, although, of course, they reported on standards to staff officers in their respective departments.

The departmental organization installed on the Rock Island by Mr. Loree in 1904 is shown in Table XIV.

The following excerpts from an address by Arthur Hale before the students of New York University, in 1902, cover very clearly some of the characteristic differences between these two types of organization:

"The question whether a division or a department

organization is the better for our great railroads is one of great importance and should be considered in perhaps a more judicial manner than I can assume. With the one-division railroad I dismissed the question by saying that every approach to the department system weakened the superintendent without strengthening the president. For the larger systems I will venture the assertion that every approach to the department system weakens the superintendents without strengthening the general manager.

" Strength and weakness are best shown in emergencies, and an actual emergency will best show how division and department organization work. On a certain occasion it became necessary to rebuild certain trestles near each other on parallel railroads organized differently. The superintendent of the railroad with a division organization got his carpenters together at once, bridge carpenters, shop carpenters and all, and ran them by special train to the scene of the accident, with all the heavy timber he could get together, and simply reported the facts to his general manager. The superintendent of the road with a department organization could do nothing but report the facts to his general manager. The superintendent had no control of the bridge carpenters or the shop carpenters in his vicinity. It was a Sunday, and to tell the truth, he did not know where they were to be found. The general manager was not in much better plight, but he managed to organize a force composed of his general superintendent, his superintendent of floating equipment, and his engineer of bridges, and he made very good time with his trestle. It

would have been better on a week day, but the organization went to pieces on Sunday.

" Or take a more usual case, the investigation of an accident. A car goes off the track; is the trouble with the car, the track, or the speed? We must know, for it must not occur again. With a division organization such a question goes to the superintendent. He represents the three departments; he knows the territory and will decide the case in short order. Indeed, the mere fact that he will so decide frequently prevents his department from urging doubtful claims. With a department organization there is no impartial authority on the ground, and many investigations are closed without decision. Of course they can be carried to the general manager, but he cannot decide all such questions, more especially as his chiefs of department are quite likely to stand up for their own men.

" From the side of economy and efficiency the division organization also has advantages. When a superintendent can be held responsible for everything on his division, he will see that he has enough men, and no more, to keep his engines and tracks in condition. Under the department system all the work will be authorized and done on orders from headquarters without so intimate a knowledge of local needs.

" Of course the division system has its difficulties. The rivalry is here between divisions instead of between departments. This means that a firm hand is needed at headquarters to keep the rivalry healthy. The objection most often urged, however, is that certain officers on the staff of the superintendent will have a divided responsibility.

The division engineer, for instance, must be responsible to his superintendent in certain matters, and to the chief engineer in others. The master mechanic also must serve two masters, the superintendent and the superintendent of motive power. And the subject is dismissed with the dictum, ' A divided responsibility will never do.'

" The gentlemen who take this ground forget that our whole railroad system is based on divided responsibility. The agent reports to four departments, so may the conductor, while the enginemen and the firemen and the car inspectors report to two. If a fireman can safely report to both the trainmaster and the road foreman, cannot two of his superiors be trusted to do the same thing?

" The only reason that it is safe for the firemen and enginemen to report to two superiors is that this responsibility is carefully defined in the book of rules, and that the men have been carefully disciplined in the matter. There is no greater difficulty in defining the dual responsibility of the division engineer and the master mechanic.

" It is obvious that these officers should report to the superintendent in the matters of policy, discipline, and expense. To the chief engineer and superintendent of motive power they should report in all technical matters. But perhaps the best way to phrase this, is to say that they should report to the superintendent in everything except in matters relating to standard design and method. It has always been recognized that standard designs come under the members of the general manager's staff. Where there has been difficulty, it can usually be traced to misunderstanding as to method of doing work, and the recognition

of standard methods should give the staff officers sufficient power as well as plenty to do, for these independent superintendents are sometimes hard to handle. . . . The department organization is the best school for specialists. It will make you splendid train masters and most accomplished engineers in the civil and mechanical branches. But under the division organization you will train all-round railroad men."

CHAPTER V

THE OFFICERS

A general statement of the kind of work done by each railroad officer—The president and his training—The wholesome tradition of recruiting officers from the ranks—The general manager, active head of the operating department; the general superintendent and his district—Special subdivisions on the Pennsylvania—The superintendent of car service—The division superintendent, exercising most of the general manager's powers in his own territory, and his assistant, the train master—The superintendent of motive power and the master mechanic—The chief engineer and his position in the organization—The division engineer, reporting to two masters—The financial departments; the comptroller, treasurer, and auditor—Control of the station agents, with the aid of the traveling auditors—The traffic officers and their work—The freight traffic manager and the general freight agent—The passenger department and its work.

THE space required to describe in detail the work of all the officers employed by a railroad would be immense, and it is doubtful if such a volume would be worth writing. It is a comparatively easy matter, however, to outline the broad objects toward which each characteristic officer is supposed to work, and the purpose of this chapter is to make such an outline, in highly condensed form. The principal references on this subject are: "The Science of Railways," by M. M. Kirkman, vol. ii; "The Economics

of Railway Operation," by M. L. Byers; "Railway Organization and Working," by E. R. Dewsnup, and the manuals issued by almost all railroad companies for the guidance of their own officers and employees. Most of the comments which follow are derived from personal observation, however.

PRESIDENT

The president of a railroad, as has been pointed out, is the officer on whom the wishes and instructions of the shareholders, acting through the directors, concentrate. He in turn must diffuse these ideas and instructions throughout the working organization, acting through the vice presidents and department heads. He has reporting to him both staff and line officers, as has also been mentioned. The staff officers act in an advisory capacity; the line officers captain actual working organizations. It is extremely improbable that the president will know more about the workings of all departments than the man or men actually in charge of those departments; his position is not primarily that of a specialist. Specialists can always be employed; the difficulty is to see to it that they conduct their specialty in a manner which produces the best results from the standpoint of the whole property. Kirkman says: "In the early history of railroads the president of a company rarely participated in its physical management. Such matters were left to the superintendent. The president was usually a man of wealth, chosen with a view to the favorable effect his name would have upon investors rather than because of his knowledge of railroad details.

His responsibility, therefore, was merely nominal; the operating officer was expected to consult with him and listen to his views, when he had any to express. He performed the dignified office of chairman of the board of directors, and was also a member *ex-officio* of its various committees. He signed its bonds, and, in some cases, its certificates of stock. He was in many cases merely a figurehead. . . . He had advisory power and direction over all the affairs of the company, but he exercised these duties only in a general way. The treasurer looked after its interests in one direction, while the superintendent had entire charge of local matters."

Mr. Kirkman then goes on to point out that in process of time the power attached to the office of the president naturally attracted the general superintendent and, in due course, as general superintendents became more and more indispensable owing to the growth of the property, it was natural that they should occasionally be chosen to fill the highest office, thus carrying with them specific knowledge of operation to add to their diplomatic functions.

By far the largest number of railroad presidents in the United States to-day are practical men, trained in the operating or traffic departments, although they have to lay aside their attention to the details of the work which formerly engrossed them, if they are to succeed in the highest degree in their new and broader work. Yet in Great Britain the chief officer of the railroad is still the diplomat. The British railroad has no president, but it has a chairman, who is often titled, and only in rare cases does the chairman direct railroad operation at first hand.

Taking for purposes of analysis a group of characteristic large American railroads, the Atchison, Topeka & Santa Fé, the Baltimore & Ohio, the Chicago & North Western, the Erie, the Missouri Pacific, the New York Central, the Northern Pacific, the Pennsylvania, the Southern Pacific, and the Southern, it is interesting to examine into the training of their chief executives. Of these ten railroads, the presidents of four have been trained continuously as operating men; the presidents of two were traffic men; one president divided his early training between civil engineering and operation; one between civil engineering, finance, and traffic; one was trained as a lawyer, while another started his railway experience as president of a small road when he was thirty years old and has been a president ever since. The greatest railroad president whom America has yet produced was E. H. Harriman, whose training was that of a stockbroker, but who had the important faculty of being able to see all his properties, not only in their entirety but as parts of a general scheme of transportation, affecting the whole country. Mr. Harriman, moreover, exercised first-rate skill in choosing his lieutenants, and he had the power, as a financier, to gather to his need enormous sums of capital, although his use of this capital was often speculative.

But while it is certain that men of strong natural aptitude may make great railroad presidents without undergoing a long training in railroad work, it is equally certain that they are not likely to, and, in this country, they are extremely unlikely to be given the opportunity. The tradition that the high officers of railroads and great industrial

companies in the United States are in the main recruited from the ranks, is wholesome. The best attribute of a democracy is not that it should be a place where all men are equal, but that it should give men a chance to make themselves unequal.

The by-laws and organization of the Pennsylvania Railroad define the duties of the chief executive in thirty-nine words: "The president shall have general supervision and direction of all departments of the company's service and be assisted in the performance of his executive duties by the vice presidents. He shall have charge of the seal of the company."

Excellent comment on the president's work is to be found in the extract quoted herewith from the private documents of Charles E. Perkins, for many years president of the Chicago, Burlington & Quincy Railroad:

"For the president of any company operating a large railroad system, as well as for those who are directly assisting him in the general administration and oversight of its affairs, the following rules will be found useful:

1. Never do, or undertake to do, yourself what can be done sufficiently well by a subordinate. There are things enough which cannot be done sufficiently well by subordinates, to occupy your time and mind.

2. Trust those under you, and let each one work out his problems, for the most part, himself; otherwise your subordinates will not learn to depend upon themselves, but upon you.

3. Keep as much as possible out of petty every-day details. Let stated reports be made to your adjutants, if you

choose, but do not take it upon yourself to see them all. So long as the machine works smoothly, you should be a looker-on, except as to those particular parts of it which, because others cannot do them well enough, you yourself may undertake to attend to. It is a mistake to assume that others are less able, or less attentive, than we are.

4. Never allow the *gossip of the camp* to reach you. It is inevitable, and the less you hear of it the better fitted you are to conduct the matters of importance.

5. Require the minutest accuracy in money matters; to which end the auditor of accounts should call attention to every departure, no matter how small, or seemingly unimportant, from well-established regulations and usages.

6. Always regard the feelings and the prerogatives of those above and below you. Do to others as you would wish to be done by, under similar circumstances."

General Manager

The duties of the general manager differ in scope on different roads. On all roads he is in direct charge of operation and receives reports from the general superintendents, who, in turn, act through the division superintendents. Thus he controls all train movement, and is the responsible authority in cases of delays, or of wrecks, or of great storms, or of special demands on the company's facilities. He is also the arbiter of the more important difficulties with labor, and this is a task of the highest delicacy, which at certain crises occupies far more of the general manager's thoughts, and occasions him more worry than all his other responsibilities together.

In addition to these duties, the general manager may or may not be in charge of the civil engineering and mechanical engineering work of the road. On the Chicago & North Western he is reported to by the superintendent of motive power, and hence by the entire mechanical force, and by the chief engineer on maintenance, but not by the chief engineer of new construction. On the Pennsylvania Railroad he is reported to by the general superintendent of motive power, who, under the general manager's direction, has direct supervision and the control of the equipment in service, but not of the company's equipment standards. Responsibility for the design of equipment is vested directly in the chief of motive power, who reports to the fifth vice president, and is asked by the general manager to meet certain requirements for locomotives and for rolling and floating equipment, much as an architect is asked to design a house. In other words, the Pennsylvania has both a staff officer and line officer to deal with the enormously important question of equipment. The line officer reports to the general manager; the staff officer, responsible for standards, does not.

According to the Pennsylvania manual, the general manager is "responsible for the safe and economical managements of the roads," and is required to report to the president and the board of directors upon their condition, and to make such suggestions in relation to the operations of his department as may seem to him necessary to promote the interests of the company. He is given authority, with the approval of the fifth vice president, to order, through the purchasing agent, machinery, tools, and materials; he approves bills for all expenses in the transportation department other than those for supplies; he keeps the fifth vice president, the president, and the board advised of all occurrences and transactions of importance connected with his department; he prepares the necessary rules for the government of his department, subject to the approval of the fifth vice president, the president, and the board, and he is responsible for the discipline among the employees of his department and appoints all the subordinate officers in the department, subject to the approval of the fifth vice president.

On the New York Central, the general manager is also a vice president and he has charge of the operations of the transportation, engineering, maintenance of way and equipment departments, with all the large powers which naturally accompany these functions. His powers are therefore broader than those of the general manager of the Pennsylvania, since the conduct of mechanical and civil engineering matters, as well as operating matters, are placed entirely in his hands, both in respect to new standards and new construction and in regard to maintenance of existing standards. This is almost always the case on smaller roads; on roads of first magnitude, however, the determination of standards and the carrying out of them are often placed in the hands of different men. The organization of the Harriman lines in this respect has already received comment. On those lines each of the seven general managers (we refer now only to the lines directly operated by the Union and Southern Pacific railroads) has a chief engineer and a superintendent of motive power on his staff

as line officers, but the determination of standards is vested in the director of maintenance and operation.

General Superintendent

Generally speaking, the first actual subdivision of the operation of a railroad into units small enough to be actually watched closely by one man, comes with the general superintendent. The Chicago, Burlington & Quincy Railroad, operating approximately 9,000 miles, is divided into two broad districts, the lines east of the Missouri River and the lines west of the Missouri River. Each of these districts has a general manager; the lines east of the Missouri River have three general superintendents, and the lines west of the river have two general superintendents and an assistant superintendent of transportation. These officers handle the actual operation of the road through twenty-two division superintendents—an average of a division superintendent for every 409 miles of line, and a general superintendent (including the assistant superintendent of transportation in this category) for every 1,500 miles of line; while each general superintendent has three or four division superintendents reporting to him.

The work of the general superintendent is very laborious, since he gets all the hardest problems of each of his division superintendents, and has what may be called the primary and direct responsibility of a larger district than anybody else concerned in operating the railroad. He must of necessity spend a great deal of his time on the road and must keep in constant touch, not only with his division superintendents, but with their own subordinates—the

road masters, master mechanics, train masters, and dispatchers—in order to have his own idea about the way in which the business of the company is being transacted. Not the least important part of his work is the skill which he must exercise in making promotions.

It may fairly be said that the routine duties of the general superintendent on a road with two or more general divisions are almost precisely the same as those of the general manager on a road with only one general division, except in the conduct of matters where general policy is not well settled and where there might be an important difference of opinion between the general superintendent and his chief, as, for example, in negotiations with labor leaders in times of pronounced industrial disquiet. His title is not always uniform; on the Louisville & Nashville he is called the superintendent of transportation, and the company's manual of organization prescribes that he shall represent the general manager in the transportation department and that he shall also have charge of the distribution of car equipment.

On the Pennsylvania lines east of Pittsburg there is the general superintendent of transportation; a superintendent of freight transportation; a superintendent of passenger transportation, and five general superintendents. The company's manual assigns to the general superintendent of transportation, under the direction of the general manager, supervision of the movement of all traffic, passenger and freight, and of the distribution of the car equipment. He is also required to furnish to the proper authority statements showing the amounts due to or by

other companies and individuals on account of car service. This sounds like a rather large order; in practice he is really the assistant general manager on transportation matters, with specific authority over car service.

The superintendent of freight transportation on the Pennsylvania reports to the general superintendent of transportation. In addition to his operating duties, he is in effect the representative of the traffic department on the operating staff; that is to say, he is responsible for seeing that freight cars are moved promptly so that they may be made to perform the greatest possible service—an operating function—and also has general supervision of freight car handling at all stations and on the line. In short, he oversees the operation of freight equipment from the standpoint both of the operating and of the traffic departments. The superintendent of passenger transportation performs somewhat the same service with regard to passenger cars, but as there is no exchange of passenger cars between roads comparable to the exchange of freight cars, his duties as a car service agent are less important than his general supervision of the way passenger trains are handled on the road. The five general superintendents on the Pennsylvania are the direct operating men, and each one has on his staff, in addition to the division superintendents and the division engineers, a principal assistant engineer and a superintendent of motive power, so that the control of the general superintendent over the ordinary up-keep of the property is very great.

Superintendent of Car Service

The man actually in charge of freight car movement and location may be called superintendent of car service, or car accountant, or superintendent of transportation. In some cases a superintendent of transportation has a car accountant to aid him, in some cases not, so that the title in itself is not wholly descriptive. The work to be performed, however, is exceedingly clear. It consists in keeping track of all the freight cars on the line at all times. Every freight car that comes on the company's tracks or goes off them to somebody else's tracks must be recorded by number and by the owner's initials, in order that the balances for the hire of foreign equipment may be promptly adjusted, and that the exact location and distribution of cars may be known to the general manager. We have already seen in the discussion of the organization of the Harriman lines how one of the assistant directors of maintenance and operation makes car service his special function, and equalizes the changing needs of different parts of the system by supervising large car movements from regions where cars are just now abundant to regions where they are temporarily scarce. The actual process of collecting the information about the freight cars is a work of great detail, involving the employment of many men, but the principles involved are quite simple.

Division Superintendent

The manual of the Louisville & Nashville defines the duties of this very important officer by saying briefly that

superintendents on their respective divisions shall exercise all powers of the general manager which may be necessary for the proper management of their divisions. They shall be responsible to the general manager for the maintenance of the roadway and building, and for the proper movement of cars and trains and the economical administration of the business of their divisions. They shall, with the approval of the general manager, appoint suitable persons for the various subordinate officers in the operating department. We have seen, from the previous discussion of organization in general, that the amount of railroad which one man can personally supervise with efficiency is generally judged to be from 250 to 500 miles; rarely as much as 500 and usually between 300 and 400. No matter how great the railroad system and no matter what the plan of organization, there must be somebody actually in charge of each operating unit, with full authority over every-day questions. He need not have authority over extraordinary matters, but must be able to keep trains moving without asking instructions for that purpose from anybody.

Division superintendents are expected to know everything, and they are not supposed to need any sleep; they must be ready at any hour of day or night to go to any part of their district where there is trouble, and to go there quickly, and they will almost invariably have to take the first executive action in the case of fire, or flood, or strike, or train wreck, although they will keep headquarters fully advised, by wire, of what they are doing. Their authority over the civil and engineering forces on work which is in progress differs greatly in different organizations. In fact,

the easiest way to tell whether a given organization is divisional or departmental is to see what subordinate officers report regularly to the division superintendent. In a crisis, however, questions of his authority seldom arise in any organization; he is supposed to be the strong, resourceful man on the ground, no matter what happens.

On the Harriman lines each division superintendent is reported to by an assistant superintendent, a division engineer (called on some of the properties a district engineer), a train master, and a master mechanic. This places in his hands all the general foremen on the division; the shop forces, the track forces, the train crews, the dispatchers, and the telegraphers, although some of these persons report jointly to other officers; thus the telegraphers report also to the superintendent of telegraph; the locomotive engineers to the master mechanic; the division engineers to the chief engineer or the assistant chief engineer, etc. But they all report to the division superintendent when it comes to doing something in a hurry, or when a question arises as to the direct conduct of the work which the division superintendent is at the time inspecting.

In the case of a pure departmental organization the division superintendents are in charge of train movement; beyond this, they are primarily inspecting officers rather than executive officers, and are supposed to refer questions to the department most concerned with them for execution. The New York Central is the only large American railroad which attempts to carry out this plan; on this road the work of the division superintendents come close to that of staff officers of the general superintendent, in charge pri-

marily of the operation of trains and block signals. The other executive duties ordinarily placed in the superintendent's hands are passed on to two assistant general managers and to the vice president and general manager of the entire Vanderbilt system directly operated. This organization has not been a conspicuous success, in spite of the high ability of the ultimate authorities. It is discussed more fully in another chapter.

Train Master

The train master is an outside man. He has no office duties of consequence, but is expected to keep on the road almost constantly, observing locomotive performance under service conditions, studying the work of the trainmen and forming opinions about their fitness, and acting generally as eyes and ears to the division superintendent. The work of the mechanical department and of the operating department are closely allied, and the train master is the expert observer for both, although reporting to the division superintendent.

Superintendent of Motive Power

The superintendent of motive power has supervision and direct control of the company's rolling stock. He is consulted in determining the mechanical standards and in deciding what types of engines and cars are best adapted to local needs, and then he watches their performance constantly, and sees to it that proper shop equipment is provided to care for current and extraordinary repairs. His work is closely allied to that of the general manager,

since both are striving to handle the tonnage of the road at a minimum of mechanical expense. Usually, on a large road, one vice president is responsible for both the operating and the mechanical departments, as on the Pennsylvania. The mechanical organization of this company is very complete. There is a chief of motive power, responsible for the company's standards, who is a staff officer reporting to the fifth vice president. There is also a general superintendent of motive power, reporting to the general manager, while each general superintendent is reported to by a local superintendent of motive power. Thus there is a staff chief, a line chief, and a group of strong subordinate mechanical officers, the latter being instructed *how* to do things by the two chiefs, and *when* to do things, by the general superintendents.

Master Mechanic

Normally, each large railroad shop is in direct charge of a master mechanic. He is the officer directly in charge of all local repair work, reporting to the superintendent of motive power on standards, and to the superintendent, general superintendent, or general manager, on the daily mechanical requirements of the operating department. He is assisted by a shop foreman, who conveys his instructions to the force of mechanics, carpenters, helpers, etc., and see that they are carried out. He is also assisted by a road foreman of engines, in most cases, whose duties overlap those of the train master, on the mechanical side of operation.

Chief Engineer

The position of the chief engineer in the organization varies a good deal on different roads. On a railroad having important new construction in hand, it not infrequently happens that the chief engineer is made a vice president, as on the New York Central at the time the New York improvement works in connection with electrification were blocked out. On the Pennsylvania, now carrying on its extraordinary work in connection with the Hudson River tunnels and the new terminal at New York, the work on that project has been placed under the direct supervision of the second vice president, Mr. Rea, who performs, on a large scale, the work of a chief engineer in connection with it.

On roads having no very important extension work or other new construction in hand, however, the chief engineer is apt to be a staff officer. On the Union Pacific the chief engineer reports to the vice president and general manager and has several assistant engineers on his own staff, as well as a signal engineer and a superintendent of wood preservation work. The chief engineer also instructs the division engineers regarding standards, but the division engineers report primarily to the division superintendents. On the Norfolk & Western the organization is similar; on the Louisville & Nashville it is prescribed that the chief engineer shall act as assistant to the general manager in all matters connected with the maintenance of way, bridges, and buildings, and shall have the direction of any construction work that may be placed in his charge; he shall

prepare plans and estimates for the construction or repair of all bridges, and other structures necessary to be constructed or repaired, and it shall be his duty to make periodical examinations of all bridges and track and report upon their condition to the general manager. It frequently happens that the new construction work and the maintenance work is separated; thus the Missouri Pacific has a consulting engineer, an engineer of construction, and a chief engineer of maintenance of way. Not infrequently a road also has a bridge engineer, who generally, though not always, reports to the chief engineer.

Marshall M. Kirkman says: "In the dawn of railroad enterprise the engineer was independent of, and in some cases superior to, the chief operating officer. He was not, however, able to maintain his independence or supremacy. Wherever he attempted to do so it had the effect to excite the active hostility of the operating manager, who saw in the ability and accomplishments of his gifted brother officer a dangerous rival."

It is true for a great many reasons that the civil engineer, of necessity the father of the railroad, ought to know more about it than anybody else. Civil engineering has reached great scientific attainment; of all the applied sciences it is perhaps second only to astronomy in the volume and the accuracy of the mathematical calculations which it requires. The construction of a great bridge is dependent on the nicest understanding of the strains and stresses affecting each minute part and of the respective ability of various materials to withstand these strains and stresses; the location of a railroad in the Andes or

the Rocky mountains so as to secure what is demonstrably the easiest grade which can be built for the sum available for that purpose, is a scientific task of the first magnitude.

The old definition that a civil engineer is a man who does for one dollar what any fool can do for ten, applies pretty well to some parts of his work; but it does not apply to achievements like the great bridges, tunnels, and mountain railroad locations of the world, which are tasks that could not possibly be accomplished without years spent in the acquisition of the collected engineering knowledge of the last half century. But the type of mind that makes a great civil engineer is apt to be different from that which makes a great executive officer, and, in the course of human progress, the manager of materials has had to give way to the manager of men. A surprisingly large number of railroad chief executives, however, have had training at one time or another in their careers in applied if not in theoretical civil engineering, and the knowledge thus acquired has doubtless been of important help to them in their executive work. The possibilities and limitations of a stretch of railroad track are no less definite and real than those of a suspension bridge, and the railroad manager must be exceedingly conversant with them.

Division Engineer

The division engineer, under a characteristic plan of organization, reports to the division superintendent on current work, although the superintendent obtains standards from the chief engineer. Part of the division engineer's

early training might well include the ability to go for long periods without sleep, because he will certainly require this in his work. Every time there is a wreck or a washout or a fire on the company's property, or a heavy fall of snow or a long-continued rain storm, with its tendency to find soft spots in new track and to make cuts or fills dangerous —every time there is an ice jam in the river or a slide on the mountainside, the division engineer is the man expected to remedy the difficulty in the briefest space of time and with the minimum interruption to regular traffic. Moreover, this is all in addition to his regular work of keeping the property in standard condition, seeing to it that the road master's gang replaces ties properly, detects and removes broken rail and keeps track surface and alignment free from irregularities. Bad track is responsible for many wrecks and delays; the responsibility for good track lies directly with the division engineer and his track is in the plain sight—and feeling—of every officer passing over the road. He works closely with the division superintendent to whom he reports, and scarcely any kind of railroad trouble can occur without the necessity of a hurry call for these two men.

Comptroller

The distinction between the static and the dynamic in railroad operation is nowhere clearer than in the financial department. Neither of the primary financial officers, the treasurer, and auditor, has any necessary connection with the dynamic part, the planning or execution of new financing; this responsibility rests with the president, the

executive committee, and the board of directors, subject to the approval of the stockholders. The comptroller unifies the work of the accounting and treasury departments. He devises ways of safeguarding the receipt of current funds from station agents, and supervises the work of the auditors, who receive all tickets and waybill copies. On the Union Pacific and Southern Pacific, the comptroller of both roads is also a vice president of both roads; on the Pennsylvania, the comptroller reports to the second vice president, and the treasurer to the fourth vice president, a separation which is quite unusual. Sometimes the title of auditor is substituted for that of comptroller; in ordinary practice the comptroller is the treasurer's superior officer, but this is not always so. On some roads the unifying takes place in the office of a vice president, and the title of comptroller is not used in the sense here given.

Treasurer

It is possible to be graphic, and substantially accurate, in the statement that the auditor collects the funds which the treasurer disburses. Theoretically, the treasurer collects them with his own force of agents, but in railroad practice the machinery of collection is vested in the auditor's office.

When the funds have been raised, however, the treasurer is the custodian of them, and, in actual practice, he is apt to be a highly important adviser to the president and the board on the manner of the raising. He must be familiar with banking procedure and forms; he must watch the periods when existing bonds and notes fall due, and

have a plan for their renewal. He is responsible for all treasury securities, and must see that all issues of stocks, bonds, notes, etc., are in the proper form. He is also the paymaster for the company, in all departments.

Auditor

Mr. Kirkman says: "The accounting officer should have such undisputed control over the accounts as to be able to mold them to his will; to make them thoroughly homogeneous and effective in application; a means at once of enlightenment and protection. . . . He should, in fact, not only audit the accounts of receiving and disbursing agents, but should also audit the accounts of the management." The detail by which this is accomplished is laborious; the characteristic of it is that receipts arising from a multitude of small sources must be collected and recorded very rapidly, and without error arising either from carelessness or from fraud. Besides the numerous office force engaged in this work, and aided by many mechanical devices of recent invention, traveling auditors keep constantly on the road, dropping in on the station agent when he least expects them, and going through his accounts much as the bank inspector examines the officers of a bank. As soon as the traveling auditor enters the office, he is in supreme charge of the local finances; he counts the cash, lists receipts and disbursements, and notes how passenger returns tally with the number and kind of tickets sold. In five or six hours, or less, he constructs an exact trial balance sheet from the agent's records, and calls for very particular explanations of any discrepancies that may occur. In view

of the fact that station agents are, as a class, underpaid and overworked, discrepancies are not infrequent, arising simply from carelessness. The agent is subject to constant interruptions; his habit of mind is very different from that of the bookkeeper.

The traveling auditor realizes this, and is primarily interested in sizing up his man, and in separating carelessness from theft. This is a rather disagreeable process for all concerned; the station agent hopes his accounts are going to balance, but he is afraid of them; if they do not balance, he knows perfectly well that the traveling auditor is considering his personal honesty among all the other possible circumstances of the case. Usually discrepancies are easily adjusted, however. There are only about so many ways in the world of making mistakes in bookkeeping, and the traveling auditor could recite them all, forwards or backwards. In the rare cases where there is dishonesty, the agent's books are pretty sure to balance nicely; the trouble must be sought deeper, among the detail items of which the balance is composed.

The rules of most railroads now require the station agent to transmit his cash to headquarters daily, if it exceeds a certain stipulated sum. Less frequent transmissions have the dangerous effect of placing free cash in the hands of the agent for a period of several days, and there have been cases where this was the cause of speculation with company funds. Moreover, every day that the head office is deprived of the collections the cash is idle, doing no work, and drawing no interest. Rapidity and accuracy in collection and transmission—these two things summarize

pretty well the fiscal duties of the station agent and of the entire auditing department above him.[1]

Traffic Department

There is no such division of responsibility in the traffic department as there is in the operating department. All the traffic officers and agents are doing one kind of work, and this work of getting new business does not lend itself to scientific organization or carefully worked out apportionment of responsibility, except in the simplest ways. The officer finally in charge of traffic on a large road is generally a vice president; on a small road, he is generally the president.

The vice president in charge of traffic is apt to have a freight traffic manager and a passenger traffic manager reporting to him. It is often hard to differentiate the work of a freight traffic manager from that of his principal subordinate and ally, the general freight agent, except that where the territory is large there are apt to be several general freight agents, all receiving their general line of policy from the freight traffic manager. The Southern Railway, for example, has a vice president in charge of traffic, and a freight traffic manager and a passenger traffic manager located in the same general office building with the vice president. The company also has a general agent located at Denver, Colo.; a general passenger agent located at Wash-

[1] Under the close supervision which the government now exercises over accounting, the auditor comes close to being a government officer paid by the railroad, so far as his public records are concerned.

ington; four assistant general passenger agents; two assistant freight traffic managers; eight general freight agents; three assistant general freight agents; a land and industrial agent; and an assistant land and industrial agent.

The Pennsylvania has a vice president in charge of traffic, a passenger traffic manager, a freight traffic manager, two general passenger agents, and two general freight agents.

Freight Traffic Manager

The duties of the freight traffic manager on the Pennsylvania are defined in the company's manual as follows: "He is under the direction of the third vice president, having charge of the freight department. He shall be charged with the duty of making rates on freight traffic other than coal and coke over the lines operated by the company, and shall make the necessary arrangements in relation thereto with individuals and other railroad or transportation companies. All such rates shall be made under the authority of the third vice president or that of the freight traffic manager, and notice of the same as soon as fixed shall be sent to the comptroller.

"The freight traffic manager shall instruct the station agents and foreign agents in commercial matters pertaining to the receiving and forwarding of freight traffic other than coal and coke. He shall be aided by a general freight agent in charge of through traffic, a general freight agent in charge of local traffic, and a freight claim agent."[1]

[1] Freight claim agents report to various officers. The claim department used to have its own effective form of rebate for use in soliciting traffic; now that this pernicious practice has been abolished, there is a tendency on some roads to attach the claim agent to the auditing department. Sometimes he reports direct to the operating department in present practice.

On the Louisville & Nashville the responsibility of the traffic manager extends over freight and passenger business alike, under the supervision of the third vice president. "He shall, subject to the approval of the third vice president, make all rates, arrangements, and contracts for such traffic over the lines operated by the company, and shall conduct the necessary negotiations with individuals, corporations, and connecting or competing companies in relation thereto. He shall, subject to the approval of the third vice president, appoint a general freight agent and a general passenger agent to assist him."

General Freight Agent

The instructions covering the duties of the general freight agent in company manuals are apt to be brief, and do not tell much because there is not much to tell. They say usually that this officer is in charge of procuring freight traffic, and that he shall instruct freight agents, station agents, etc., in matters pertaining not only to soliciting their business but to the details of handling it. He is primarily a salesman, and like all other salesmen, no matter what they deal in, he must adjust his means to the needs and requirements of his customers. His customers, broadly, are the whole body of freight shippers, actual and prospective, on the line.

The freight traffic manager and the general freight

agent alike are expected to know all about the normal output of every industry which ships or could ship over the company's lines, and they are expected to have a full knowledge of the local needs of every community. Their work broadly divides itself into two parts: one dealing with traffic which is already in existence; the other with traffic which they hope to create. The traffic already in existence is also divisible into two clearly differentiated parts, the distinction being made between local business, which can move over no other road, and competitive business, which has a choice of routes. But even local business, so called, is often highly competitive with the local business of some other parts of the country, where the same commodities are manufactured for shipment to the same market or to different markets. Therefore it does not do to give anybody a bad service on the theory that he cannot get away; this experiment has been tried from time to time in the railroad history of the country, and has never worked well.

The general freight agent keeps closely in touch with the local agents at each important point on the line, with the traveling agents, with the agents located in points off the line—as, for example, the Denver agent of the Southern Railway, already mentioned—and with the station agents. The station agents ordinarily do not have time to solicit business. They are joint employees of the traffic and the operating department, and they are enormously busy men, being responsible not only for selling tickets and waybills, for handling trunks and helping load and unload freight, but for receiving and transmitting train orders over the

telegraph and for keeping up a large number of statistical forms required by different departments. They are the employees with whom the general public comes by far most frequently in contact and, being somewhat underpaid and overworked, they do not always treat the public with that degree of courtesy to which as a customer it is entitled. Much of the unpopularity of railroads has arisen from this cause, which is a hard one to remedy. The company cannot afford to pay vice presidents' salaries to a thousand local station agents, and yet the highly trained, broad-minded general officers rarely see the patrons who are disposed to make trouble, while the $60 a month station agents see them every day—if, indeed, the station agent is lucky enough to be paid as much as $60. This public relations aspect of the station agent's work is dealt with more fully in another chapter.

One of the duties of the general freight agent, the traffic manager and the division superintendent alike, is to train the station agent in courtesy. The general freight agent also watches closely the work of the local freight agents, who are apt to be of a different type from the station agent. They have no routine duties except to keep in touch with all the local shippers and to keep them happy.

The amount of traffic which a local agent can bring to his company by sheer virtue of his personality is extraordinary. At a certain station in the South, served by three roads, the local freight agent of one of these roads got two thirds of all the cotton shipped during the past season, although his route was the longest of the three to the

market for the cotton, and the rates were uniform. Thus it is very important for the general freight agent to know whether his representative is the popular or the unpopular man with the local shippers; popularity in a case like this is an asset which it is worth paying a good deal of money, comparatively speaking, to secure. The old method of controlling business by buying drinks for shippers happily is dying out, but the local agent has a good many strings still left to his bow. For example, he can keep the shipper accurately advised of the location of inbound freight which the shipper is expecting, and he can use his personal services to expedite shipments which are liable to be followed by more business. He can find out what small or large defects in service have annoyed the shipper in previous cases, and he can take means to correct them. He can give the shipper helpful bits of information about what the shipper's own rivals are doing, and, in short, can be a real friend to him, and build up a personal relationship which will serve to bring and hold business for long periods against all comers.

Passenger Traffic Manager

These conditions do not hold true in the passenger department. The local passenger agent can build up a good deal of special traffic in excursions, etc., by studying the needs of the community and by judicious advertising, but he cannot often make people travel by an inferior route when a superior one is at their service, unless he has inducements to offer which are beyond those which can be included in personal services. Where conditions are equal

or almost equal, however, the general passenger agent can influence an enormous amount of business, not so much by personal solicitation as by giving the best train service which the company can possibly afford, and by having constantly in mind all the details of that service. He must study out popular dining-car runs, details in the sleeping-car service which can be improved, etc. In brief, his work deals with the train service rather than with the customers, while the freight agent deals with the customer rather than with the train service.

The details of the statistical organization which the traffic department requires are discussed in another chapter. This organization, however, is rather meager, and may best be summed up by saying that it consists simply of the information which will help the various agents to sell transportation. Often the work of inducing new traffic and locating new industries on the line is placed in the hands of an industrial commissioner, who studies out every detail of the natural advantages possessed by his territory and brings them to the attention of manufacturers and farmers located elsewhere.

The Harriman lines have made especial progress with this work through the issuance of what they call their community pamphlets. The traffic department here coöperates with the local boards of trade in towns along the line; as, for example, in Grant's Pass, Oregon. Grant's Pass, like all the new Western communities, is extremely anxious to increase its population and resources, and the railroad is equally anxious to have it do so. Consequently, an arrangement is made by which the railroad places skilled

pamphlet makers at the disposal of the Grant's Pass board of trade, and, under the board of trade's direction, works up one or more very handsome booklets showing the resources and advantages of Grant's Pass, and starring that town on a general railroad map of the United States which is attached. Handsome photogravures are shown, in colors, of the kind of apples or other fruits grown in that fertile region, and the natural gifts of the climate are ably portrayed.

The actual expense of preparing these pamphlets is borne by the communities, but the railroad does the work at cost and takes charge of the distribution. The pamphlets go all over the United States, and the small farmer in the East or in the central West is strongly moved to emigrate to a region where he can grow better crops during a longer season than he can at home.

This is only a single instance of the work of the industrial department, but it illustrates well the whole underlying idea of the traffic department, that the railroad and the community must work closely together for mutual benefit.

The survey given in the preceding pages of the work of the officers of a railroad is necessarily not an exhaustive one. We have said nothing of the general counsel, who works closely with the claim agent in settling and defending suits for real or unreal damages; who is constantly in touch with the problems of the land department and who is deeply concerned with the precise form of contract which a railroad makes with its bond or note holders. Nor have we included the purchasing agent, who buys all

the supplies of the road, usually up to a specified maximum cost limit, above which the requisition must be passed by the higher officers; nor have we covered the work of the secretary, who is *ex-officio* custodian of the company's records, is supposed to have an extraordinary memory, and endeavors to save the directors' time at meetings by having their material arranged for them in systematic and orderly fashion. Moreover, our survey has not gone into the work of very many of the men in the lowest ranks of the service —of the train crews, nor the office clerks, nor the carpenters and machinists, nor the track gang. Nor have we covered the part which the telegraph and the block signal bear in railroad operation.

The object of this chapter has been rather to show the organization by which work is accomplished than to go into the details of the work; the details which we have actually covered have been those which have to be understood before the nature and effect of the organization can be understood. A railroad organization, as an organization, is worth study for two reasons. First, because it binds together and controls an enormous enterprise which is owned by thousands of persons and which employs many more thousands; second, because the work of this enterprise extends over a tremendous geographical area, and a good part of the actual work is performed by units which move more or less constantly over this territory instead of remaining in one place, the way a factory or a plantation does. It is believed that the description here given of the work of the principal officers in the three broad departments—those concerned with getting the business, with moving it, and

with keeping the accounts—will serve to illustrate the nature of a railroad organization in its effect on the individual officer, and that instances need not be multiplied for this purpose.

CHAPTER VI

BRITISH RAILROAD ORGANIZATION

Fundamental differences in the theory of railroad organization in Great Britain and the United States—British roads less subject to manipulation; the directorate an administrative one and the organization departmental—The wide powers of the British secretary—The mixing of the operating and traffic organizations under the superintendent of the line—The inspectors and the station master—Characteristic British organizations: the Lancashire & Yorkshire, the London & North Western, the London & South Western; progressive changes on the North Eastern and the Midland—The British Railway Association—The Clearing House—The work done with integrity, but handicapped by the capital burden.

THERE are several fundamental differences between the organization of an American railroad and of a British one, and one of these differences extends to the conditions under which the organization is built up. The proprietorship of the British road is spread among a great many more persons than is the proprietorship of an American road, although the mileage is usually far less. Most of the largest English railroads, such as the London & North Western, the Great Western, etc., have from 50,000 to 80,000 shareholders. The Pennsylvania Railroad has 55,000, but this is exceptional; the control, actual or potential, of most

American systems is vested in a relatively small financial party, and the directorate is usually so arranged that this party, through its representatives, can have a dominant voice in the policy of the company. In England, railroad shares have been, for two generations, a preferred security with the large class having idle funds to invest, and consequently the directors are selected to represent localities, rather than interests. This is wholesome, and the fact that the directorate is an honor conferred upon substantial citizens who have achieved distinction in lines of industry entirely remote from the railroad, is of potent effect in preventing the manipulation, in selfish interest, which is the weakest spot in American railroad administration.

Moreover, the British directorate does not merely direct; it administers. It is an active body, corresponding in this particular to the executive committee of an American board, but, unlike the American executive committee, it feels itself answerable directly to the shareholders. The Southern Pacific Railroad Company has its annual meeting at Beechmont, Kentucky, where representatives of the controlling interests meet solemnly, with a trunk full of proxies, and transact their business rapidly and undisturbed. But at the semiannual meetings of the great British companies, in London, the minority shareholders throng the hall, and " heckle " the chairman as if he were a candidate standing for his borough for the House of Commons. Thus the ultimate management of the American road is aristocratic in its character, while that of the British road is democratic.

The British directorate is an administrative body, but

its members are nontechnical. Therefore, in early days, the directors appointed three technical men to help them; an engineer (civil), responsible for way and works, a mechanical engineer, responsible for motive power and rolling stock, and a general manager, responsible for operation and also for what we call the traffic department.

This was the original theory of the British railroad administrators, but, from an organization standpoint, it was defective. The railroad was not intended as a monument of the civil engineer's skill, upon which the general manager, by grace of the mechanical engineer, was permitted to run trains, yet the original total separation into departments brought about a condition suggesting this. The mechanical engineer had definite ideas about the kind of rolling stock the company should build, and the way that rolling stock should be used; if these ideas did not always balance with traffic needs, as viewed by the general manager, so much the worse for traffic needs! The two officers were coördinate, and nobody short of the directorate, unskilled in railroad operation, could harmonize their work in the interest of the whole company. The same thing was true of the civil engineer, though the result in his case was less damaging. If the general manager wanted a certain number of engines at a certain time, he must ask the mechanical engineer for them very politely; if the mechanical engineer did not see his way clear to send them, the traffic would be diverted long before the general manager could appeal the matter to his directors.

This kind of organization was costly, yet it persisted for a good many years, because all concerned realized that

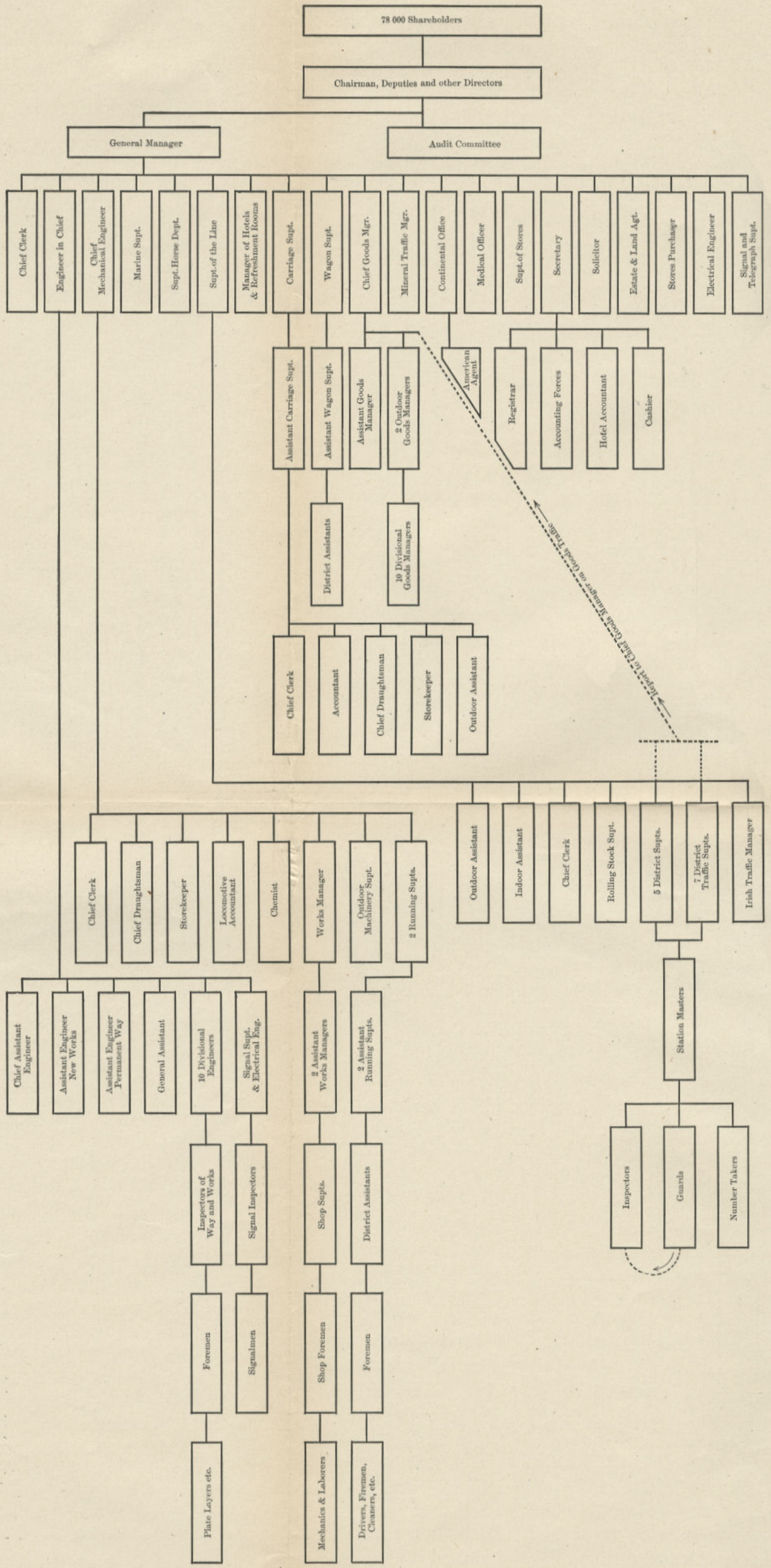
there was nothing to be made out of department quarrels. At the present day, by almost imperceptible steps, the authority of the general manager has been extended to cover nearly all phases of current, or dynamic, railroad operation. Static railroad operation, or responsibility for design and general policy, still rests with the directors and their department heads. The general manager nowadays corresponds well enough to the general manager of an American road, except that his authority covers traffic as well as operation. Curiously enough, these two unlike functions have always been centered on the same officer in Great Britain, and the use of the term " traffic " has there been extended to cover both securing business and moving it.

Another marked difference between British and American organization is found in the position of secretary. The American secretary is the custodian of records, the collector of proxies and the officer in charge of stock transfers; his work is largely clerical. The British secretary is often nearly coördinate with the general manager, in charge of the law department, the treasury department, the accounting department, special provident departments, and, oddly enough, sometimes of the hotel and refreshment room departments as well. In America his responsibilities would ordinarily be divided among one or two vice presidents and the passenger traffic department; in England the secretary concentrates work which we separate, while the operating departments separate work which we concentrate.

In spite of the increasing powers vested in the general manager, the British railroad organization is strongly de-

TABLE XV

OUTLINE ORGANIZATION, LONDON & NORTH WESTERN RY., 1910 (UNOFFICIAL)



partmental. The authority of the department heads ordinarily converges nowhere short of the general manager, but extends right down into the boundaries of the district, about corresponding to our division. The workings of this may be observed in the accompanying diagram (Table XV) showing the organization of the London & North Western.[1] Starting at the top, the first difference between this organization and the characteristic American organization is the very large number of shareholders. The different character of the board of directors cannot be illustrated graphically, but the existence of an audit committee which reports to the board instead of doing the work of the board, differs from American practice.

It will be seen that the secretary coördinates the work of the accounting and of the treasury departments, while all the other departments of the road concentrate upon the general manager. The result of this is far better than the old-fashioned arrangement of having the chief mechanical engineer and the chief civil engineer report direct to the board. Yet the general manager on the present plan cannot do very much more than coördinate; he is doing work which would be performed on a large American road by at least three vice presidents and a general manager besides; consequently his scrutiny can only be general.

The mixture of what we call the traffic department and the operating department is one of the curious features of the British railroad organization which is hard to explain in its working. The operating head of the London &

[1] This diagram is nonofficial, but may be assumed to be approximately correct.

North Western in our sense of the word is the superintendent of the line, but the superintendent of the line is especially charged with the conduct of passenger business on all British roads, and this includes procuring the business as well as moving it. In other words, the British general superintendent, if we choose to apply that title to the superintendent of the line, is also passenger traffic manager.

As we follow out the successive divisions of authority lower down, this peculiar feature is not made more easily explainable. The superintendent of the line is reported to directly by seventeen officers. His outdoor assistant and his indoor assistant are staff officers, performing such special duties of inspection as he may assign to them from time to time; his chief clerk is in charge of the large and complex office force; his rolling stock superintendent is the officer whom we would call the car accountant, since he is charged with keeping track of the location and movement of goods, wagons, and passenger carriages as well. There is no obvious distinction in the work of the five district superintendents and the seven district traffic superintendents. These officers are responsible for both traffic and operation in their district, but on matters of goods traffic they report to the chief goods manager, whereas on passenger traffic and operation they report to the superintendent of the line.

Next below the district superintendents in the operating organization come the station masters. We have in this country no position exactly corresponding to that of the British station master. He is considerably more than a

station agent, since the inspectors, the guards, the number takers and other employees report to him. The number takers are the men who keep track of the goods wagons; each company has its own group of these men, and the Railway Clearing House has an additional group which have it as their special responsibility to keep track of all goods wagons which are off their home lines.

It will be observed that this joint operating and passenger traffic organization does not include the mechanical forces, the civil engineering forces, nor the engine drivers. The mechanical forces report to the chief mechanical engineer through the works manager and the two running superintendents, respectively. The district assistants in this department may be said in general to combine the functions of the American trainmaster and traveling engineer, but all direct control of the motive power and the men who handle it is kept distinct from the men in charge of operation. Similarly, the care of the track and structures is detached from the district superintendent and placed in the hands of one of the divisional engineers.

The operation of this railroad is first of all divided into two main divisions, and then into ten districts. Each district has a district superintendent in charge of operation and of passenger traffic; a divisional goods manager in charge of freight traffic and, to a certain extent, of freight movement, and a divisional engineer in charge of way and works. The control of the mechanical forces is not divided clearly by districts, but rests with the mechanical officers at the head of each of the grand divisions. It will be observed that the carriage superintendent and the wagon

superintendent do not report through the office of the chief mechanical engineer, but that the up-keep and construction of the freight and passenger equipment is placed in the hands of departments reporting direct to the general manager.

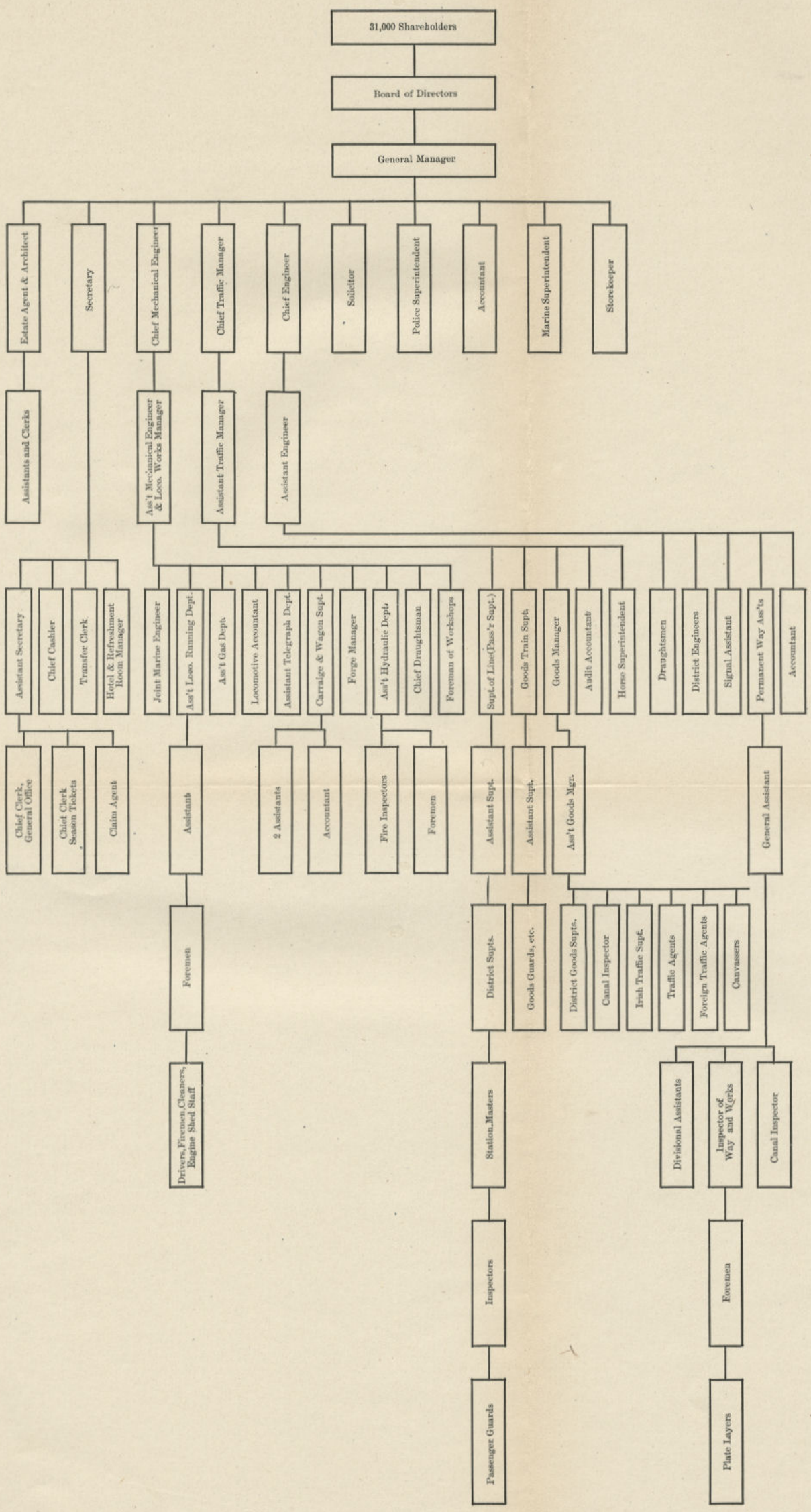
The diagram (Table XVI) illustrating the organization of the Lancashire & Yorkshire shows very clearly the workings of a somewhat smaller company, although a very busy one. The board of directors of the Lancashire & Yorkshire is composed of fourteen members and is divided into eleven committees, dealing respectively with general affairs, with accounts, with finance, with compensation claims, with land and real estate, with way and works, with stores, with traffic and operation, with rolling stock and machinery, with hotels and refreshment rooms, and with parliamentary affairs. Usually these committees meet once a month, although the accounts committee meets weekly. The chief officers concerned with the work of each committee generally meet with it, and the results are passed to the full board for confirmation.[1]

In the early days of British railroads the position of general manager was frequently filled from the retired list of the army and navy, and there was good justification in the theory that an army colonel would be able to organize men and handle them efficiently. But it was found that

[1] An excellent account of the organization of the Lancashire & Yorkshire, from which part of this description is condensed, is to be found in a series of articles in the *Railway Gazette* during 1907, by H. Marriott, assistant traffic manager of the Lancashire & Yorkshire.

TABLE XVI

SKELETON ORGANIZATION OF THE LANCASHIRE & YORKSHIRE RAILWAY, 1910



it was a wiser plan to fill this office with a man who had undergone years of training for the special work called for, and consequently it became more and more customary to appoint general managers from the traffic department. (In discussing British railroads the fact must not be overlooked that the use of the term traffic department does not correspond with our use, since it includes what we call operating as well as what we call passenger traffic, and since it generally does not include what we call freight traffic). The work actually done in practice by the British general manager is summarized as follows by Mr. Marriott:

1. The general manager takes charge of all departments on the railway, and the chief officers are subject to his direction. By this arrangement all possibility of clashing as between department and department is avoided, and the whole railway machinery works smoothly.

2. The chief officers consult with the general manager on all matters which he may consider necessary, and furnish him with all plans, reports, documents, and letters having reference to any subject on which he may desire information.

3. Plans are not prepared for any additions or alterations to railways without the general manager having previously been satisfied that such additions or alterations are desirable.

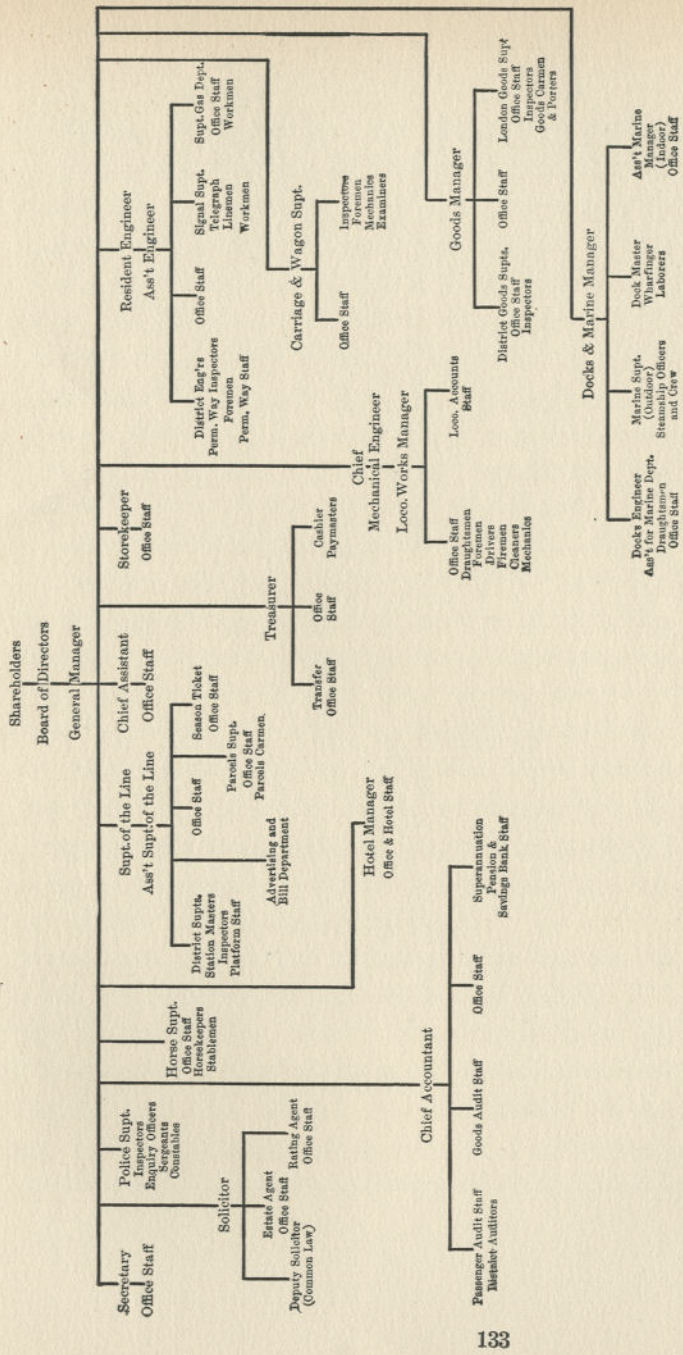
4. All appointments of assistant officers are submitted to the general manager for his approval before they are brought before the several departmental committees of directors.

The diagram (Table XVII) of the London & South Western shows especially well the type of British organization which was almost universal until certain lines began trying administrative experiments a few years ago. It will be observed that fourteen department heads report to the general manager, in addition to his own assistant, and that the departments concerned have no point of mutual contact short of his office. In accordance with usual British practice, the passenger and freight departments are isolated, having no common traffic heads, and the carriage and wagon department is distinct from the mechanical department. The duties of the secretary on the London & South Western are narrower than is usually the case, however. The horse superintendent on all British lines has important work to do. Collection and delivery is made at shops, warehouses, and residences by the company's own forces, except in certain cities where a general contract is let to a trucking company for this service. Moreover, horses are used rather extensively in yards and terminals, and can haul readily the small goods wagons used in merchandise service. The dock and marine department finds its counterpart in the organization of most large British lines, which must needs conduct their search for traffic in Ireland or at Channel and North Sea ports, as well as in England, Scotland, and Wales.

Within the last few years the North Eastern and Great Northern railways have separated the commercial from the operating portion of the work performed by the superintendent of the line, and a department corresponding in general to our traffic department has been created, headed

TABLE XVII

ORGANIZATION OF THE LONDON & SOUTH WESTERN RAILWAY, 1910



by an officer described as chief passenger agent. The North Eastern, which has been the most advanced of all British railroads in its desire to work out a scientific plan of organization, has in effect copied American practice in the appointment of three divisional superintendents, each one of whom has charge of one section of the entire system, including, roughly, the supervision of all the work on his section, except that of the mechanical engineer.

A change along the same lines, but even more radical, was made in 1909 on the Midland Railway, which went one step farther along lines of American organization and divided up the work of the mechanical department. Formerly there were in this department two main sections; one for building and repairing locomotives and for maintaining the various machinery, and the other for handling the engines in service, this department also supervising the work of drivers and firemen. The current control of drivers and firemen does not yet find its way into the hands of the district superintendent, but a new officer, termed the superintendent of motive power, is created, who has full responsibility for the equipment which is in service, while the chief mechanical engineer is responsible for supplying the equipment and for repairing it.

Thus it will be seen that a feeling exists that the old hard and fast departmental organization had defects. The changes which are being made to cure these supposed defects have not yet arrived at the point of view of railroad managements in this country in concentrating current control of all operation, including the work of the mechanical and the civil engineering departments, upon the divi-

sion superintendent, while the higher officers in the respective departments have staff rather than line functions, and the traffic department alone is separated. A very important fact, however, in relation to the success with which department work is coördinated in England is the comparatively small area covered even by the largest railroads. The Great Western has more mileage than any other British road, operating approximately 3,000 miles, but the two most distant points on the system are only about 250 miles apart by air line distance, and there is not a railroad in England which could not be encompassed with a circle having a radius of 150 miles.

The following five diagrams (Tables XVIII, XIX, XX, XXI, XXII) prepared from the general organization plan of the Lancashire & Yorkshire show the respective characteristic divisions of authority in England and in America.

British railroad administration could doubtless have been simplified and made more economical in a good many particulars if there had been a strong central body which represented the interests of all the roads, and at the same time was on the lookout for the interests of the public—a body corresponding to the general administrative councils in Prussia or in Italy. It has been a characteristic trait of British managers to be jealous of other enterprises in the same field. Perhaps no argument was more frequently heard in opposition to the campaign for ton-mile statistics than that these statistics would give business secrets to rivals. This fear is doubtless what has prevented British railroads from forming an effective central union to direct

TABLE XVIII

CONTROL OF THE PASSENGER TRAIN CONDUCTOR, OR PASSENGER GUARD.

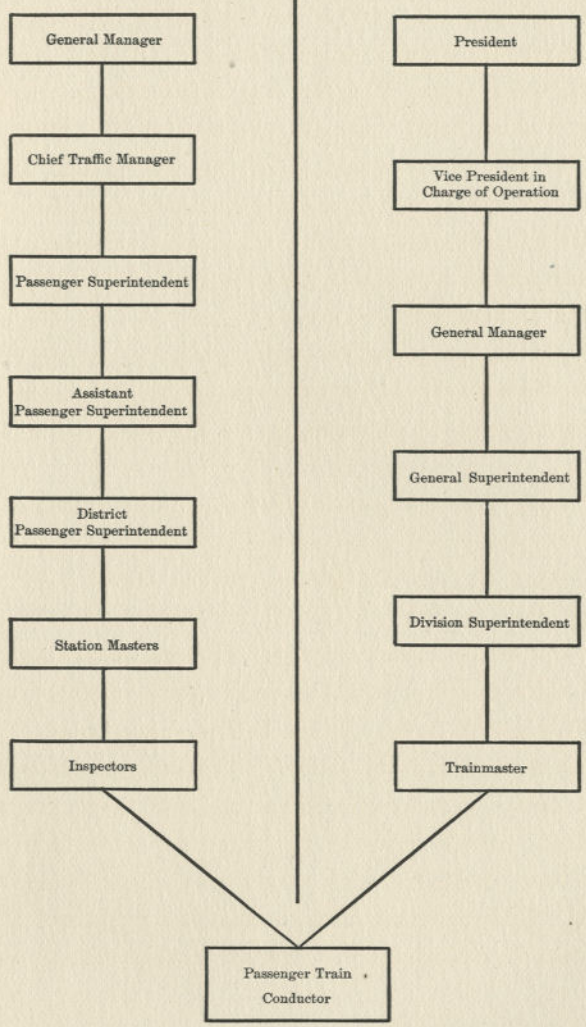


TABLE XIX

CONTROL OF THE LOCOMOTIVE ENGINEER, OR ENGINE DRIVER.

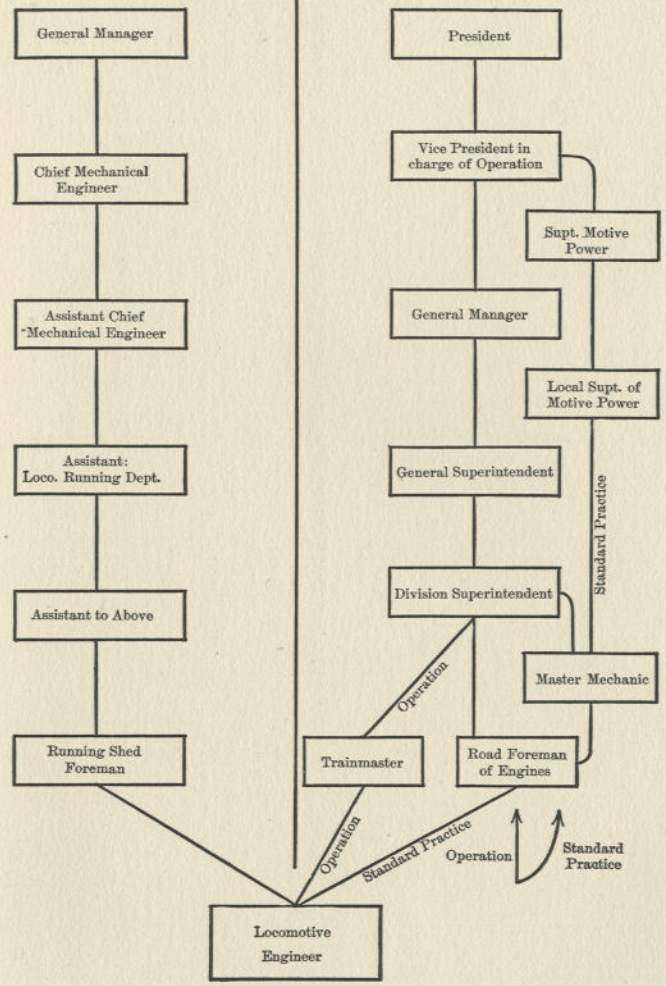
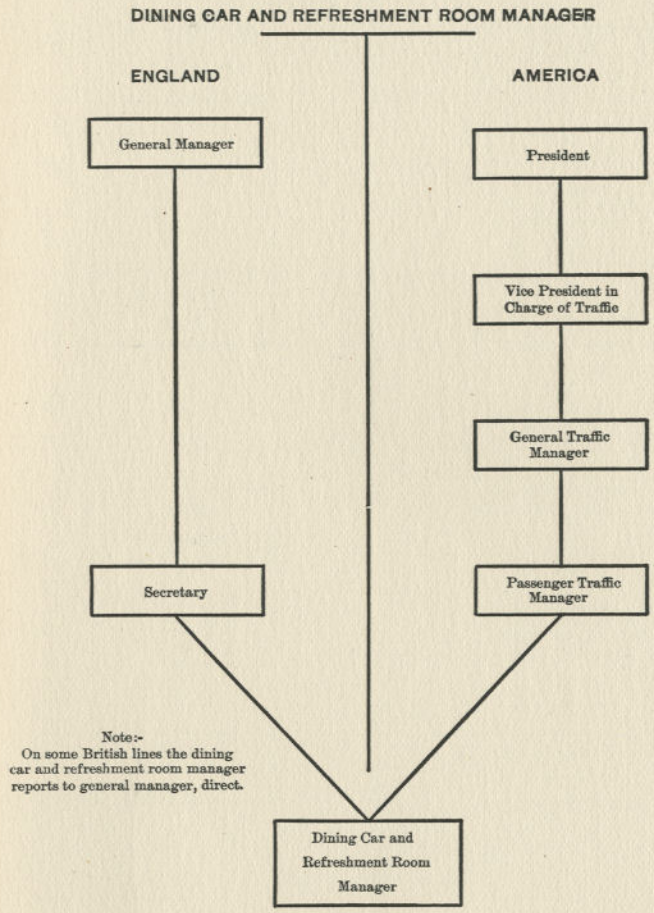


TABLE XX



Note:-
On some British lines the dining car and refreshment room manager reports to general manager, direct.

TABLE XXI

CONTROL OF THE FREIGHT TRAIN CONDUCTOR, OR GOODS GUARD.

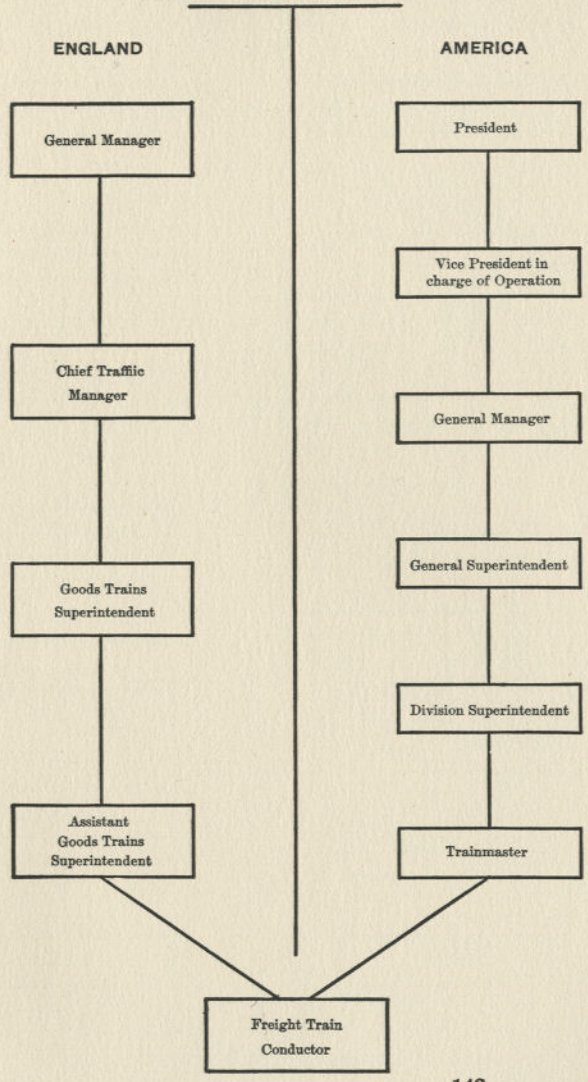
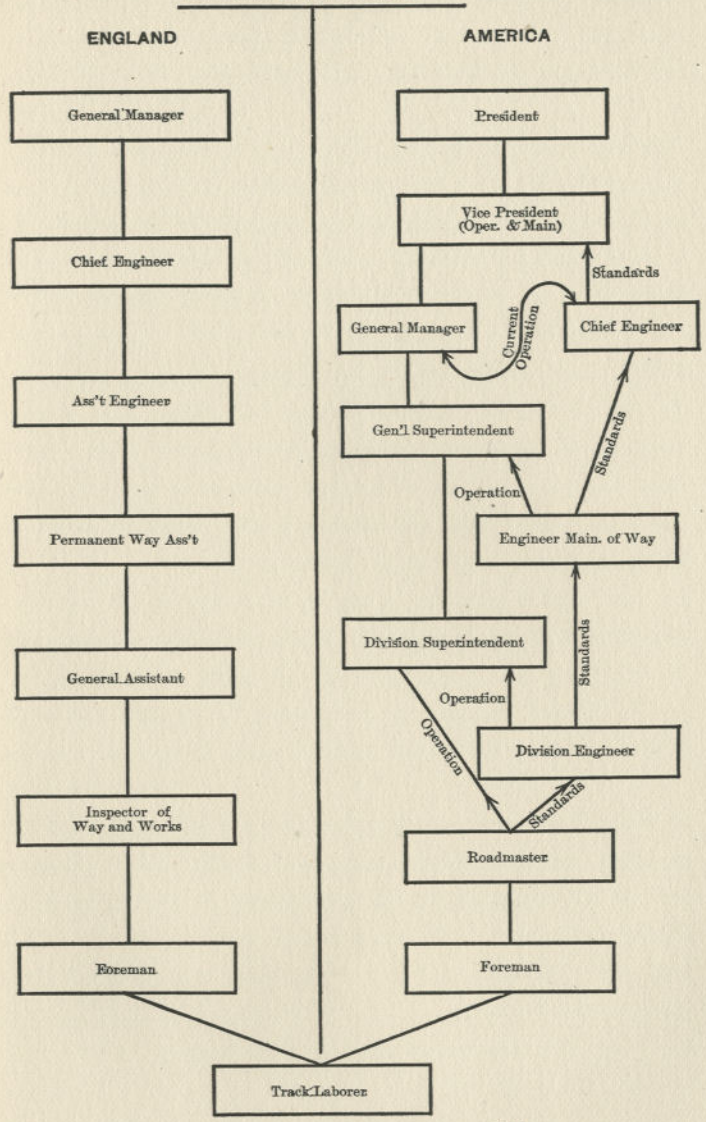


TABLE XXII

CONTROL OF THE TRACK LABORER; ENGLAND AND AMERICA



the general conduct of affairs. Much the same situation exists in this country, although from different reasons. The American Railway Association is a weak body, concerned far more with detail than with general constructive questions of policy.

Within the last few years the British Railway Association has been much strengthened, and it is now becoming to be somewhat representative, but it is at least as far from efficient working as the American Railway Association is.

The British Railway Clearing House is on a different plane entirely. In spite of the jealousies and suspicions that have existed between companies from the earliest times, it was recognized many years ago that there was an obvious need for a central body to deal with the proportions accruing to specific companies on traffic routed over two or more lines. Even before the first British railroad was built, in the old coaching days, there was a clearing house of the proprietors of stage coaches which had its headquarters at Golden Cross, Charing Cross, and arranged between various stage coach proprietors the amounts respectively due from passengers or parcels booked for a journey by way of state coaches owned by perhaps half a dozen concerns.[1]

The British Railway Clearing House was established in January, 1842. Each company joining in the clearing house agreement is represented by its chairman or by one of the directors, who forms part of a committee which meets from time to time to provide the necessary laws and

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1 "Railways," by E. R. McDermott.

regulations governing the conduct of the business, and to supervise through a subcommittee the work which the clearing house is doing. The secretary of the clearing house reports to this subcommittee once a month, while a general body, composed of the general managers of the railroads joining in the clearing house, meets quarterly to discuss matters bearing directly or indirectly on through rates and their apportionment. Parliament stands behind the clearing house by an important act which provides that whatever is declared to be due by the clearing house shall be legally due and must be paid, and from the decisions of the clearing house in this respect there is no appeal.

In 1904, according to Mr. McDermott, the Railway Clearing House was responsible for almost 700,000 goods wagons, whenever these wagons were traveling off their own lines. As has already been mentioned, the clearing house has a large force of outdoor clerks, who are stationed at all junction points and take the numbers of all goods wagons which leave or come on a specified road. There are over five hundred men engaged in this work. In a single year they trace some thirteen million journeys of passenger coaches and goods wagons on lines which do not own them. The clerk at the junction has in his note-book a history of each goods train which goes from one line on the rails of another. Abstracts from this are sent once a week to the clearing house, where four hundred indoor clerks arrange and check the results. Then, after allowing two days as free time in which a car must be unloaded, the clearing house calculates a charge against the line detaining the cars at the rate of three shillings per day, although

cars of costly construction or of large size take a higher rate, which sometimes runs as high as twenty shillings a day.

The bearing of the clearing house on British railroad administration is important. Without it, the work of the officers responsible for car supply and car distribution would be very heavy, although probably no heavier than in this country, where the companies have not yet been able to get together on a general car clearing arrangement. It is noteworthy that Arthur Hale, who is at the head of the committee [1] of the American Railway Association concerned with the general questions arising out of car distribution, is gradually inducing one road after another to clear its car balances through his office, and there seems fair likelihood that the greater part of the railroad mileage of the United States will some day clear its cars in that manner. At present, the car accountant or superintendent of transportation of each road must keep his own records.

Viewing British railroad organization and administration in its broader aspect, the American observer gets the impression that the work of the country is done by men of a high order of integrity who execute routine matters with great fidelity, but are apt as a class to be rather slow in changing inherited forms of administration for new ones, to meet current requirements. There are reasons to believe that the departmental type of organization has resulted in duplication of effort, and that economies could have been gained by the concentration of current responsi-

[1] This has now been given the title of American Railway Clearing House.

bilities some distance below the committees of the board of directors who now handle them. I am inclined to think that British railroad managements have also suffered from lack of thoroughgoing control through statistics. In both these important particulars, however, there has been a great change in England during the last five years, and the younger blood in the management appears quite willing to undertake broad administrative changes which were looked at askance by older generations.

The problem of the fearful load of capital which every British railroad must carry is more serious. This is a complex topic, which does not belong in the present chapter, but is discussed somewhat fully elsewhere in this book. Whether or not British administration has cost somewhat more than it need to have cost in proportion to the service rendered, the fact must not be lost sight of that the quality of this service has been high.

CHAPTER VII

TYPES OF GOVERNMENT RAILROAD ORGANIZATION

The government's different position from that of the private company—Voluntary and reluctant government control—Voluntary control in Germany; the Italian experiments; reluctant government control in India—Details of railroad administration in Prussia, showing the subdivisions of authority and the system of national and of circuit councils—The *Betriebs Inspektor* and the American division superintendent—Classification of Italian railroads—The difficulties encountered in administration on a quasi-private basis—The Acts of 1905 and 1907 evidently based on Prussia—Efforts to develop the Indian railroads without concessions unsatisfactory to the government—Capital and earnings in India—The 1896 regulations—The Robertson report in 1903 and the finance committee report in 1907—General results in India good.

VIEWING railroad organization in the broader meaning of the word, as connoting the administrative framework which makes it possible for railroads to be built and operated in a country, it is evident that the government has a somewhat different position, as an administrator, from the private corporation. The government's credit is broader than the corporation's credit, and it has the important advantage of possessing the law-making power, so that its administrative regulations have the force of

statutes. On the other hand, as soon as any kind of an enterprise is relieved from the direct necessity of making its own living, economic inefficiency in varying forms is almost certain to be developed, while political needs and economic needs may be widely at variance.

Leaving out of consideration government regulation of railroads in which the state has no capital invested, there are two clearly distinguishable types of government railroad organization. One type may be described as voluntary control, as a result of direct policy; the other, as involuntary, or reluctant control, assumed because it seems to be the best way out of a present difficulty. The Prussian state railroads furnish a capital example of successful voluntary government control; the government railroad systems in India and in Italy stand as important instances of reluctant state control, with varying degrees of reluctance and varying results.

The German empire wished to control its railroads for purposes of industrial development and for military expediency. It did not propose to have them become a drain on its resources. All these ends could have been attained under private ownership, and doubtless would have been, for the system was growing rapidly through corporate venture before the government policy of buying and of building railroads was put actively into effect in 1880. But the new Germany was developing along military lines; the government wanted all the power it could get, and it was most natural that the railroads should have been included in the policy of centralization.

In Italy there has been an abundance of experimenting,

both with private and with state control. In the early days of Italian railroads, the control was largely private, but the ventures were mostly unprofitable, and there was no incentive to corporate capital to extend them, especially in view of the political situation, the jealousies between the states, and the national reluctance to permit foreign control of the transportation system. For nearly a decade following 1870, therefore, attempts were made by the government to take the lines over, and considerable mileage was actually purchased. But the general policy was periodically altered by changes in the ministry, until finally, in 1878, a commission was appointed which studied the subject exhaustively for three years and then, in 1881, reported against a state railroad system.[1] Meantime, while the commission was at work, more mileage had been taken over by the government, but the national credit was extremely weak, and resources were wholly lacking to meet many of the purchases which had been arranged for.

Contracts were finally made in 1885, in accordance with which the roads were to be purchased and operated by private companies, but the state was to be primarily concerned in making improvements and extensions. This contract could be terminated in 1905, and was duly terminated at that time, since operation of the system as a whole remained unprofitable, and dissatisfaction over details of the service was widespread. The government had to do one of two things, advance new sums and readjust

[1] This account is condensed from Hadley's "Railroad Transportation."

matters with the companies, or take the lines back into its own hands again. It chose the latter alternative.[1]

[1] The following account of the situation in 1905 is condensed from an article in the *Zeitung des Vereins Deutscher Eisenbahnverwaltungen* for February 15, 1905, published in the *Railroad Gazette*:

"July 1, 1905, marks the end of the twenty years' period during which the Italian railroads, while almost exclusively owned by the government, have been operated under contract with private companies. Previous to 1885 the Italian railroads were owned and operated in a great variety of ways. Some were owned by the government, but operated by private concerns; others were owned by the latter and operated by the former. Some were owned and operated by the government; others by private companies. As a result of these experiences, the government in 1885 acquired the ownership of the railroads, but farmed out their operation to four great companies (the Southern, Adriatic, Mediterranean, and Sicilian companies) for seventy-five years, the government, however, reserving the right to terminate the contracts in twenty years, that is, in 1905. These contracts have been the source of endless litigation and quarrels. The government bureaucracy has frequently been accused of dilatoriness in carrying out its share of the agreements with the railroads. Needed extensions have thereby been indefinitely delayed. Through the indifference and mismanagement of the government, needed changes in railroad rates, time tables, and general traffic arrangements have been made impossible. The poor connections between the various lines, the inferior station accommodations, and the insufficient rolling stock are largely accounted for in this way.

"Neither the government in owning nor the companies in operating the railroads directly assumed the responsibility of renewing and enlarging the equipment and rolling stock. To meet these expenses a series of reserve funds were created by the contracts. These funds were to consist of annual contributions of given percentages of the railroads' gross earnings. These, it was unfortunately assumed, would amount to a certain figure in 1886, and would increase in a certain proportion. In point of fact, the initial figure was put too high, and the increase fell far below the original expectations. For instance, the fund intended to meet the cost of improving and enlarging the railroads' equipment should have amounted to $20,000,000 in 1895. In reality, it barely reached

In India the government did not want to own railroads if it could avoid it, but it very much wanted to develop the vast areas of the empire, and the problem in recent

$2,000,000 by that year. As a result of these miscalculations, the roadbed, rolling stock, and stations rapidly deteriorated, and have long since fallen far below the requirements of modern railroad traffic. The terminal facilities of such an important port as Genoa are antiquated and very deficient. Elsewhere the roadbed is in a bad condition; the rails are often in a condition dangerous to traffic. The government has had no means to make improvements. At least $100,000,000 is necessary to put the railroads in proper condition. The poor condition of the rolling stock is known to all travelers. In the original contracts of 1885 the life of the cars was put at too high a figure—for passenger cars and locomotives forty years, for freight cars sixty years. In Prussia the similar figures are twenty-six, twenty-one, and twenty-five years. (The life of an American freight car is ordinarily assumed to be ten years.)

"The worst feature of the railroad contracts of 1885 was the fact that they did not encourage the railroads to develop traffic. The contracts provided for much building by the private companies, and the terms were such as to make it more profitable for the companies to build new lines in distinction from operating them in a far-sighted way. Moreover, in providing for a division of profits between the government and the companies a distinction was made between lines that had a gross revenue of $3,000 and more per kilometer and those that had a smaller revenue. The necessary result was that the companies did not encourage heavy traffic. Beyond a certain figure increased traffic was unprofitable to them. By general agreement the arrangement which is now drawing to an end has been unprofitable to both the government and the companies, and harmful to the community. None favored the continuance of the contracts, and they are to terminate in a few months. A new policy is to be inaugurated, by which the government will both own and operate the railroads. This will call for roughly $200,000,000, half of this sum for the purchase of the existing rolling stock and the other half for impending and necessary improvements. It will be no easy matter to raise this amount by government loans, and there are grave doubts whether government management will bring about a marked improvement in the railroads."

years has been how to get the lines built. Government aid was indispensable, for the inducement to private capital to build government-regulated lines was not sufficient. But if the government lent its credit to the builders, or guaranteed them a minimum return, it proposed to supervise their work. In the course of Indian development, more than twenty thousand miles of railroad have come under direct government control, some being owned and worked outright, some purchased by the government from companies and leased to the companies to work, and some promoted by companies on government guarantee.

It is worth while to compare the administration of railroads in Prussia, Italy, and India, since no stronger instances can be found of state operation as a result of direct policy, state operation arising out of the political situation, and state operation springing from the fact that private capital would not undertake to provide a great colony with transportation facilities on terms satisfactory to the government. First in order comes Prussia.

The German *Reich*, or imperial government, has the right of railroad control throughout the empire, by virtue of the constitution of 1871, but it has left actual construction to the various states. Of these, Prussia is the largest, and the Prussian government not only owns and operates a great railroad system of its own, but leases additional mileage in Alsace-Lorraine and Hesse. The authority exercised by the imperial government in practice is regulative rather than administrative, and the regulation is potential rather than direct.

At the head of actual administration of the Prussian

state railroads is the Minister of Public Works, who gathers about him an administrative staff with chiefs of operation, traffic, construction, and finance. He must approve all rates, whether of the state or of the private roads, and he is the final administrative authority for both.[1] Current administration, however, is vested in the Royal Railroad Directories, of which there are twenty-one. Each *Königliche Eisenbahn-Direktion* has its division, the amount of mileage assigned to each varying, and handles all the affairs of the division, traffic as well as transportation.

This is a stronger application of the divisional theory of organization than exists anywhere in this country, since traffic affairs are outside the jurisdiction of all American division officers, on roads having more than one division. Yet, within each grand division, the organization is sharply departmental. Each Prussian directory has four departments, or *Inspektionen,* charged respectively with the management of traffic, operation, motive power, and shops. The civil engineering organization (*Bau-Abteilung*) is managed somewhat differently, much as the American chief engineer is a general officer rather than a division officer.

Thus, in 1909, the Altona Division, embracing 1,212 miles of line, and equipped with 925 locomotives, 2,045 passenger cars, 13,456 freight cars, and two steam ferries,

[1] An excellent brief paper on Prussian Railway Administration, from which this account is largely taken, was published by Ernest S. Bradford in the March, 1907, *Annals* of the American Academy of Political and Social Science.

had a directory consisting of a president and twenty-two other members, aided by twelve assistants, with clerical forces, treasurer, and accounting department. The headquarters of the division is at Altona, near Hamburg, and the directory employs fourteen operating managers or superintendents (*Betriebs Inspektors*), seven mechanical engineers (*Maschinen Inspektors*), five shop superintendents (*Werkstatten Inspektors*), five traffic managers (*Verkehrs Inspektors*), and a civil engineer engaged at specific betterment work. The Berlin Division, with dense traffic movement, consists of only 382 miles, but has a directory with twenty-eight members and seven assistants; eleven operating superintendents, five mechanical engineers, ten shop superintendents, four traffic managers, and a fully-equipped central office. The Königsberg Division, on the other hand, where traffic is relatively light, handled, in 1909, 1,639 miles of line. The Königsberg directory is composed of sixteen members and twelve assistants, and employs seventeen operating superintendents and two assistants; four mechanical engineers, five shop superintendents, five traffic managers, and six civil engineering superintendents.

Thus each division on the Prussian state railroads is roughly comparable to an American railroad, five hundred, a thousand, or fifteen hundred miles long, with a president, and a large board of directors which is its own executive committee. But these operating units do not perform their work unaided and unregulated. Perhaps the best, and at all events the most characteristic feature of Prussian railroad administration, is the system of advisory councils,

dealing with rates and classifications. At the head of this system is the national council, and there are nine circuit councils, all representing the shippers, and making constant recommendations to the railroad management, which is obliged to consult with them, although not required to carry out the suggestions made. The aim of the circuit councils is to represent all the important shipping interests. The national council meets twice a year and considers the broader questions of administration; the circuit councils maintain standing committees which receive local complaints and suggestions, and pass them along to the full council with recommendations.

Outside of the direct scheme of administration but having an important bearing on it, there is also a general conference of all German railroads, which maintains a rate commission and a committee of shippers, and there is a society of German railroad managements, which considers international traffic questions under the Berne treaty.[1]

Viewing this Prussian organization from the functions of the smallest operating unit, the district in charge of the *Betriebs Inspektor* reporting to a divisional directory, it appears that this officer has responsibilities both of operation and of maintenance which class him fairly closely with the American division superintendent in a divisional organization. But the Prussian superintendent has a territory only about a third as great as that under the jurisdic-

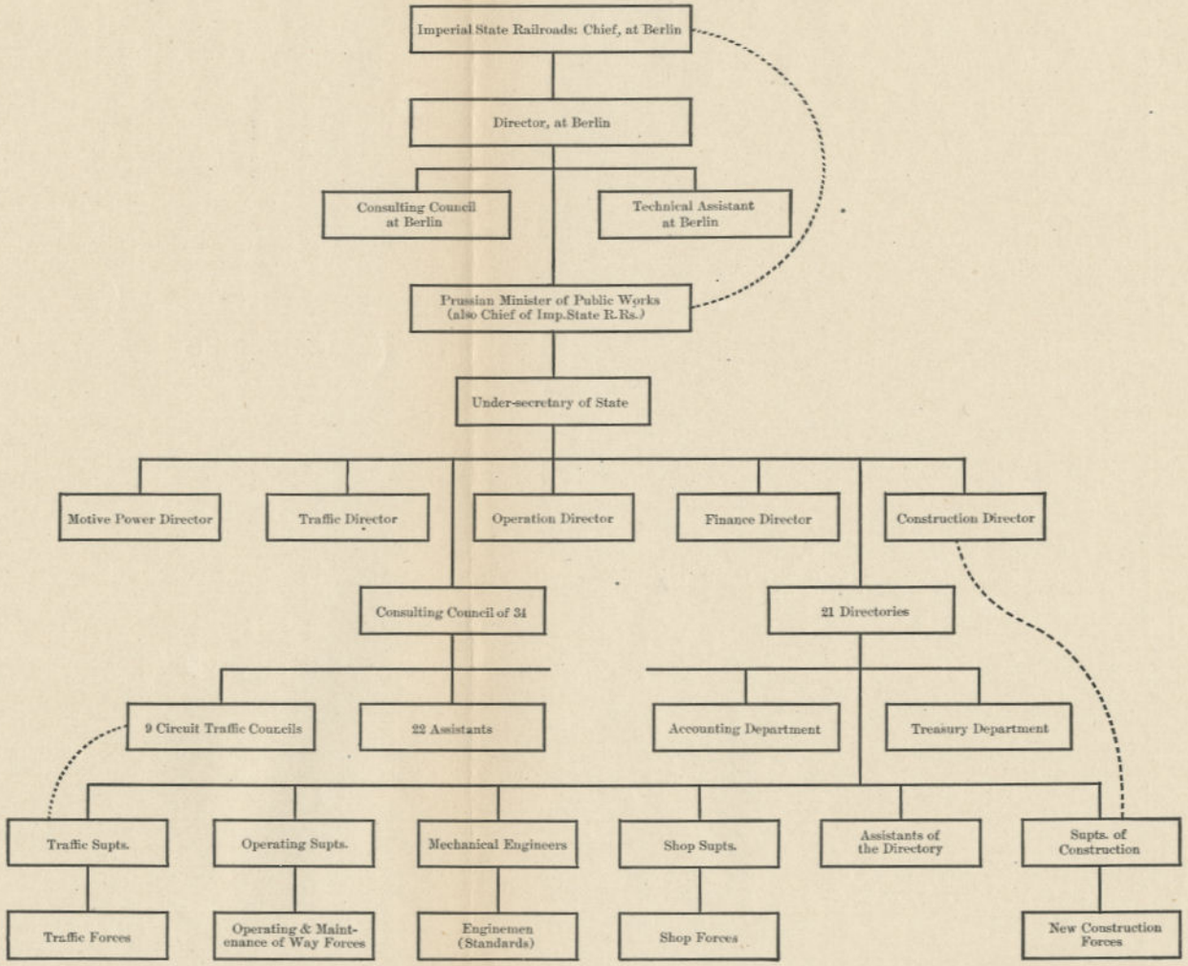
[1] This international freight traffic agreement commenced in 1893, embracing 94,785 miles of railroad. At the beginning of 1910 it covered fourteen different countries, with 150,230 miles of line.

tion of the American superintendent, and his authority does not extend over motive power or shop work, two departments which are united in this country, but kept separate in Germany. The Prussian division, however, which corresponds well enough in mileage to the territory in the hands of an American general superintendent, concentrates far more administrative power than is to be found in any American grand division, and is in effect an independent railroad, subject to the Prussian headquarters administration and the Imperial administration, and conferring constantly with the traffic councils. If there was as much friction between these separate bodies in authority as there is apt to be between the American railroad managements, the state commissions and the Interstate Commerce Commission, the result would probably be a series of administrative blockades. But the Prussian situation is very different from ours. There, power was conferred by the federal and state governments upon the railroad managers; here, the power which railroad managers supposed they possessed under their charters is gradually being taken away from them by the two, or five, or ten governments to which they may be subject, and the process naturally generates friction.

The Prussian plan works well. The rate-making power is used much like a protective tariff, giving German producers certain marked advantages in competitive fields. The original idea of giving railroad service to the country at cost has been abandoned, however, and rates are kept high enough so that the railroads yield an immense revenue to the state. In 1905 the net profit to the Prussian state

TABLE XXIII

SIMPLIFIED ORGANIZATION DIAGRAM OF THE PRUSSIAN STATE RAILROADS.



from its railroad ventures, after charging off interest, special funds, etc., was over $120,000,000.[1]

A graphic chart of the Prussian railroad organization can be drawn as illustrated in Table XXIII.

A noteworthy feature of this organization, difficult to illustrate graphically, is the concentration of certain kinds of work pertaining to the whole system or specified directories. Thus, car supply for all the Prussian state railroads is handled by the Magdeburg directory, and purchasing, auditing, and the appointment of junior officers is similarly centralized.

In the case of Italy, it took two years to work out a satisfactory scheme of government control after the decision, in 1905, that it should be effected. The physical condition of the lines was deplorable, and instances were cited where goods had been hauled sixty miles or more by wagon because the railroad service was so bad. The public blamed the railroad companies, and the companies, which had been able to earn less than six per cent on the capital they had paid the state in accordance with the 1885 agreement, blamed the government. The government, on the other hand, had been obliged to spend on betterment work and on the up-keep of various reserve funds far more than it had received from the percentage of gross returns which the companies had paid it.[2]

On June 30, 1905, the following classification could be made of the Italian railroads:

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[1] B. H. Meyer.

[2] Much of this material is condensed from a series of articles in the *Railroad Gazette* by an Italian railroad councilor.

Railroads belonging to		the state	5,592	miles
"	"	" state and private companies	90	"
"	"	" Mediterranean Company	245	"
"	"	" Southern Company	1,135	"
"	"	" Adriatic Company	279	"
"	"	" Sicilian companies	149	"
"	"	" various companies	211	"

Because of lack of preparation, doubtful credit, and want of harmony between the state and the companies, the Italian government was not in position in the spring of 1905 really to solve the problem on a permanent basis; its action was almost purely political. Therefore the ministry presented a temporary plan, by which the state should own the lines and the companies work them, under the general supervision of a manager appointed by the state, and an administrative council appointed by the manager from among the state employees and those of the railroad companies.

As might have been expected under the circumstances, the results partook of the worst of both forms of administration. But the government persevered; in 1906 the Southern companies were taken over, after much bargaining about their subventions, and in 1907 an Act was passed placing operation, as well as ownership of the principal Italian lines in the hands of the state.

The new Act, dated July 7, 1907, did not repeal the Act of April 22, 1905, except in cases where the provisions of the new Act were in direct opposition to those in the Act of 1905. The administration of the state railroads remains subject to the control of the minister of public works, and an administrative council and general manager are placed

at the head of the operating force, members of the council and the general manager to be appointed by royal decree on the nomination of the minister of public works, with the consent of the council of ministers.

Rates can be raised only by an Act of Parliament. Temporary reductions for definite quantities of goods from definite points to definite destinations may be authorized by the general manager after the administrative council reports in favor thereof. Equality of rates and service are to be granted to everyone under equal conditions. Every five years a general revision of the classifications of goods is to be undertaken.

A line is to be operated with three passenger trains daily in each direction if the gross receipts from passenger and quick freight service do not exceed 9,000 lire per kilometer ($2,900 per mile). When the gross receipts exceed this sum and are less than 12,000 lire per kilometer ($3,860 per mile), a fourth passenger train is to be run in both directions. When the gross receipts exceed 12,000 lire per kilometer, other daily passenger trains may be run. But in cases where the passenger trains are hauled by electric traction or motor cars exclusively, these rules do not apply.

All employees of the railroads operated by the state are considered public servants, which makes the penalty for going on strike severe.

A general traffic council is provided for, consisting of the minister of public works as president, the general manager as vice president, three of the higher officers of the railroad nominated by the administrative council and other citizens, among whom is to be a representative of the

Italian Press Association, representatives from the local consulting commissions, and representatives of the two most important shipping companies in Italy. This general traffic council has merely advisory functions.

The general manager, or director general, is assisted by two vice director generals, and by a council of administration with eight members, two selected from among the higher railroad officers, three from officers of the state, and three from nonofficial citizens. There is also a " central inspection " board, reporting to the administrative council, and composed of thirteen members. This administrative council has general supervision of the operation of the roads, and must approve proposed work on the line or purchases of over 50,000 lire ($10,000). The general offices are at Rome. Members of the administrative council and the general manager are responsible to the state for any losses resulting from a breach of laws or from gross negligence.

Reporting to the managing board are thirteen chiefs of departments, charged, respectively, with correspondence, law, appointment of junior officers, operation, maintenance of way and structures, maintenance of equipment, accounts, sanitation, purchases and stores, time-tables, operation of rolling stock, new construction, and insurance. These officers all have their headquarters at Rome.[1]

The entire state railroad system is divided into eight

[1] The Act of 1907 is published in English in the April, 1908, *Bulletin of the International Railway Congress*. A personal account of the organization was published by Edward P. North in the *Railroad Gazette*, September 28, 1906.

sections, each of which has from 1,600 to 3,200 miles of line, and the intention has been that each section should handle, roughly, an equal amount of traffic. Each section is manned by 11,000 to 12,000 employees, and the grand division headquarters are at Rome, Venice, Turin, Genoa, Milan, Florence, Naples, and Palermo.

Each grand division has a chief, who is assisted by a local council, made up of two local officers of the road, four local representatives of industry, commerce, and agriculture, and two members selected by the Minister of Public Works from among other representative citizens not in railroad service. He has also a staff, with a secretary and six department chiefs, in charge of legal matters, accounts, operation, sanitation, maintenance, and motive power.

The grand-division chiefs usually have a telephone conference daily with the director general, and with each other. Once a month they are required to come to Rome for a general conference lasting a day or two. Much as on the Prussian railroad system (which was obviously the model for the Italian government) the grand-division chiefs and their staffs are authorized to use such authority as is necessary for the proper conduct of affairs in their territory, subject to the general limitations fixed by the administrative council and the general management. They have only an advisory voice in rate adjustment, but they are expected to investigate and explain to the management the relations of the rate structure to commercial needs, and the way traffic demands are being met in their districts, and to make suggestions for increasing traffic or for bettering service.

To summarize the Italian situation, it may be said that the administrative organization is a fairly close copy of the Prussian organization of to-day, but the financial organization resembles that of the German *Reich* thirty years ago, when the state purchases were begun on a large scale, with the important difference that Italy has little surplus capital to invest in the venture. Mile for mile, the Italian lines earn not much more than a quarter what the Prussian lines earn, and they are in defective physical condition. Yet if they do not prove to be self-sustaining almost from the outset, there is danger that the rapid changes in party politics will uproot the seeds thus carefully planted, to see why they have not sprouted.

The Act of 1905 provided that the national treasury should place at the disposal of the Minister of Public Works, on application, 65,000,000 lire ($13,000,000) for new equipment during 1905 and 1906, repayable in forty years and bearing 3.75 per cent interest for the first five years and 3.5 per cent thereafter. It also provided that an additional $6,000,000 should be advanced to the railroad administration during 1906 and 1907, and that for supplies, the railroad administration might contract a loan of $1,600,000 at the Bank of Italy. The Act of 1907 states, hopefully, that the railroad administration shall provide for expenses by drawing the necessary sums from the receipts, but estimates for the railroad budget covering extraordinary expenses for new works, amortization, etc., as well as current income and expenditure, are to be submitted to Parliament as an appendix to the estimates for the budget of the Minister of Public Works. A reserve

fund for unforeseen expenditures is also created by means of an annual charge of two per cent to be deducted from gross railroad receipts until there is $6,000,000 in the fund, when the charge will only be made in amounts sufficient to keep it up to that sum. The companies' rolling stock was bought by the state for about $100,000,000.

Thus the state has embarked boldly in its railroad venture, and has noted and adapted to its peculiar needs the general type of administrative framework which has been so successful in Prussia. But the Prussian railroads earn well above $18,000, gross, per mile of line; the Italian railroads a scant $5,000, and the difference between the earning powers thus expressed may conceivably have an important effect on ultimate Italian state policy. There can be no doubt that the present attempt to grasp the entire situation gives better promise than earlier half-hearted attempts to get the benefits of state control without assuming its responsibilities.

As an example of reluctant but efficient state railroad organization, the situation in India is of considerable interest. In 1853, when the Indian railroad system had its beginnings, as to-day, the problem has been to develop the immense potential resources of a country with an enormous population of unskilled, backward people, producing a very small amount of freight traffic in proportion to their numbers, and having exceedingly low individual purchasing power. From a military standpoint, it was highly important to the British government to have and to control transportation routes through India; from a commercial standpoint, some inducement better than the assured nat-

ural return was required to interest private capital in this development. Yet the government of India did not want to assume the entire financial responsibility of providing a railroad system, and there were many years when such responsibility would have embarrassed it seriously.

As a result of these causes, the railroads in India have been developed under every shade of government control and exhibit many curious contrasts of policy resting on the two main assumptions that the government must have power to regulate, and that, with that power, its financial liability must be kept as low as possible.

On April 1, 1908, the Indian railroad mileage could be classified as follows:

	Miles.
Government lines, worked by Government of India	6,233
" " " " companies	17,125
Companies' lines receiving various forms of direct subsidies or guarantees from Government of India	1,776
District boards' lines, direct and subsidized	311
Native state lines, worked by native states or state railway agency	1,593
Native state lines, worked by companies	1,945
Companies' lines receiving various forms of subsidies from native states	128
Branch line companies' railways assisted by rebates from imperial government	901
Leased lines	79
Unassisted companies' lines	42
Lines in foreign territory	73
Grand total	30,206

The total capital outlay on lines open for traffic amounted, in that year, to $1,373,057,000 (assuming three rupees equal to one dollar), which is at the rate of $44,906 per mile. Gross earnings were $149,423,000, or $4,887 per mile, and the lines operated at sixty per cent. But the year ending April 1, 1908, was a bad one in India, which added crop failure and famine to the general commercial depression felt throughout the world. In 1906–1907, the best year in the history of Indian railroads, gross earnings were $157,683,333, or $5,263 per mile on the lines then open, and the operating ratio was fifty-two per cent of gross.

A situation much the same as the present one, as regards the status of government aid and of the general physical railroad situation, existed in 1903, when Thomas Robertson, C. V. O., special commissioner for Indian railways, made his report on the subject to Parliament. Mr. Robertson considered the entire scheme of Indian railroad development, and made recommendations concerning the way in which the lines ought to be managed, and the kind of aid the state ought to give new enterprises. His blue book is an important document in the records of government railroad organization and administration, especially when the railroads are located thousands of miles away from the home government.

Mr. Robertson grouped the railroads of India into two main classes, which included all the subclassifications we have shown on a previous page. In 1902, the year he reviewed, there were 5,462 miles of railroad for which the government had no financial responsibility, and 20,474 miles for which it had full financial responsibility. All the roads, in both classes, were actually controlled by the government of India, but the forms in which this control

was exercised varied widely. The reason for this was simply that the government never really wanted to be the proprietor of its railroads, but it wished definitely to exercise a rather complete control of their operations; consequently, since the earliest construction it had changed its form of administration periodically to meet the necessities of the situation.

Under the contracts first made, the Indian government guaranteed the railroad companies five per cent on their capital, and divided surplus profits over five per cent on the half year's earnings at a fixed rate of exchange. But railroads which saw no prospect of earning surplus profits had small inducement to economy, since their dividends were assured them whatever their income might be. Railroads which did a larger business in one half year than in the other and which saw a prospect of surplus profits in one half year and not in the other were encouraged thereby to confine as much as possible of their revenue expenditure to the bad half year, since the lower expenditure in the good half year increased their dividends; while the higher expenditure in the bad half year did not affect the minimum return guaranteed by the government. Consequently, the interests of the government and of the companies were apt to be antagonistic, and it was necessary to bring regulative pressure to bear to prevent extravagance in construction and waste in maintenance and working, and to insure that expenditures were charged to the proper half year.

These old contracts have now expired by limitation, but during the process of transition various other forms of contracts have been tried. In 1896 the government set

forth a new system of dealing with new railroad projects. Under the 1896 arrangement a private company was allowed to build approved branch lines and to pay interest out of capital during the construction period, and was allowed a division up to the full extent of the net earnings of the main line from traffic interchanged with the branch, to increase its own earnings so as to permit a dividend of 3.5 per cent on its capital.[1]

A few railroads were built on these terms, but the new

[1] The 1896 regulations for building branch lines forming feeders (excluding lines longer than 100 miles and mountain branches) provide: Main line administrations have prior right to build. Government must approve (1) financial status of applicant; (2) gauge; (3) route and dimensions. Proposed railway must be subject to all acts; Proposed railway subject to government inspection *re* standards. Government is prepared to aid: (*a*) Company will receive absolute guarantee of interest at not exceeding three per cent, and a higher return if the net earnings of the branch are sufficient to pay more than the guaranteed dividend. (*b*) It may be provided that company receive from *main line* a three-and-one-half-per-cent dividend on actual expenditure, provided the payments to the branch do not exceed the net earned for the *main line* by the branch. If the *branch* earns more than three and a half per cent, it gets it. Company has no power to increase capital without authority of Secretary of State, and has limited borrowing power. State railway rates shall be enforced. Interest may be charged to capital during construction. Land provided free for line, yards and stations. Telegraph and appliances supplied by Government of India at usual charges. Results of existing surveys given free. Materials for the branch will be carried over state railways at *special* rates. Government reserves the right to buy branch after twenty-one years, or subsequent ten-year periods, on twelve months' notice, the purchase price being twenty-five times the yearly average net, not including rebate payments for three years previous to the purchase, with a maximum price of 120 and a minimum of 100, cost price in rupees. Government reserves right to fix and vary rates and classifications, and to exercise a general control regarding train schedules.

conditions were unpopular. The government only allowed the companies to undertake the projects which were the least promising, and the government found it very difficult to induce capital to take up railroad schemes without some form of guarantee.

Mr. Robertson complained that at the time of his investigation in 1903 all funds required for capital expenditure by railroads for which the government had entire financial responsibility was governed by what was known as the Programme, under which the railway department was annually allotted a sum of money, the amount depending on the state of the treasury, the money market, and the general conditions of the country at the time. The money so allotted is apportioned at the commencement of the year among all the roads which look to the government for support, and also among certain new projects. Consequently, no railroad knows or can form an accurate estimate of the sums which it is going to receive during a series of years, or even during two successive years, and the allotment is made all the more difficult of economical use because all unspent balances lapse at the close of the year. If a road is not carrying on its work quite as fast as was contemplated, its allotment is apt to be taken away from it before the close of the year and given to some other company in order that the entire sum allowed the department may somehow be used during the year.

At other times, the exigencies of the state have required that the grant be reduced while work was in progress, involving high cost for nonproductive capital and serious complications with contractors and others.

Mr. Robertson enumerated nine specific objections to the state railroad management in India, as follows:

(1) The difficulty in which the government often finds itself through having to act as judge in disputes or differences in which the government itself is really one of the interested parties.

(2) Danger that the interests of the state railroad may be sacrificed to serve some object political or otherwise, which it is desired to attain, or because it is less difficult to yield to the other party's demand than to resist it.

(3) The danger that something necessary to the interest of some other railroad or to the public may be withheld because it may be regarded as injurious to the state railroad interest. Thus the general good is liable to be sacrificed to the specific object of the state railroad administration, and from this, of course, there is no appeal.

(4) The difficulty of working government railroads on strict commercial principles when part of the staff is pensionable and is not confined to one railroad.

(5) The danger that continuity of policy will be absent from the management of the property. In this connection Mr. Robertson pointed out that in the five years 1898 to 1902 there were no less than seven changes in the head government railroad management.

(6) The great difficulty in differentiating between the railway department and the other departments of state and the difficulty of treating the business of the railroad as a merely commercial undertaking, and of regulating the salaries of its employees by the same considerations that govern skilled labor in similar undertakings managed by

companies. Thus Mr. Robertson pointed out that the salaries paid railroad department heads had to be gauged to a certain extent by the rate of pay in other branches of the government, while the private companies paid materially higher salaries and consequently were apt to get materially better officers.

(7) The great difficulty experienced in getting rid of inefficient men, whether superior or subordinate, pensionable or nonpensionable.

(8) The difficulty of ignoring the claims of seniority when there is nothing special against a man, but when he is not the best selection for an appointment.

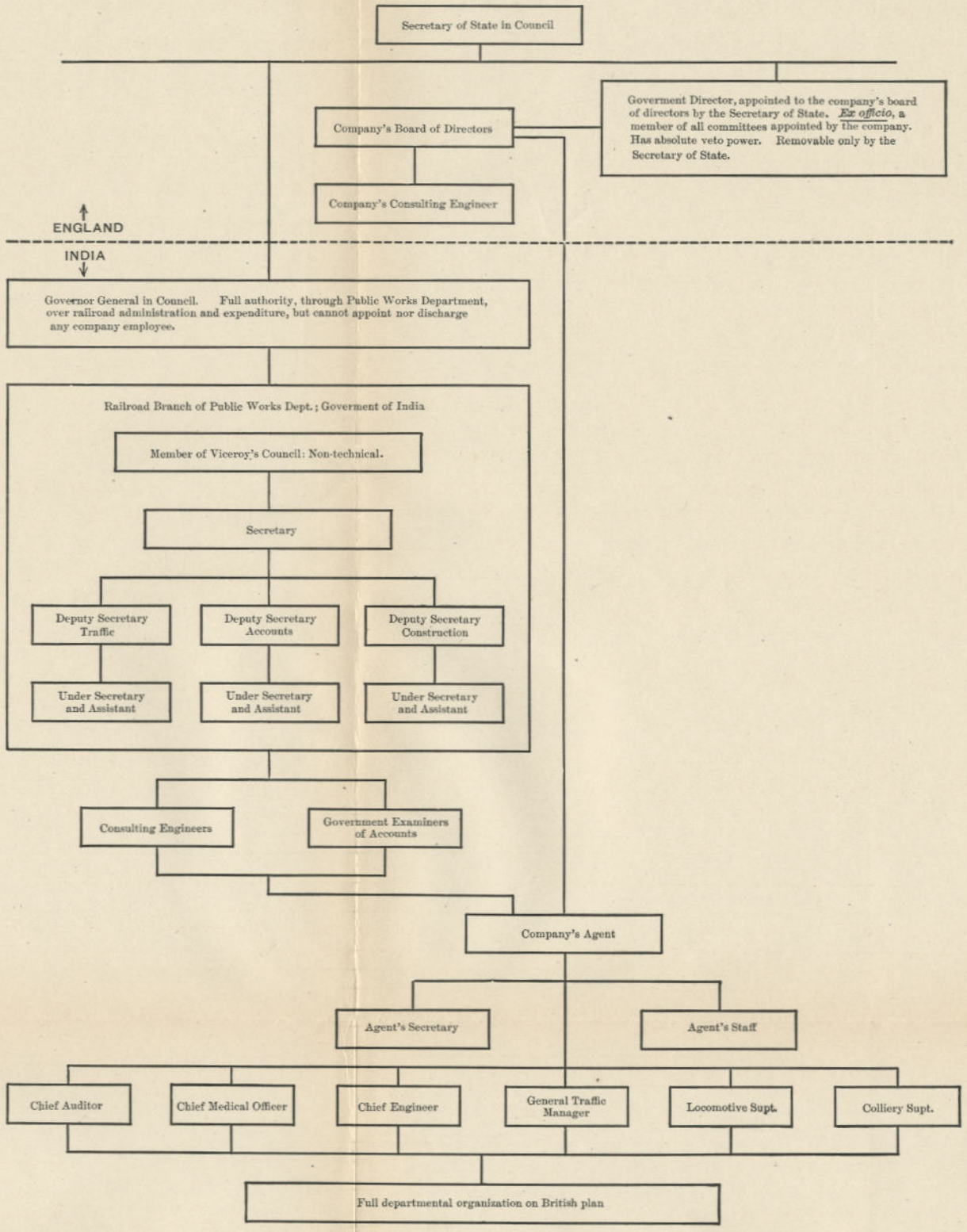
(9) The absence of that healthy control which a strong and judicious board of directors is capable of exercising. Mr. Robertson points out that when a body of men have a personal interest in and responsibility for the welfare of the business intrusted to them, their dividends depending on their proper conduct of it, they necessarily have a more powerful influence for good than can be obtained by any system of control which lacks personal responsibility for results.

Mr. Robertson felt that the disadvantages of direct state railroad management not only outweighed its possible advantages, but were much heightened by a situation where state management and private management existed side by side, and he recommended that the government should lease all its railroads to private companies to operate.

His recommendations were not carried out in their entirety, and his recommendation that the state put the operation of all the lines in private hands, was not carried

TABLE XXIV

ORGANIZATION OF THE EAST INDIAN RAILWAY AT THE TIME OF THE ROBERTSON REPORT, 1903



out at all. But certain important changes in the scheme of government organization and administration followed his report. In 1905 the arduous duties performed in relation to new railroad projects by the secretariat of the government of India were transferred to a general railway board, and railroad administration as a whole was transferred to this board from the Railway Branch of the Public Works Department, which was given increased powers. But in 1907 the government decided on some modifications of the control which it had exercised over the capital expenditures of Indian railroads through the body of consulting engineers (see Table XXIV). This control had been very detailed, extending not only to matters of engineering and expenditure, but to almost all questions, both executive and administrative, connected with railroad working. Therefore, in January, 1908, certain powers of sanction and of administration were delegated to the company's boards, which were requested to intrust their chief representatives in India with a considerable portion of their own powers, the government reserving the right to reimpose more detailed powers of control if circumstances should require it, while the appointment and duties of the provincial consulting engineers were abolished, except that it was provided that their work as inspectors should be carried on by officers specially charged with that duty. Subsequently, a finance committee, appointed in 1907, made a report in March, 1908, through which the railway board became the railway department of the government of India.

From the organization viewpoint, the most important recent changes have been the increase in the powers given

the companies' local agents and the reduction in the authority granted the consulting engineers. The defect in the old arrangement was that the consulting engineer had so much authority that he was practically a controlling officer at the same time that he was a government inspector; a concentration of authority absolutely wrong in principle. The underlying idea of the recent reduction of the powers of this consulting board to cover inspection only is that the government, while retaining full power of control, shall exercise very little control.

To summarize the situation in India, it may be said that the control of railroads for which the government assumes financial responsibility (and these constitute most of the mileage) has, on the whole, been satisfactory and harmonious. The difficulties have been occasioned by two prime causes: the existence side by side of government administrative officers and company administrative officers and the attempt to refer too many decisions on current affairs to the home board in England. As we have seen, the board of directors of a British railroad takes its responsibilities seriously, and likes to pass on matters which in this country would be delegated at least to the executive committee, and probably to the general manager. This form of administration works well enough when the board meets frequently and is close to the railroad; but when it is separated by the distance between London and Bombay or Calcutta, results are bad.

To meet these difficulties the government has apparently done the two important things: it has made the consulting engineers, who were formerly administrative officers,

inspecting or staff officers only, and it has urged the companies to give their agent, or Indian general manager, full current authority.

It is rather curious that the earnings of the Indian railroad system and the Italian railroad system are about the same, averaging not far from $5,000 per mile gross. But the Indian system works for about fifty per cent of expenses, with rates and fares which are quite low, especially the passenger rates, while the Italian system, with rates and fares which are quite high, has never been able to operate for very much below seventy-five per cent of gross. The conditions in the two countries are enormously different, and it would be extremely hazardous to make any strict comparison of operations. But the Italian railroads, unfortunately for them, have always been in politics; the attitude of the government toward them has seldom been sincere, but has been influenced largely by the effect that a certain course of action or a certain set of promises would have on the politicians. This is a very grave defect, and the administration of most British colonial governments has been singularly free from it. The administration of the railroads of India has been conspicuously honest, and it has been placed in the hands of competent men, who used their best efforts to handle the property as it ought to be handled. There are grounds for thinking that if the government of India and the government of Italy should change places, it would not be many years before the Italian railroads were being operated for fifty per cent of gross, and the Indian roads for seventy-five per cent.

CHAPTER VIII

RAILROAD FINANCIAL ORGANIZATION

The financial organization deals with credit, as the operating organization deals with men—The assets of a railroad are less fixed and tangible in value than the assets of a mill or of a plantation—Two broad divisions of railroad financing: the proprietor and his stock; the creditor and his bonds, debentures, or notes—The way financial needs are met—The part played by the banker as underwriter of the railroad's securities—The transformation of small roads into big ones and the progressive changes in financing—What a bond is; the mortgage and its provisions—The organization necessary to market securities—The great American banking houses and the lesser ones; the work done by each group—The reasons why railroads need bankers.

THE operating and traffic organizations of a railroad are organizations of men. The financial organization is an organization of credit. In one case the problem is so to plan things that an army of men—eighty regiments, on the Harriman lines—can be made to work in an efficient and highly standardized manner. In the other case, the managers must so arrange that ten or twenty thousand shareholders and creditors can furnish, and will want to furnish, the huge capital funds which must be invested in the property before a dollar can be earned. An immense amount of clerical work attaches to the financial department of a

railroad, and it must be carefully organized, especially to prevent fraud and carelessness. This is a task that presents few problems that distinguish railroad fiscal work from the collections and disbursements of a large bank or of a trading company, however, and the principal features of it have already been outlined in the chapter on the officers.

The organization of railroad credit is a subject by itself, differing in some important respects from the organization of any other kind of credit. The factory manager can borrow on his buildings and machinery, present or prospective; current prices fluctuate, but their ordinary limits are pretty well known, and he can start with a small plant and enlarge it by degrees, his credit resting on tangible physical assets, with due allowance for management. The merchant negotiates loans based on his stock in trade; the realty operator borrows against known land values; the farmer can obtain credit up to a percentage of his normal crops; the banker makes a small beginning and increases his working capital by degrees, securing his loans by collateral which is presumed to be convertible.

But the railroad needs a large sum of money to start with, and its values are neither fixed, easily ascertainable, nor convertible. To build and equip a line 100 miles long in hilly country, where there are occasional streams to be crossed, will probably cost $3,000,000; in some districts it will cost double or treble that sum. No public statement has been made of the cost of the Western Pacific, or of the Virginian Railway, or of the Carolina, Clinchfield & Ohio, three roads recently built with low grades in

exceptionally difficult country, but it is a safe presumption that no one of the three was built for less than $100,000 a mile.

This great sum must be secured in advance, on faith, and the best traffic expert in the world does not *know* what the new line will earn. He knows what similar lines, elsewhere, have earned, and this is his best guide, but there are many variables, many differences to be considered which cannot be measured by any certain rule, especially when it must be decided whether it will pay better to have a line with high first cost and low operating expenses, or low first cost and high operating expenses.

To induce public participation in the enterprise, in view of these facts, two kinds of financing have been devised, which broadly cover the whole field. One rests on the certificate of joint proprietorship, called, in this country, stock; the other, on the railroad company's promise to pay a specified sum at a specified time, with periodic interest at a specified rate. These promises to pay exist in a considerable variety of forms, which will be discussed later; in their most frequent forms they are called bonds.

The difference between the two forms of financing is elementary. The railroad does not promise to pay the stockholder anything, but he is a proprietor of the enterprise. With the other proprietors, he is entitled to a pro-rata share in all the profits, after expenses, including bond interest and taxes, have been met. The bondholder, on the other hand, is not entitled to any share in the profits at all, but he is a creditor, and must be paid all that is due him before the proprietors can divide anything. Broadly

speaking, therefore, the bonds are intended to attract the investor who is willing to receive a small return on his investment if it be well assured; the stocks, to attract the man who is willing to take a risk for the sake of larger potential returns.

In American practice, the managers of a new railroad usually calculate what they estimate to be the safe minimum earnings of the line they are about to build, and then issue bonds in such amounts that the total interest charge will not exceed this minimum revenue. But the money received from the sale of these bonds usually is not sufficient to pay construction costs; therefore stock is issued also, in such amounts that good dividends can be paid on it if the venture is a success.

Let us suppose that the promoters of the line 100 miles long, already referred to, feel confident that it can be built for $3,000,000, and that it will earn an assured minimum of $4,000 per mile, gross, and operate for seventy per cent. On this basis total gross earnings would be $400,000 a year, with net earnings of $120,000. This will pay the interest on $2,400,000 of five per cent bonds. These bonds cannot be sold at par, however; there are plenty of securities on the market far better secured which yield the investor five per cent on his money. The new road will do well if it gets them underwritten at 90, or $900 cash for each $1,000 bond, and this will give it only $2,160,000 of the needed $3,000,000.

To make up the difference, the underwriters agree, let us say, to take an additional issue of $2,400,000 stock—$500,000 five per cent preferred stock at 70, and $1,900,000

common stock at 40. The finances of the new road may now be tabulated as follows:

To cost of road.....	$3,000,000	By sale of $2,400,000 bonds at 90.....	$2,160,000
Interest on bonds during construction...	120,000	By sale of $500,000 preferred stock at 70	350,000
Working capital	150,000	By sale of $1,900,000 common stock at 40	760,000
Total	$3,270,000	Total	$3,270,000

Thus the new road has secured its construction costs, and a slim working balance as well. Let us assume that it actually earns the contemplated $4,000 per mile, gross, and operates at seventy per cent during the first full year after it is built. In that case, bond interest can be paid without diminishing the working capital of $150,000, and taxes, at the outset, are light. Then times are good; industries locate along the line, and additional agricultural land is put in cultivation, while one or two little " boom " towns spring up, with considerable attendant increases in the freight traffic of the road, and the passenger traffic as well.

The next year gross earnings have risen to $4,800 per mile, and operating expenses, which do not quite follow gross, have fallen to sixty-six per cent because the maintenance costs and officers' salaries are substantially unchanged from the year previous. This leaves net earnings at thirty-four per cent of $480,000, or $163,200. Taxes absorb, say, $13,200, and the remaining $150,000 pays bond interest and leaves a margin sufficient to pay the full pre-

ferred stock dividends if the directors think it safe to sail so close to the wind.

Meantime, the country continues to develop; the " boom " towns take root and increase in size, while, as is the case with all new communities, made up almost wholly of enterprising, producing men, the per-capita payments for transportation service are very high. Five years from the inception of the enterprise the railroad finds itself earning more than double its fixed charges, and paying small dividends on the common stock, which now has a market value, say, of $75 per share, in anticipation of increases in the dividend rate.

The managers have been successful; they are confident of further success if they build several extensions. Moreover, no such difficulties present themselves in financing these extensions as were present at the beginning of the enterprise; the earning power of a railroad in this particular district is no longer a matter of great uncertainty, and the company has established credit. The question for the directors to determine is the precise form of financing, or of organized credit, which will best suit their particular needs. As security for a new loan they have not only the branch line mileage which they propose to build, but also the *equity* in the earnings of the old line, over and above its charges. Their former loan was secured by a first mortgage on 100 miles of railroad; to build 100 miles of branches, with somewhat lighter construction, they figure that they need $2,000,000 additional. Therefore they decide to create a " first and refunding mortgage " on the whole system, and to authorize $5,000,000 of bonds under

it. Of this sum, $2,400,000 is specifically reserved, unissued, to retire the old debt at its maturity; $2,000,000 is to be issued, at the rate of $20,000 per mile for branch line mileage as it is built and certified to by the chief engineer, and $600,000 is not issued at present, but is reserved for future contingencies.

The managers will not be able to get these bonds underwritten at par, but the bankers' commission will be smaller than in the previous instance, because the earnings of the old road are sufficient to make it reasonably sure that the company can pay its interest charges, even if the branch lines do not bring in the contemplated revenue. The issue is ultimately underwritten at 95, or $1,900,000 for the $2,000,000 construction bonds, and the company meets the balance required by a small additional issue of preferred stock.

Ten years later additional important extensions are made. The company has done well; it is paying seven per cent on its common stock, and this stock is selling at 120. Thus the credit of the enterprise is excellent, but it is somewhat difficult to place bonds effectively because the old firsts have not yet reached their maturity; the first-and-refundings are next in line, and the lien of new bonds on the older portions of the line would be rather remote. On the whole, the sale of new stock seems the best way of extending the credit organization. This new stock is offered to holders of the old stock at par, on the basis of one share of new for every two shares of old. Thus the company, in effect, pays seven per cent for its money, but creates no new obligation, and is that much further away from insolvency in times of panic.

The road is now 250 miles long; solvent and prosperous. The managers wish to build 250 miles of extensions and make an entry into territory which they feel assured will well repay them, but it would be a serious strain on the credit of the old road to finance the project. Consequently, as directors of the successful North & South Railroad Company, they propose to their bankers that they underwrite the securities of the Southern Extension Railroad Company, with the understanding that the North & South Railroad Company control the Southern Extension Railroad Company by the ownership of all its common stock, and that the older company guarantee the bonds of the younger.

This financing may be plotted as follows:

To cost of 250 miles "Southern Extension R. R." at $25,000	$6,250,000	By sale of $6,250,000 5% bonds guaranteed by North & South R. R., at 90	$5,625,000
To working capital and interest during construction	551,000	Advanced by North & South R. R. from sale of its $600,000 unissued bonds at 96	576,000
		By sale of $1,000,000 Southern Extension R. R. preferred stock at 60	600,000
Total	$6,801,000	Total	$6,801,000

The margin of working capital is none too great, and it is found in this case (as it usually is found) that construction costs exceed the engineers' estimates. To meet a deficiency of $600,000, the North & South Railroad issues

three-year notes, which are simply promises to pay, unsecured, and accepts in return second mortgage bonds of its protegé, the Southern Extension Railroad.

The situation is now precarious. The North & South Railroad is a good earner; there is every reason to suppose that the Southern Extension Railroad also will be, but as yet it is earning nothing, and the charges of a 500-mile line must be met by the earning power and credit of a 250-mile line. If the management is lucky—if its own capital needs come in a period when the security market is brisk, and if its extension proves a good earner from the start—the crisis can be tided over, but if the elements of chance run against it, a receivership will be the probable outcome. Then interest on the bonds and notes is defaulted, and the bondholders, as creditors, take possession of the property. When times are again propitious, there is a reorganization; usually the former shareholders are assessed, pro rata, to provide current funds, and the property again becomes solvent and prosperous.

Assuming that the North & South Railroad and the Southern Extension Railroad escape receivership, however, and that the new line is able to carry itself, the next step is usually a merger of the two properties. The North & South Railroad already owns all the Southern Extension common stock; at a favorable time it creates a general mortgage, and offers the new bonds in exchange for all the outstanding bonds of both companies, and offers bonds or stock for the preferred stock of the Southern Extension Railroad, on terms advantageous to the original holders. Very likely this offer is made at the time when the original

North & South bonds fall due; in that case the new bonds become a first mortgage on the old line. On the new lines, some of the bondholders will accept the exchange offered and some will not, the result being that the new general mortgage bonds are a mixed lien, becoming a first mortgage on part of the line and a second mortgage on the rest, with a reduced amount of prior liens taking precedence of them.

The processes outlined above have been exemplified again and again in American railroad history, subject to many greater or less variations. The financing of the Western Pacific by the Denver & Rio Grande is a reasonably close parallel to the illustration afforded by the imaginary case of the North & South Railroad and the Southern Extension. The St. Paul extension, incorporated first as several distinct local roads which were subsequently merged into the Chicago, Milwaukee & Puget Sound, was financed originally by the sale of Chicago, Milwaukee & St. Paul stock to former stockholders, additional funds having been provided later on by a new issue of the parent company's bonds.

The whole growth of local railroads into great systems has been accomplished by a gradual extension of the credit organization, accompanied by a good deal of inevitable complexity in the issue of new securities. Out of this situation has grown an immense list of bonds, of every imaginable degree of security, from the old first mortgage bond outstanding at a low rate per mile on a gilt-edge main line, to the discredited income bond having no lien on anything except surplus earnings, if there happen to be any.

A bond is a promise to pay, as has been pointed out.

But in American railroad practice it is customary to secure this promise by making over to a trustee " to have and to hold " a certain tangible piece of physical property, until principal and interest in full have been met on the original loan. The loan rests on a mortgage, which is a formal and technical document deeding the property mortgaged to a third party in trust, subject to repossession by the original proprietors after they have performed the stipulated obligations which they impose upon themselves. In case the proprietors are unable to carry out their agreement with the bondholders, the mortgaged property reverts automatically to the trustee, who acts, under supervision of the courts, in such manner as best safeguards the interests of the creditors.

The form which this agreement takes can best be shown by excerpts from existing mortgage indentures. For example, in the case of the Louisville & Nashville Unified 4s, the agreement is stated as having been entered into by and between the Louisville & Nashville Railroad Company, a corporation created and organized under the laws of the State of Kentucky, and the Central Trust Company of New York, designated the Trustee. A recital of the powers granted the company under its charter is then made, followed by a statement of the purpose of the company in issuing these bonds; its existing indebtedness is various in property covered, rates of interest, and maturities, and it wishes to unify this debt, as each of the underlying securities falls due, by purchasing the old obligations or exchanging new, uniform bonds for them.

To carry out this purpose " and the other lawful purposes of the company," the company has determined to borrow money, " and to make and issue its bonds to an amount not exceeding in the aggregate of the principal thereof, $75,000,000; each of said bonds to be dated the second day of June, 1890, and to be payable at the office or the agency of the company, in the City of New York, on the first day of July, A.D. 1940, in gold coin of the United States, of or equal to the present standard of weight and fineness, and to bear such rate of interest not to exceed four per cent per annum, as shall be, from time to time, determined upon by its Board of Directors,[1] free from all United States, State, and Municipal taxes that may be required by the law to be deducted from said interest."

Then follows a description of the form of the bond, and of the company's determination that each bond shall be certified by the Trustee in a prescribed manner. On the face of each bond is printed an agreement, which provides, among other things, that if the company or its successors shall make default in the payment of any semiannual interest on the bond for six months from the time said interest becomes due, and payment thereof is demanded, " then the principal hereof shall, on the terms and conditions provided in the mortgage securing this bond, become due and payable, and may at once be enforced." The statement on the face of the bond also affirms the fact that all the bonds of this series as may be issued are equally secured by, and subject to the provisions of the mortgage,

[1] This provision is unusual. Ordinarily the rate is fixed.

duly executed and delivered by the Louisville & Nashville Railroad Company to the Central Trust Company, " conveying to said Trust Company, in trust, the railroad property and other property, equipments, franchises, rights, and privileges of said Railroad Company now or hereafter acquired as mentioned in said mortgage, upon the terms and conditions therein set forth, to which reference is hereby made."

Seven printed pages of the mortgage indenture are devoted to listing the property thus " granted, bargained, and sold, transferred, assigned, set over, released, conveyed, and confirmed " to the Central Trust Company. A characteristic item, for example, lists " the Bardstown Branch of said railroad, extending from Bardstown Junction, on said main line, to Bardstown, in the State of Kentucky, a distance of 17.37 miles." The property list, moreover, includes various holdings of the securities of subsidiary companies. But we know from the purpose of the company in creating the mortgage that it is subject to a number of underlying liens. These are all set forth in great detail, the recital filling four printed pages.

Then the mortgage indenture proceeds to state formally the various facts about the amount of the issue and the form of the bonds, many of which were previously mentioned, descriptively, in the preamble—the " whereas " part of the indenture. But the formal statement goes into detail which is supposed to be exhaustive, prescribing with the utmost minuteness the purposes for which the new bonds may be issued and may not be issued, so that original purchasers shall be in no uncertainty in regard to the

action of future boards of directors. For example, " It is understood and agreed, however, that the Company shall in no case use and disburse, in the purchase of prior outstanding bonds, the proceeds of more than one thousand dollars, par value of said bonds sold in advance, for each one thousand dollars, par value, of prior outstanding bonds purchased." The company also covenants that the outstanding prior liens do not exceed $41,917,660, and that this sum shall not be increased, " directly or indirectly, in any manner whatsoever." The mortgage specifies that bonds may also be issued, at par, at a specified rate per mile against certain classified kinds of new extensions and specified forms of betterment work, purchases of additional railroads, etc.

These authorizations and limitations fill fourteen pages of the mortgage. Then follows a stipulation that, " until default shall be made by the Company, in the payment of the principal or interest of the bonds hereby secured, or some of them, or in respect of some act or thing, covenant or agreement, herein required by it to be done, performed, or kept, the Company shall be suffered and permitted to possess, manage, operate, and enjoy the said lines of railroad, divisions, and branches," etc. Provisions are then made in full detail outlining the procedure of the Trustee in case of default, and the Trustee is also vested with certain authority to release from the mortgage property included under it which, in the Trustee's judgment, is unnecessary. There follow certain further definitions of the Trustee's duties and pledges of good faith on the part of the company in the execution of its contract, and finally

there are many pages of printed forms which the clerks of all county courts sign, in the district traversed by the railroad, attesting that they have received and recorded the mortgage.

The entire mortgage, with its certificates of attestation, is a document rather more than half as voluminous as this book, and it is by no means exceptional in this regard. Thus the formalities with which the mortgage creditor surrounds himself are in striking contrast to the proprietor's certificate of capital stock, the entire authority for which ordinarily rests on the recorded action of the directors, usually brief, while the certificate itself contains the name of the railroad, a statement of the par value of the stock and of the number of shares which the certificate represents, and, occasionally, a statement of the total capital issue of which it is a part.

The railroad's promises to pay take a good many forms, and many of them are technically unsecured; that is to say, no specific property is deeded in trust to cover them. A form of financing common a generation ago and to-day, though it was not used by railroads for many intervening years, is the convertible debenture. The indenture of an issue of debentures, whether convertible or not, often provides that, "so long as any of said debentures are outstanding and unpaid, the railroad company will not make any new mortgage upon its railroad (other than upon leased lines) without also thereby including therein every debenture issued under this indenture equally and ratably with every bond or debenture issued under and secured by any such mortgage; but this covenant

shall not prevent the renewal or extension of any existing mortgage."[1]

In the case of the convertible debenture, the holder is given the additional privilege of exchanging his debenture for the company's stock, sometimes at his option, but usually after the lapse of a specified number of years. The price of stock at which this conversion may be affected is stipulated; sometimes the exchange may be made dollar for dollar; sometimes the conversion power of the debenture calls for a less amount of stock than that represented by the par debenture value. The Union Pacific Convertible 4s were convertible into stock at 175; that is to say, it took $175 par value of debentures to obtain in exchange $100 par value of stock. So long as the market value of the stock was below $175, the conversion feature of the debentures had only a speculative value, but when the stock went above $175, the market value of the debentures rose accordingly.

Convertible debentures have been popular as "business men's investments," because, while ranking ahead of all the stock and having many of the properties of a bond, though unsecured by deed of specific property, their holders could share in the prosperity of the company, if at any time within the period during which conversion might be effected, the capital stock, at the specified rate of exchange, should prove more desirable than the mere promise to pay a specified sum with specified interest. The holders were creditors if times were bad; they could become proprietors on advantageous terms if times became good.

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[1] Michigan Central Debenture 4s of 1909.

Collateral trust bonds are bonds secured by a deposit with a trustee of various securities, either stocks or bonds or both, which, in case of default, are sold for the benefit of the collateral bondholders. They may be described as secondary, rather than as primary securities, since they rest on some other promise to pay, or certificate of proprietorship, than their own.

Perhaps the note is the simplest of all the forms taken by a railroad's promises to pay. Usually unsecured (except in the case of equipment notes, discussed below), this form of financing would have little attraction for investors if it covered protracted periods. In practice, the use of the note is to tide the company over brief periods when it needs a limited amount of new capital, but is unwilling or unable to place a new issue of bonds or stock on a satisfactory basis. A note issue is, in effect, a gamble that conditions for permanent financing will be better in one, two, three, or five years than at the time. If they do not prove to be so, the company is worse off than it was before it issued the notes. But they usually cover a relatively small sum, representing some pressing need rather than a systematic plan, and, by paying a high interest rate for a brief period, the company, if it is fortunate, avoids paying a rate which it deems excessive on long-term bonds. Around 1906 large amounts of notes were issued, because the market was exceedingly unfavorable to new issues of stocks and bonds.

Equipment notes, or car-trust notes, are a different matter. A railroad negotiates a loan on new cars and locomotives, which it has ordered, and deeds them over to the

trustee, just as main line mileage is deeded over. But equipment wears out in service, and is destroyed in fires and wrecks; consequently equipment notes usually run for a period well short of the probable life of the equipment—say ten years—and provision is made for their retirement serially, so that at the end of the ten years or less the equipment, or what is left of it, is owned by the railroad company in fee, while all the pledged equipment remains in trust until full final payment. These notes have been well described as a deferred charge against the income which the equipment is expected to earn; their security and salability are usually good.

It would be possible to enumerate many other forms of corporate obligation on which railroads raise capital in this country, but all could be broadly classified as secured or as unsecured promises to pay. The forms of security vary tremendously; an income bond, for example—which should scarcely be called a bond at all—usually promises merely a first call on surplus income. Market value rests directly on the security, as appraised by bankers and investors, in conjunction with salability—the relative ease with which a bond of this special character can be sold in a special market.

The financial organization of a railroad does not consist merely in devising good and safe forms of bonds, however; it must also find the market for them, and keep in expert touch with that market at all times, since, so long as the country continues to increase in population and trade, railroads will continue to do new financing. The early railroad builders probably expected to pay off their bonds at

maturity, but nobody expects anything of the sort now; there is a great difference between the kind of freight and passenger rates that suffice to earn six or seven or ten per cent on the capital investment, and the kind that would earn enough to make securities marketable and also to pay them off at maturity. Nor is there any economic reason why proprietors should forego a return on their present investment for the sake of presenting to future generations a railroad system free of debt.

Only where property wears out or is used up is it necessary to provide for extinguishing the debt on it, and a railroad, maintained out of current income, neither wears out nor is used up. So its capital debt need not be paid off, but provisions must be made for refunding capital issues as they fall due. The railroad will give the bondholder his cash at maturity, " in United States gold coin, of a standard of weight and fineness equal to the present standard," if he wants it, but most bondholders are willing to exchange old bonds for new ones, provided the investment is made as attractive as any other current use to which their funds could be applied. Otherwise, old bondholders will not take the new bonds, and the issue will be thrown back on the underwriters, who must pay the old bondholders off and receive the new bonds themselves.

This brings us to the position of the underwriter in railroad financial organization. Theoretically, this third party, intermediate between the issues of bonds and the final buyer, could be dispensed with. A new venture often has no underwriting at all, the bonds and stock being peddled locally among residents along the projected route. But

this system has many disadvantages. Farmers and country merchants are not ordinarily large buyers of securities of any kind; they are producers themselves, and need their money in their own business. The best market for the securities of a railroad in Oregon is quite likely to be among the wealthy individual investors and investing institutions, such as the great insurance companies in New York City. But the Oregon railroad cannot itself keep in touch with these investors, three thousand miles away; that is a business by itself, requiring years of experience and a large and efficient selling organization.

In renewals of existing bond issues, the problem is even more critical. A railroad has a $50,000,000 bond issue maturing June 1st. Its cash and liquid assets amount to $6,000,000, or perhaps to only $3,000,000. The directors plan their new financing so as to offer each old bondholder a new bond that will satisfy him, taking current market conditions into account, but if they plan mistakenly, they are liable for the whole of the $50,000,000 *in cash* at the expiration of the time stipulated in the mortgage; perhaps sixty days after the bonds fall due. If they cannot find this cash or find something that the old bondholder will accept instead, their company is insolvent. Moreover, even with the best of financing, a certain proportion of the old bondholders will elect to receive cash instead of new securities, and to provide this cash new bonds must either be sold in increased amounts to other old bondholders, or new investors must be found, and found instantly.

No railroad will assume any such responsibility, if it can avoid it. So the new financing is underwritten, or

insured, by a large banking house or trust company, which buys from the railroad the entire issue, or contracts to buy all which present creditors do not seek in exchange, at a specified sum which will enable the railroad to meet its obligations.

This is a very important service; naturally it is not performed for nothing. The financial officers of the railroad either ask for bids on their new issue or else bargain privately with the banking house where their credit is strongest, and the banker quotes a price which his experience has taught him will enable him, with a fair degree of certainty, to sell again at a profit. The amount of profit he calculates on depends wholly on the risk he must assume; if the bond market is brisk and the securities are excellent, he is willing to underwrite the issue for a small profit; if the market is bad and the bonds are shaky, he will properly require a large margin, since his prospective profit may readily be converted into a loss.

When the underwriting is completed and the appointed time arrives, the railroad receives the entire sum of money from the bankers, and has no further share in the problem of finding the new funds. But the work of the banker has only just begun, except in these rare cases where he receives more applications for the new bonds than he has bonds to sell—where the issue is oversubscribed, as it is termed. Ordinarily, he himself must borrow the money which he pays the railroad, depositing the railroad's securities as collateral for his loans, and then he must exert his selling organization to place these bonds which he himself has already bought, and paid for with borrowed money. This

borrowed money is drawing interest every day; if the market for securities is rising and call-money rates are moderate, this fact may be of relatively small importance, but if the market is growing worse and the money rate is high, time is an element of first importance; every day that the securities remain unsold reduces the banker's profits at both ends—through the interest rate he himself pays, and through periodic reductions in the price he can hope to obtain for the issue he has underwritten.

A study of the reasons why the American security market is peculiarly subject to wide variations, making the work of the underwriters especially hazardous, would involve a long digression from the subject at hand, so it is not attempted here. The way that the placing of the bonds covered by these great underwritings is effected is of considerable interest. There are three great banking houses in New York which are preëminent as primary underwriters of securities on a huge scale, J. P. Morgan & Co., Kuhn, Loeb & Co., and Speyer & Co., the house of J. P. Morgan & Co. being considerably the greatest of the three, with its affiliated group of banks and trust companies. Around each of these financial centers there are a large number of lesser private banking houses which in effect supply the sales force for the primary underwriters. These lesser houses do considerable amounts of primary underwriting themselves, either singly or in combinations, but the biggest issues and the toughest financial problems naturally fall to the leaders. One of these great houses underwrites a large refunding issue of bonds, say at 95 per cent of par value, and immediately offers blocks of the

securities to the junior banking houses, perhaps at 97, or a two-point profit. The junior houses then proceed to act as retailers, placing the bonds among their own customers all over the country. For mutual protection, the primary underwriter usually specifies a minimum price at which the bonds can be retailed. Thus the distribution, which is the work of many hands, is spread out widely, while the original credit is concentrated and at the same time the risk of the original underwriter is greatly reduced, or removed entirely.

In cases where a railroad provides new funds by offering new stock to former stockholders, pro rata, at an attractive price, the work of the underwriter is minimized, but a contract is usually made with some banking house to take, at a specified price, all the new stock which is not subscribed. The railroad cannot efficiently maintain a stock-selling organization, and must arrange to have this part of its work done for it. In practice, each great American railroad is apt to do its financing through the same channels for long series of years, and there thus arises an obligation on the part of the banker, very real, if he wants to hold the business, to stick to his customer through thick and thin, and aid and protect it in times of stress. This sort of relationship has been well exemplified in the financing of the Erie and the Southern Railway by J. P. Morgan & Co.

Thus it is seen that the financial organization of a railroad, the credit organization, is no less tangible and constant than the operating organization, but that it is maintained largely outside of the railroad offices. The basis of

the credit rests squarely on the physical assets and operating record of the road, but a railroad is organized to sell transportation, not securities, and for this latter task, which must be performed continuously and ably if it is to do business at all, it must turn to the specialists in credit.

CHAPTER IX

THE PUBLIC RELATIONS OF A RAILROAD

Relations with customers and with governing bodies—Corporate bad manners—The passive attitude of the American Railway Association—The Roosevelt legislation and the new commissions—An estimate of the Interstate Commerce Commission—The three great sources of the unpopularity of the railroads: rebates, claim departments, and station agents—The difficulties which beset an attempt to give honest and popular service—There is still room for improvement in the diplomatic work of the railroad—The value of harmony, and some methods for securing it—The overturn of the old corrupt system—The fallacy that an overcapitalized road can raise its charges in competitive territory—Cost of service and value of service in rate-making—Statutory attempts to prevent overcapitalization.

A RAILROAD has two kinds of public relations. It comes into public contact with its customers, and also with governing bodies, municipal, state, and national. At the present time, determined efforts are being made by the roads in every part of the country to keep relations with their customers constantly adjusted on a friendly and reasonable basis, but this has by no means always been the case. There cannot be the smallest doubt that a persistent condition which may be described as corporate bad manners was in large measure responsible for the exceedingly bitter

attacks upon railroads which characterized the so-called Granger period, in the seventies, and, more recently, in the Roosevelt administration. In large measure, but not wholly, for there was also the element of mere bigness, and that of absentee ownership. It was easy for the Iowa farmer who had some petty grievance against the railroad to feel that he—an American citizen and the legal equal of every other American citizen—was being crushed by a huge corporation which was well out of his reach in the courts, and could be as arbitrary as it pleased in all the details of its arrangements to perform transportation services for him.

The aggrieved farmer or small shipper did not consider how much better he was served by an arbitrary railroad than anybody could possibly have been served before the railroad came; he knew that the largest concerns, with whom he had to compete, got their transportation on more favorable terms than he did, and he saw obvious evidences of strong-handed control of state legislation in the railroad interest. That he himself and his neighbors were electing representatives who have been well described as legislative highwaymen, did not concern him; he observed only the laws that were enacted, not those that were threatened, and withdrawn for a consideration. Any fair-minded analysis of American railroad legislation must take into consideration the fact that there was a long list of deplorable wrongs on both sides of the ledger.

But it was extraordinarily shortsighted of the railroad managers to let these wrongs pile up until they provided an inexhaustible store of ammunition for the politician

seeking a party issue. The American Railway Association has a heavy responsibility for this situation. Purporting to represent the joint interests of the railroads of the country, it has buried itself in formalities and trivialities; it has resisted public opinion when it should have led it, and it has remained inactive while the cure for recognized abuses has been applied by the clumsy hands of the lawmaker. The American Railway Association ought to have stopped rebating; it ought to have been alive to every broad complaint of discrimination, and of lobbying, and of excessive charges for service performed. The difficulties in its way were great, but they were not insuperable, and hundreds of the able executives who have been included in its membership must have foreseen the trend of affairs. It is one of the most unfortunate things in American railroad history that this great association should have put itself in the position of working against the government, instead of with it, in the correction of many curable defects of administration.[1]

It is impossible to make even an approximate estimate of the real public feeling that was behind the Roosevelt

[1] I have been criticised for the point of view here expressed, on the ground that the association was purely an operating body, and rarely, if ever, considered traffic problems. But at a time when the people were conscious of grievances and were in a temper to enact hostile legislation, it seems to me that the only body competent to deal with the situation was the existing conference of presidents, vice presidents, and general managers. If the American Railway Association had broken away squarely from its tradition of non-interference in 1905, and by majority vote had used its potential strength in the interest of the common good, I believe the political history of the last five years would have been very different.

legislation. The issues were popular, because they involved doing something to big people for the supposed benefit of little people, and the Congressional hearings on rate regulation and its attendant circumstances were ably conducted. But of the mass of hysterical state legislation that followed in the wake, only a tiny proportion was a careful, efficient expression of tangible public grievances; the railroads found themselves a political issue, and the angriest speaker went farthest in the public favor, while hostile sentiment throve on the food given to it. The result found expression in two forms: direct legislation, such as that fixing rates, especially passenger rates, since these were tangible and readily computed on a mileage basis, and indirect legislation, creating commissions with power over rate making and many other features of railroad management, including, frequently, the terms on which new securities could be issued.

Much of the direct legislation, conceived in a state of public excitement, has since been declared unconstitutional, after certain historic clashes between the state and federal courts, especially in the South. The indirect, or commission-making legislation, has fared better. The state railroad commissioners, as a class, are not well equipped for their work; their responsibilities are heavy, and particular care has often been taken to choose men without any actual experience in railroad management.[1] But the worst of the

[1] The following facts about the state commissions in 1908 are summarized from an article by Samuel O. Dunn in the *Railway Age Gazette*, January 15, 1909:

The commissioners of eighteen states are appointed by the gov-

commissioners, whose training and interest was purely political, have not cared for the incessant attention to business that their appointments called for, and their negligence has had the effect of moderation. On the whole, a surprisingly large number of the appointees have really tried to grasp the complex situation and to be fair. With every succeeding year of their tenure in office, they have understood the problems of a railroad a little better, and, in spite of occasional irritating and costly blunders, it is safe to say that the state commissions are growing wiser, and that their administration is less harmful than the best judges thought it was going to be.

ernors, and of twenty-two are elected by the people. The number of lawyers on the commissions (forty-two) is much larger than the number of men from any other vocation. Many of these lawyers have been active politicians, but four were formerly judges—an excellent qualification. The commissions also include thirteen former railroad employees, including the ex-foreman of a blacksmith shop, a telegraph operator, and three conductors. They include five "business men," three merchants, two cotton factors, two real estate dealers, two newspaper men, five manufacturers, three engineers, twelve farmers, six bankers, an insurance agent, a contractor, a liveryman, a coal operator, a teacher, a lumberman, an economist, a state land agent, a sheriff, a commissioner of labor, and a physician.

The salaries paid these commissioners do not tally well with their responsibilities, and constitute an additional reason why it is hard to get good men for the positions. In Florida, the commissioners are paid $2,500 each; in North Dakota, $1,200 each; in South Dakota, $1,500 each; in Vermont, the chairman is paid $1,500 and the other commissioners $1,200; in Iowa, $2,200 is paid; in Georgia, the chairman gets $4,000 and the other commissioners $2,500. Excluding the chairmen's salaries, there are only ten states which pay $4,000 or more, and New York ($15,000) is the only state which pays more than $8,000, although the commissions occasionally hire valuation experts and counsel at a higher salary than the commissioners themselves receive.

They add enormously to the difficulties of the railroad manager, however. Almost all railroads of consequence are interstate; they are subject to the rulings of the Interstate Commerce Commission and perhaps to half a dozen state commissions as well, and a state order changing a specific rate or group of rates is liable to affect the traffic structure and trend of traffic movement over immense areas outside the jurisdiction of the commission making the order.

The work of the interstate commission is materially better than that of the state commissions. It is composed of men with a better and longer training, and its direct work, on the whole, is nonpolitical, although the commission has constantly sought extensions of its powers, already immense. The obvious defect of all commission rate regulation is the tendency it creates toward inflexibility; managers rightly hesitate to make temporary rates or special rates to enable the movement of certain low-value commodities, if these rates are to be made a criterion for all the business of the road. It seems inevitable that the net effect of endowing the Interstate Commerce Commission and a group of state commissions with strong powers of rate regulation will be to keep freight and passenger rates at a somewhat higher level than they would be if unregulated.

The creation of these commissions has one extremely wholesome effect on the public relations of the railroad, however. They are at once the best possible safeguard against a government-ownership campaign, and the best assurance that there will not soon again be an anti-railroad

storm throughout the country. The popular feeling of helpless oppression by a tyrant corporation can find little expression when the tyrant is broken to harness, and guided by a commission chosen directly or indirectly by the electors. Moreover, a political campaign cannot be made very effectively on additional minor issues of the details of administration by the commissions; these matters are too intangible to arouse any enthusiasm in a mass of voters. The situation may be summarized by saying that the commissions are not likely to accomplish any permanent useful results in the fields for which they were created, but that their indirect effect as safety valves, and as promoters of harmony, ought to be considerable. It is more important to have a court of appeal than to use it; the great thing is accomplished when the public is satisfied that it is being treated justly, and that somebody is looking after its interest.

In the public relations which a railroad has with its customers, it is possible to localize under three principal heads the principal direct sources of unpopularity. These are, discrimination, the claim department, and the station agent. Discrimination has been removed from the situation by law; it ought to have been abolished years ago, but the difficulties in the way were great. Essentially a competitive device, it existed in a hundred forms, and no force short of the American Railway Association was competent to deal with it. The claim department, on the other hand, is an essential part of every railroad organization, but it takes the nicest judgment to make it at once efficient and fair. Railroads are beset by a perfect horde of im-

postors in every accident case. The "ambulance chaser," or shyster lawyer on the lookout for a share in jury-awarded damages, is as well known on the western prairies as he is in New York City. Every decrepit animal that is killed by a train is alleged to be blooded stock; every package of merchandise damaged in shipment is charged to the carrier, no matter how flimsy the original packing. Even where the claim agent can establish the clearest proof against the shipper, or show how slight was the actual injury to the passenger, a local jury will almost inevitably find in favor of its neighbors and against the great corporation.

The work of the claim agent, who must know all the facts and interview all the witnesses, is exceedingly toilsome, and there is much about it to make him suspicious of mankind in general. Yet, with full allowance for these undisputed facts, many railroad claim departments have been so administered as to stir up unbounded ill feeling, much of which was clearly merited. The claim agent must fight the impostor to the last ditch, unless it is cheaper to compromise with him, but when he is dealing with meritorious cases of actual damage, with the shipper whose perishable freight has been ruined by delay in transit, or with the merchant whose consignment of furniture, well packed, has been damaged by careless handling, he owes it just as much to his company as to the public to make prompt and equitable settlement.

On some roads this business is handled with admirable fairness; on others, the settled policy seems to be to pay no claim, just or unjust, that can be circumvented or out-

lawed by continued delay. The agent takes a week to answer the original complaint, and his answer is evasive. The second and third letters he forgets entirely; the fourth he replies to by confusing the issue with a preposterous counter claim. In the end, the man with the most influence or the loudest voice gets paid; the more obscure or more courteous claimant does not. Consequently, the swindler with a jury case gets his damages in a week, while the honest man without a jury case is defrauded, a perversion of justice that has been the cause of a tremendous amount of bitterness on the part of the small shipper and consignee toward the railroad.

The case of the station agent, as a trouble maker for his employer, is different. The station agent is the only representative of the road with whom most travelers and many small shippers ever come in contact. To provide an agent for every station, big or little, naturally requires a tremendous organization; the work is laborious, but not skilled, and appeals to a man of no capital and no special training. Consequently the pay is small and the opportunity for advancement not particularly good. When all these facts are taken into account, the general personnel of the station agent force throughout the country seems surprisingly good, yet there have been many special instances where the contrary was true. An agent who is rude, or dictatorial, never fails to make enemies for his company, and not infrequently is the source of an accumulation of petty grievances that find their expression at election time, or in the local jury's attitude of mind. Yet this is one of the hardest features of railroad operation to control, and

there were many years when it was largely ignored by the management, unless the cases were flagrant. Much care was taken to guard the company from theft; little attention was paid to petty evidence of local hostility.

This situation has greatly changed for the better in the last few years. Almost all railroads now appreciate the value of good public feeling as an asset, and they go about securing it in a more or less systematic way. Yet there is still room for improvement in what may be called the railroad diplomatic corps. Even the least of governments, the smallest of principalities, has an army to repel invasion, and a diplomatic corps to economize the use of the army. But a railroad, which has a good many points of analogy to a government in its public relations, has no efficient defensive forces. Yet it has especial need of them, because it is a very curiously shaped kingdom, being a thousand miles long, let us say, and a hundred feet wide, and wholly surrounded by other governments, which may or may not be friendly. The principality of Monaco, surrounded by the French department of the Alpes Maritimes except on the side toward the sea, contains about eight square miles of territory. It has an army of one hundred and twenty-six men, and a well-organized diplomatic corps. The railroad kingdom, a thousand miles long and a hundred feet wide, occupies about nineteen square miles of territory, but has neither army nor diplomatic corps, except in so far as the traffic department keeps in touch with the principal shippers.

Two ways of meeting this need have been tried. The alert superintendent or general manager reads the local

papers, and tries to find and remove the causes of criticisms of the company or of the service. This is especially carefully organized on the Harriman Lines, with their press clipping bureau under the supervision of the director of maintenance and operation's office. In this way the political attack can be differentiated from press criticism resting on genuine grounds, and the management can gradually localize real sources of complaint and take measures accordingly.

Another way of promoting local harmony, much used in recent years, is for the president or one of the vice presidents to travel extensively on his line, meeting boards of trade and speaking at banquets, so that to the leading citizens at least he is something more than a figurehead. This tends to correct some of the misunderstandings growing out of absentee management, but it has the disadvantage of requiring a vast amount of time, which is urgently needed in the direct conduct of the company's affairs. When the president is away, his work must either be done for him by somebody else, or it must accumulate on his desk. Either arrangement is unsatisfactory.

Probably the best ultimate solution of the difficulty is going to be found in a combination of these two methods. Railroad managers realize to-day more clearly than ever before that they cannot afford to neglect local sentiment, and that petty grievances and misunderstandings are just as costly in the railroad business as they are in the grocery business, although the costliness manifests itself in a different way. During the past two years many circulars have been issued from general offices to subordinate employees,

insisting on courtesy in dealings with the public, and there is a pronounced tendency to follow this up, and see whether or not the instructions are being observed. General harmony, from day to day, is best promoted by the watchfulness of the division officers, and they are sure to be watchful if the president and general manager really want them to be. For occasional hard jobs, where hostile legislation is threatened or efforts are being made to organize competing lines, the personal work of the senior officers of the road is urgently needed, in the open, where everybody can see it.

Not many years ago, President Mellen, of the New York, New Haven & Hartford, created something of a public sensation by appearing before a committee of the Connecticut legislature in person, and explaining exactly why he thought a projected competing line should not be given a charter; to-day, this sort of frankness on the part of railroad presidents is fairly common, and is exceedingly well received, as evidencing an intention to play fair, instead of working through the medium of the lobby. The importance of this both to the railroad and to the community can scarcely be overestimated. The atmosphere of the state legislatures in this country has not been a healthy one; a condition which the railroads have done much to foster by their shortsighted belief that the paid legislative agent was their only protection against the demagogue. At times, when the paid agent and the demagogue were one and the same, it must be admitted that there was foundation for this belief. A situation existed which could not be remedied without long, costly, and uncertain warfare, at

the expense of the stockholders, and so the railroad managers paid blackmail, and bought privileges, too; it was all part of the same vicious system.

One happy result of the legislative storms of 1905, 1906, and 1907 was to overturn this structure balanced in unstable equilibrium, and the ablest managers are now wiser than to try to set it up again. They believe that the same drift of affairs that has purified national legislation since the fifties is going to be felt at the state capitols, and few of them care to reëstablish the old lobbies.

The legal department of a railroad is not apt to be successful at the broad task of establishing harmony with the public. The local board of trade wants to be in touch with the principal, not the agent; the legislative committee sees so much of the attorney representing special interests that it discounts his arguments, and pays more heed to the operating or traffic officer who makes his appeal at first hand. The work that President Finley, of the Southern Railway, has done in bettering public relations in the South, and that James J. Hill and Howard Elliott have done in the Northwest, could not have been duplicated by counsel.

These efforts to improve the relations between the railroad and the community have no parallel in any other part of the world. In Great Britain the railway chairman is often hard beset by his shareholders at the semiannual meeting, but the public at large does not have to be conciliated; it has faith in the railway department of the Board of Trade as its representative in physical questions affecting way and structures, rolling stock, and safety

appliances, and in the venerable Railway & Canal Commission, on matters of rates and finances. On the Continent, where private and government ownership exist side by side, the influence of the government is dominating; only in a democracy, with privately owned lines and a national habit of perpetual law making, can a situation like that in this county arise. For the future, the commissions, state and interstate, give the best promise of relief, both to the country and to the railroads, but it looks as if their utility was likely to be in inverse ratio to their activity. Their value, as has been said, lies in the public confidence they beget, not in the rates they make.

The public relations created by the issuance of railroad securities have recently attracted a good deal of attention in this country, and it seems almost inevitable that national legislation will be enacted restricting the power of interstate railroads to issue new stocks and bonds except under statutory limitations. Such legislation has already been enacted in many states, and almost always on the totally false economic concept that the rates charged for the transportation service are affected by the capitalization. A member of the Interstate Commerce Commission recently had the hardihood to assert, at a large public dinner,[1] that the over-

[1] This was at the January, 1910, meeting of the New York Economic Club. Referring to the refinancing of the Alton, after the change of management in 1899, and to the Stock Exchange scandal when John W. Gates got control of the Louisville & Nashville, and had it subsequently bought away from him at a large profit to himself, "in both these cases," said Commissioner Clements, "the added amount in stocks and bonds was taken out of the pocket of the public in increased rates."

capitalization of the Chicago & Alton and the Louisville & Nashville had been paid for by the public in the form of higher rates.

Commissioner Clements's text gives a good opportunity for the discussion of this popular fallacy. The Chicago & Alton changed hands in 1899, and the new management proceeded to capitalize betterment work which had previously been charged to income for a long series of years. In the process the total of the company's stocks and bonds jumped from $33,010,450, in 1898, to $64,944,450 after the conclusion of the readjustments. This was bad financing, because it seriously damaged the company's credit. The Alton's wings were clipped by this transaction; it was thereby denied access to the money markets of the world for a long period of years, except on terms which might fairly be considered prohibitive.

But the statement that the Alton recouped itself after this financial debauch by raising its rates, or that it could have done such a thing, was nonsense. The Chicago & Alton runs from Chicago to St. Louis and Kansas City, serving a district which may be fairly described as the most highly competitive traffic territory in the United States. We may be pardoned for wondering what the Wabash, the Illinois Central, the Cleveland, Cincinnati, Chicago & St. Louis, the Chicago, Burlington & Quincy, the Chicago & Eastern Illinois, and the Pan Handle and Vandalia were doing while the Chicago & Alton was endeavoring to collect the amount of its increased rates between Chicago & St. Louis. It would be interesting, also, to know who chloroformed the Wabash, the Chicago, Rock Island & Pacific, the Chicago,

Burlington & Quincy, the Atchison, Topeka & Santa Fé, the Chicago, Milwaukee & St. Paul, and the Great Western while " the added amount in stocks and bonds was taken out of the pocket of the public in increased rates " between Chicago and Kansas City.

Of course, the contention that an isolated road in a highly competitive group can raise its rates for any cause whatever, whether based on its own stern necessities or on the pleasure of the chase, and still do business, is foolishness. In regions where there is either actual or potential railway competition, overcapitalization cannot affect the rates; it can seriously damage the minority stockholder, and, therefore, is wrong morally; it has a bad effect on the financial credit of the railroad which is the victim of it, and therefore is bad railroad practice. But the rates charged by the Chicago & Alton Railway have not been increased to the extent of one cent because of the overcapitalization of this property.

We have discussed the case of the Alton rather than that of the Louisville & Nashville because the principles involved are more sharply pointed. In the Louisville & Nashville affair the overcapitalization was not serious—a fact conclusively demonstrated by the company's high financial credit at the present time. But the Louisville & Nashville could no more take the increased capitalization out of the public in the form of higher rates than the Alton could. The Louisville & Nashville is a less simple and compact property than the Alton; it has one kind of competition between Cincinnati and New Orleans and another kind between the Birmingham district and the Atlanta district,

while between Louisville and Memphis or Nashville and Memphis it has yet a different kind of competition. But in the whole Louisville & Nashville system there is not one single line which has not some effective competitor, unless we except two or three minute branch lines which are not important enough to attract competition. What would the Queen & Crescent, or the Illinois Central, or the St. Louis & San Francisco, or the Mobile & Ohio have done if the Louisville & Nashville had attempted to increase its rates at the cost of the public? They would have taken all the company's business, and left a very handsome railroad entirely idle.

Court decisions on the basis of reasonable rates have almost always adhered to the " cost of service " principle, because it was tangible, and the proposition that the entire corporate income should not exceed a " reasonable " return on the capital invested in the business looked equitable. Yet only if we assumed the total absence of all competition, local and national—competition of carriers, competition of markets, and competition of commodities capable of substitution for one another—could rates be made in accordance with what the work cost the railway, or with what the railway would like to earn. In real practice, they always have to be made on a basis which will permit the traffic to compete effectively in the markets of the world. If rates on an existing group of railways were suddenly altered on the " cost of service " theory there could be no competition in the country at all, since the line with the lowest operating costs would get all the business, and the other lines serving the same points would get none whatever.

To illustrate this point without undue elaboration of detail, it may be mentioned that butter and eggs from Denmark compete sharply in the London market with butter and eggs from Devonshire; that Australian wool and Montana wool compete at Boston; that Texas oil competes at Calcutta with oil from Baku, and that Florida oranges, Jamaica oranges, and California oranges sell on a quality basis—not a distance basis—in New York City. Railroads and steamship lines that cannot see their way clear to make rates that will place their commodities in the markets of the world at a price that will enable them to be sold in competition with other commodities, must simply give up the business entirely; nobody will pay high freight rates out of sympathy for the carrier's heavy expenses. And if rates are fixed by statute on an inflexible basis to yield the minimum revenue which will support the most efficient carrier in each group, then all the other carriers in the group must become bankrupt. That is why railroad valuation as a basis for rate making is futile. If the railroads hauling oranges from Florida were compelled by statute to charge the same ton-mile rate for them that the railroads hauling from California do, the result would simply be to exclude California oranges entirely from the New York market; if the Pennsylvania could prove that it had actually spent twice as much per mile of line as the Erie, between New York and Chicago, that fact would not enable it to add one cent to its freight rates, unless the additional charge covered quality of service, not cost of service to the railroad. As a matter of fact, the Erie is the historic example of a road overburdened with watered capital (not with cost of

road) which cannot collect enough freight charges to pay dividends.

Public regulation of railroad capital cannot effect freight charges, therefore; it can only serve as a protection for the individual investor, and as a safeguard for the community against the general disadvantages arising from the presence of an insolvent corporation. But it is almost, if not quite, impossible to frame laws rigidly so that they can accomplish any useful protection of this kind without incidentally doing vastly more harm than good.

Massachusetts has made perhaps the most intelligent effort of any state to frame this kind of legislation. The Anti-Stock-Watering Act of 1894 provided that whenever a steam railroad, a street railway, or a gas, electric lighting, aqueduct, water, telegraph or telephone company, should increase its stock by an issue exceeding four per cent of the existing capital stock, the amount necessary for the contemplated purpose should be offered to shareholders at its market value at the time, as determined by the Board of Railroad Commissioners . . . but no share to be sold or issued at less than par. The feeling throughout the state gradually became widespread that, while this law effectually prevented stock-watering, it was a millstone around the neck of industry, and in the summer of 1907 an exceedingly able commission was appointed by the legislature to find out whether this law or some other thing was opposing the material development of the state.

This commission reported in March, 1908. It found, first, that when the state prescribed a price above par as the minimum basis on which new stock could be offered,

it thereby put itself in an impossible position with regard to any subsequent efforts to determine what was a fair rate upon investment, and consequently impaired its own efforts to control the service performed by the corporation. It found, also, that capital had been kept away from the legitimate enterprises of the state by the requirements of the law, and the commission placed emphasis on the point of view that the concern of the public with what a railroad earns is very slight, whereas its concern with what the railroad does is very great. The commission finally added a modest recommendation that the idea of punishment be left out of new corporation legislation entirely, and that the state find ways to benefit its own commerce and industry instead of devoting its best energies to revenge for supposed misdeeds by its corporations.

This point of view was too advanced for the Massachusetts legislature in its entirety, although the law was so amended that the price at which new stock should be issued was to be fixed by the stockholders instead of by the Railroad commission. Yet the flat failure of the law in Massachusetts, and the actual deterioration of the transportation properties on account of it, since no one would buy new securities from them at the market price of the old ones, will probably not prevent it from being tried in many other states, and not improbably by the national government.

After all, laws to prevent overcapitalization are much like laws to prevent usury, or to fix the price of corn; if enforced at all, they usually have an opposite effect from what was intended. The railroad which is allowed to issue

no capital except for the actual cost of specific additions and betterments, for example, will see to it that no additions and betterments escape uncapitalized. But it is just this practice which is bringing the British railroad system closer to insolvency every year, as we shall presently see. The British government scrutinizes all railroad share and debenture issues closely, yet its transportation system is seriously overcapitalized; our government has hitherto not scrutinized railroad securities at all, and yet we may feel reasonably certain that the railroads of the country could not be replaced for the securities standing against them.

Gross fraud in the manipulation of corporation securities has not been uncommon in our economic history. The scandal of the looted Metropolitan Street Railway is ever present with the citizen of New York, and examples of the same kind of maladministration, though of lesser degree, can be found in many parts of the country. But no legislature can frame laws in advance to prevent this sort of thing, because the methods of it are different in every instance, and a stern chase is proverbially a long chase. The manipulators are fully as clever as the legislators, and have the incomparable advantage of finishing their work before the legislators begin. In such cases it is the stockholder who is most wronged, not the community.

It is certain that the community will be better served in its corporation regulation if it makes fewer laws and wiser ones, and works away from what the Massachusetts commission described as the punishment idea. But the lessons of the last five years have taught the railroads the

costliness of dictatorial methods, and the importance of keeping in touch with the personal wishes and inclinations of the persons for whom they do business. On its commercial side the railroad is a salesman, and no salesman can afford to make enemies of his customers.

CHAPTER X

CONTROL THROUGH STATISTICS

The plant with which a railroad operates is spread over a great territory, increasing the difficulty of efficient control—Statistical control consists of establishing units and comparing them with fixed or relative performances—Ton-miles and passenger-miles in England and America—The division of working statistics among primary and secondary officers for practical application—Daily, weekly, and monthly reports on the Erie and other roads—Tonnage ratings; yard and terminal statistics; the freight-car situation—The part which statistical work plays in the traffic department—Statistical control in the mechanical department; locomotive performance sheets—The danger of statistical comparisons by a layman—The danger of using statistical records as an end in themselves.

THE business of a railroad can be divided into two parts—soliciting traffic and moving it—which correspond quite closely to the customary separation of industrial enterprises into the selling end and the manufacturing end. The railroad manufactures one commodity only, transportation, and sells it, in characteristically different forms, to passengers, shippers, express companies, and the United States Post Office Department.

The main distinction between the manufacturing done by a railroad and that done by a cotton mill or a coal mine,

from the standpoint of management and control, lies in the fact that the plant and equipment of the railroad is spread over a tremendous physical stretch of country, so that all supervision has to be delegated, while most of the work is done by transportation units which are constantly moving from place to place, so that they cannot be supervised, except sporadically. An unusually large number of the employees of this industry must work without direct supervision, yet the margin of operating profit is exceptionally small, as compared with average returns on the capital invested in manufacturing or in farming, and the chance of costly damage suits is exceedingly great, since the courts require the railroad practically to insure, at its own cost, the human lives and valuable property which it conveys at high rates of speed over open country subject to storms, under circumstances which make it unusually easy for a vicious employee or a negligent one to damage the property. Besides these serious physical limitations, the business of transportation tends readily to become highly competitive, not alone as between two or more carriers serving the same localities, but, as we have seen, between carriers serving different localities which compete in the same market.

In the early days of railroading, control of operations through the use of statistics was very imperfect, and the need for it was slight. Competition was not usually important, and railroads were compact, reaching a limited territory only. Moreover, the margin of profit was large on rates amounting to only a fraction of the cost of hauling similar goods in wagons or on pack trains. But the profits of the enterprise brought in much new capital; competition

was established; rate wars took place; lines were extended, and the effectiveness and solvency of railroads soon became a matter of close and careful management.

The general manager of a great railroad may in some cases spend half his time in inspection, but under normal conditions he does not actually direct any part of the movement of trains. If he actually saw one per cent of his company's business moved, it would be an occasion for comment, and so, since the eye of the master is so limited in its vision, other means of control for the property must be provided. Roughly speaking, the method of accomplishing this is to split all the operations of the road into rigid, clearly defined units, and then to compare these units with similar ones on other railroads, or with the same railroad at other periods, or with arbitrary standards set up like yardsticks. Railroad control through statistics might be defined as the process of finding the unit in each operation, of seeing to it that these units are rigid, that they are collected and reported accurately, promptly, and economically, and then of taking the necessary measures to correct the defects which they indicate. Statistics are the clinical thermometer of industry.

The leading unit in the movement of freight is the product of the ton and the distance. In America, the multiplication is actually performed, and the ton-mile is created. In England, as a rule, the multiplication is not actually performed, but the manager has his daily statement showing the movement of all trains, and specifying what each train contains when it leaves the starting point.

Ton-miles and passenger-miles have recently been made

the subject of a Board of Trade inquiry in England. A strong committee was appointed to consider and report what changes, if any, were desirable in the form and scope of the accounts and statistical returns rendered by railway companies under the railway regulation acts. The North Eastern, distinguished for its mineral traffic, is now the only railway in Great Britain which keeps ton-mile and passenger-mile statistics, although the Great Western tried them some years ago but discontinued them. Sir George Gibb, former general manager of the North Eastern, spoke strongly in favor of the general adoption of these statistics in Great Britain, on the ground that they afforded the only scientific and complete measure of work done, and said that the supervision of the affairs of the North Eastern had been totally different, more searching, more intelligent, and more fruitful in result than it ever was before ton-mile and passenger-mile statistics were tried. The testimony of most British railroad managers who appeared before the commission, however, was against the use of these statistics. They were accustomed to gauge their results by the train-mile unit, while the superintendent directly in charge of operation was provided with a good deal of additional data. Thus, on the London & North Western, monthly statements are prepared dealing with the loadings of each individual car at the starting point, classified to show the results for each station, for each district, and for the entire line. On the Great Central the starting load of each car is recorded; the average for each station is prepared monthly, and the average number of cars per train is similarly recorded. These statistics provide the necessary material for the com-

pilation of figures showing the average *starting* load per train for the whole line, and train miles are recorded. The distance each load travels, however, does not appear in the statistics which reach the general manager, although it is noted by local officers daily, in the form of a statement giving the amounts and the destinations of the business done in their territory on the day previous.

The British commission was evidently impressed with the utility of the ton-mile and the passenger-mile, but was not disposed to recommend that they be made compulsory, in view of the skepticism with which many managers regarded them. Nevertheless, they are regarded as an indispensable part of the executive officer's equipment in this country, and, indeed, in nearly all foreign countries except Portugal and Belgium. British traditions change slowly, and it is fair to assume that temperamental inertia and the dislike of radical innovations had some weight in the attitude of the dissenting managers.

The important statistics deducible from ton-miles and passenger-miles were clearly stated by this commission, as follows:

(1) The average train load of freight and passengers, obtained by dividing ton-mileage and passenger-mileage by train-mileage.

(2) The average car load, freight and passenger, obtained by dividing ton-mileage and passenger-mileage by the respective car-mileages.

(3) Ton-miles per engine-hour.

(4) The average length of haul for passengers and freight respectively, obtained by dividing passenger-mileage

and ton-mileage by the total number of passengers carried and the total tons moved.

(5) The average receipts for passenger-mile and per ton-mile, obtained by dividing freight receipts by ton-miles, and passenger receipts by passenger-miles.

(6) The average density of traffic per mile of road, obtained by dividing ton-miles and passenger-miles by the length of road.

Mr. Hays, president of the Grand Trunk Railway of Canada, summarized the applied use of these statistics by saying that they put the manager on the defensive as to what he was doing. "He has to explain why, because another manager does a thing, he does not produce the same result as his neighbor does."

Entirely apart from such explanations, however, the defect in the prevalent British statistical system is that the manager actually never knows what his neighbor is doing; he has no opportunity, as the American manager has, to whet his curiosity on the good performances which somebody else is making. Consequently, improvements in British practice spread but slowly, whereas in this country every efficiency-producing device is studied and imitated as soon as it makes itself apparent in the ton-mileage figures.

In the United States, ton-miles are made up from the waybills, a process which is somewhat elaborate, but lends itself readily to mechanical labor-saving devices, and is not very costly. Mr. Hays estimated that ton-mile statistics occasioned an *extra* cost to the Grand Trunk of $3,000 per year—say 75 cents per mile, and that passenger-mile statistics, made up from ticket sales, cost $1,500, or 37½ cents per

mile. It should be noted, parenthetically, that passenger-mile statistics are not exact, as they include, on some roads, a heavy commutation movement, tickets for which are sold by the month, entitling the purchaser to an arbitrary number of rides, which he may or may not use up in the restricted period.

Ton-mile and passenger-mile statistics reach the general manager five or six weeks late. While of high value in determining general efficiency of operation, it is necessary to have a rough-and-ready current record as well. There are several ways of accomplishing this. Perhaps the most universal daily vehicle of information in this country is the train sheet, which is received daily by the train masters, the division superintendent, and often by high officers as well. The train sheet records the movement of all trains on the division, stating how many cars each contains, and how these cars are divided between "loads" and "empties." It may also state how many passengers were carried on each of the passenger trains, and may give information about the observance of schedule time, the causes of delays, etc.

It may be said, in general, that statistical control of railroad operations is brought about by concentrating upon a number of primary officers as much detail information about the working of the road as each one of those officers can scrutinize with advantage. The statistical results of this primary officer's scrutiny are then passed on to an officer higher up, who receives reports from two or three, or perhaps from twelve or fifteen, of these primary officers. Thus, by a gradual process of concentration, the workings

of the road are reported with detail constantly reduced, to officers increasing in rank until the president is reached, while certain statistical detail may keep right on until it reaches the executive committee of the board of directors.

The most important primary officer in the operating department is the division superintendent. He receives complete returns every day from operations in his own territory.

These returns usually cover the number of through trains of loaded cars, empty cars, and total cars received and dispatched in each direction at each terminal, together with the same facts for train movement at certain midway points. The superintendent must know, also, the entire train movement, both freight and passenger, in each direction, together with the number of cars in each train and the tonnage movement, and he must have a full statement of delays and their causes. He is informed about the condition of each yard on his division, and also about outside yards which have an effect on his operations; he knows what the demand is for freight cars at each important shipping point, and he knows how many cars are in sight to meet this demand. Moreover, he receives a good many detailed reports on matters embraced within the general topics which have been mentioned, and he is advised at once of all important news affecting his division of the railroad.

On many roads, in addition to this daily information, the division superintendent has a number of statistical cards prepared monthly, which show in condensed form the comparative result of a large number of operations on the division, one month as against another month, one day as

against another day, and one year as against another year. These cards often contain a horizontal ruling for each day in the month and a vertical ruling for two or three consecutive years, so that the superintendent can readily see, for example, what has been the average weight and the average time of a certain class of freight trains day by day in the present year, as compared with the same trains day by day in the previous year. These cards cover an immense amount of statistical information; a division superintendent on a busy division of the Pennsylvania will have a pack of cards the right size to carry in his pocket showing some forty or fifty different things, such as the interchange of cars at a number of specified junction points; the number of passengers carried; the conditions of temperature and weather; the average weight of trains moving between a number of specified points, etc.

Next beyond the division superintendents in the operating department come the general superintendents and superintendents of car service. On the Erie Railroad, which has a heavy traffic in through trunk-line business, a heavy traffic both in anthracite and in bituminous coal, and a heavy suburban passenger traffic out of Jersey City, the general superintendent receives the following reports each day.

Statement of delays to passenger trains.

Daily telegraphic report of freight cars handled and of switch engines in service.

Report of cars moved by divisions.

Report of cars in yards.

Report of condition of each yard.

Report of the situation at Cleveland, including coal and ore.

Report of the situation at Buffalo, including grain and package freight.

Report of the anthracite coal movement on the line.

Report showing how many cars the company is short, classified by divisions.

Report of the coal-car situation, daily at 4 P.M.

Report of the engine situation at specified points, summarized also by divisions.

Report of the number of car loads of company material on hand for unloading, and unloaded during the twenty-four hours ended at 5 P.M.

Statement of through freight engines in service and mileage made by them for the twenty-four hours ending at midnight. This statement covers, by divisions, the number of engines assigned, the total number of through freight engines shown on the train sheets, the number of through freight engines out of shop and available for service before midnight, the number of through freight engines in shop for repairs and reported as coming out within the next twenty-four hours, the number of through freight engines in shop for repairs that will not be completed within the next twenty-four hours, the total mileage made by through freight engines in service, the average mileage made by through freight engines in service, special engine assignments, classified according to way freights and pick-ups, passenger engines and switch engines; and general remarks.

Report on the number of cars on storage at five o'clock in the morning.

Report by stations of the number of cars of merchandise on hand to-day and unloaded yesterday.

Report of traffic exchange with the Central New England Railway.

General summary of mining reports, including number of cars moved, number of cars in yards, condition of yards, anthracite-coal condition, etc.

Detail report of the situation at Buffalo in car loads, classified into grain, iron ore, package freight, coal and salt, etc., and including a statement of the number of grain boats at Buffalo and of the boats unloaded during the last twenty-four hours.

Statement of anthracite coal in transit for Hammond and Buffalo at 5 A.M., and loaded at mines during the previous twenty-four hours.

Coal report telegraphed at 7 A.M. from Buffalo, giving amounts received yesterday in box cars and in coal cars, stock on hand, etc., subclassified into a number of divisions, such as box cars reconsigned, Erie system box cars on hand, coal cars reconsigned, etc.

Telegraphic report of coal at Weehawken at 5 A.M. for local delivery classified.

Statement of commercial coal loaded at mines and received from connections during the twenty-four hours ending at 5 P.M., classified into 675 items.

Mine situation report for the twenty-four hours ending 5 P.M., with special reference to car supply.

Report on loaded cars interchanged and cars loaded at stations for the twenty-four hours ending at 5 P.M.

Report on the weather.

Report giving a statement of all car detentions and the reasons for them.

The superintendent of car service receives in general these same reports, so far as they apply to the location and use of freight cars.

The vice president in charge of operation, however, receives a smaller number of reports, covering only the main topics. There are approximately ten reports which reach the vice president in charge of operation daily, covering trains and cars handled over the principal suburban division; passenger train delays; number of cars handled and of switch engines in service; report describing with some detail the car movement, the condition of each yard, the condition at Cleveland and Buffalo, the anthracite coal movement, and the car shortages; reports showing the coal-car situation, by divisions; general report summarizing the reports of the morning, including seven or eight items; report on the weather; report on car detentions, and report on the general position and the schedule time of through trains, both regular and special.

It is obvious that no general superintendent could really exercise close watchfulness over the thousands of separate items which these daily reports cover; as a matter of fact, he does not have to. A general superintendent not trained on the property could at first make only scanty use of the greater part of these figures, since their value is not so much absolute as relative, and nine tenths of the statistical matter in these daily reports must be judged comparatively to be of any use. Knowing all these conditions, and how the property ought to operate, the general superintendent

can look for deviations from the kind of practice he is expecting. It may fairly be said that his system of government and of control is largely based on deviations.

Among the current statistics received by the management of the Harriman lines may be mentioned the following:

Statement of all expenditures on account of road and equipment, itemized; received monthly from each grand division.

Comparative statement and explanation, itemized, of all large increases and decreases in amount of traffic and in operating expenses; reported monthly.

Division superintendent's periodic report to the general superintendent of unsatisfactory conditions, as follows:

FORM 2218

———— R.R. ————Division.

————19—

———————————

General Superintendent.

DEAR SIR:

I transmit herewith explanations of fluctuations in operating expenses for————————19— compared with same period of previous year, having personally reviewed the month's exhibit.

The fluctuations shown in the following amounts are regarded by me as unsatisfactory, and I have taken action indicated to improve results in future periods:

Account No.	Increase.	Decrease.	Action Taken.

The general superintendent or general manager receives and studies this report from his division superintendent, and then makes it the basis of a new report to the director of maintenance and operation, stating what additional action he, the general superintendent, has taken.

Another form presents a comparative monthly statement of bad-order cars, as follows:

CARS UNDERGOING AND AWAITING REPAIRS
MARCH 1, 1909.

	March 1, 1909.					Feb. 1, 1909.		Mar. 1, 1908.		Bad-order Cars per Mile of Road Mar. 1, 1909.
	System and Home.	P'ct. of Total Equipment.	Foreign.	Total.	P'ct. of Total Equipment.	Total.	Per Cent.	Total.	Per Cent.	
Union Pacific Railroad...	594	3.9	82	676	4.5	787	−14	855	−21	.20
Oregon Short Line.....	408	5.5	66	474	6.4	496	−5	702	−32	.19
Oregon Railroad & N..	78	2.5	8	86	2.8	94	−8	130	−55	.05
Southern Pacific Co. P. System....	1,912	7.1	136	2,048[1]	7.6	1,215	+69	1,374	+49	.48
Louisiana Lines.....	716	4.2	42	758	4.4	905	−16	1,558	−51	.23
Total....	3,708	5.3	334	4,042	5.8	3,497	+15	4,679	−14	.26

[1] Increase due to reduction of working hours in shop.

Another monthly form, making comparison with the statistics of the same month in the previous year, gives the operations of each important freight station in detail. This form covers the following items:

1. Number of freight cars originating at station, loaded by station men.
2. Number of freight cars handled in station yard.
3. Tons of freight loaded by station men into cars originating at station.
4. Tons of freight loaded by station men into cars passing station.
5. Tons of freight unloaded by station men.
6. Total tons of freight handled by station men.
7. Total tons of freight handled by station men, shippers, etc.
8. Average tons of freight loaded per car by station men into cars originating at station.
9. Agency expenses for freight service, agents, and clerks.
10. Agency expenses (dollars) for station labor.
11. Agency expenses, total.
12. Expenses, yardmen and switchmen in freight service.
13. Total agency and yard expenses for freight service.
14. Yard expenses per freight car handled.
15. Cost of agents and clerks per ton handled by station men.
16. Cost of station labor per ton handled by station men.
17. Miles run by switch locomotives.

Number of cars interchanged with connections.

18. Received from
19. Delivered to
20. Total.

For both freight and passenger service elaborate monthly cost reports are made, covering such items as freight locomotive-mileage; ton-mileage; tons of coal burned; locomotive miles run per ton of coal, per pint of lubricating oil and per pint of illuminating oil; cars per locomotive, loaded and empty; cost per locomotive mile, divided into repairs, wages, roundhouse expenses, fuel, etc.; cost per 100 ton-miles, also subclassified into seven heads; average miles run daily per freight locomotive, etc.

The enumerated report forms cover only a relatively small portion of the statistical information periodically gathered; a task requiring an immense amount of clerical labor, in the aggregate. Yet it is obvious that no measuring can be done without a unit of performance, or without a standard by which that unit can be measured. So the units are industriously sought, in every branch of the service, and then are set up alongside similar units found on other divisions or in other years. Thus the management is always in position to know what sort of results are being accomplished, in detail, on every part of the huge system. The facts are at hand, and some of the forms we have shown stating what action is being taken to correct unsatisfactory conditions, indicate at least the intention to make the statistics accomplish things.

Each class of engine in service has an arbitrary tonnage rating assigned to it, which is, in effect, a more or less scientific calculation of the weight of train which an engine of a given cylinder capacity ought to be able to haul over a certain stretch of track, due allowance being made for grades and curves. If the reported loadings fall systematically short of the ratings, the motive power is not doing the work it was bought to do, and coal consumption and the wages of train crews will both run too high in consequence, when measured on a ton-mile basis. The assignment of engine ratings is one of the important theoretic calculations with which the mechanical department is constantly engaged, the ratings usually being expressed in Ms,

or thousand-pound units. Local conditions, however, effect the actual results materially.

The train masters, who spend most of their time on the road, have as their principal duty the investigation of actual service results in train performance as compared with the standards set by the mechanical department and the division superintendents, and they ordinarily make the first report on any divergence from standard conditions, as indicated by the daily statistics of loading.

The exact condition of yards and terminals is a subject which is of first-class importance to the operating departments; sometimes reports on this are received as often as every four hours. At times of traffic congestion it is the nicest sort of a problem to keep cars of perishable goods and other " time " freight from being blockaded in great collecting and distributing yards by the in-and-out movement of slow freight trains. Trains can only move forwards and backwards—they cannot move sideways—and when an enormous freight terminal appears to be packed solid with cars, it takes a cool head and long experience to get the right car to the right place at even approximately the right time.

Indeed, the whole freight-car situation is a matter that depends utterly upon the prompt collection and efficient use of current statistics. The management must know at all times how the apparent need for cars at every shipping point on the line tallies with the apparent supply; it must know how many cars are coming, and where they are coming from, and how many cars are going, and where they are going to. And if there are yards and sidings full of

idle cars, it must know where these cars are, how many there are of them, and whom they belong to. Freight cars complying with certain standard minimum requirements are used indiscriminately by all railroads, regardless of their ownership, but their owners are paid by the user a certain fixed " per diem " rental, which is ordinarily about twenty-five cents per car per day, but may be raised to fifty cents, or even more, at short notice in times of car shortage. Thus every car on every road must be accounted for daily; a task performed by men stationed at all junction points, who take the numbers and the owner's initials of every car entering or leaving each line.

The superintendent of transportation, or car accountant, or car service manager, as he is variously described, must have the car situation clearly in hand, or at least in mind, at all times; the summaries of his daily records go to the general manager, who plans how a shortage, actual or prospective, may best be met, and who observes the percentage of bad-order cars, and notes the efficiency with which the shops are making repairs. If his per diem is costing him too much, it is very likely an indication that he should buy more equipment. Steel underframe cars of 80,000 pounds capacity cost about $1,000 apiece, in a normal market. If his road can borrow money at five per cent this makes the cost of the interest on his $1,000 investment about 13.7 cents per day. If the life of the car be assumed at ten years, the amortization charge is $100 per year, or 27.4 cents per day additional. His steel-underframe cars ought to last longer than ten years, however; the calculation is somewhat uncertain, but the total cost of owning a freight

car of this description is doubtless somewhere between thirty and forty cents a day. This is above the usual per diem rate; on the other hand, it is hard for a road deficient in cars to bargain for the loan of them advantageously in times of shortage, and the actual car-day earnings when traffic is moving well should be more than ten times the car-day cost of ownership.

All these general considerations, and many other local ones, the manager has clear in his mind, but accurate statistical information must be the basis of his judgment in any specific case. He must also receive constant advices about the current productive power of his district; the state of the wheat crop, or of the cotton crop, or of the lumber market, so as to be able to foresee future traffic movement, as well as to watch current movement. This again is merely a matter of statistical organization, but it can be made to yield large results in actual operating efficiency, and hence in dollars saved and earned.

The traffic department and the operating department come close together in their investigation of probable future business, although from different motives. The traffic manager is interested only in car supply, and in train service when it is very good or very bad, but, as has been mentioned in the chapter on the work of the officers, it is his duty to secure for his road the largest possible number of routings of the business actually in sight, and also to plan ways of creating business that is not in sight. His business is divided into two main classifications—local traffic and competitive traffic; he wants daily statistics of local traffic to see how it compares with his expectations, or

with other seasons, and it is vital to him to know how his local agents are handling the competitive situation. Even the local traffic is probably competitive with the traffic of other roads serving other markets, and the traffic manager must gauge the prosperity of his local industries largely in terms of their output.

In competitive freight routings the influence of the local agent is immense. Routing goes much by favor, in cases where rates are necessarily equal and time is either approximately equal or a secondary factor, and an active agent who keeps in constant touch with the local shippers, and does them favors, like procuring quick and accurate information about the location of consignments which they are expecting, can get and hold almost all their business. So the freight traffic manager must watch the local situation at every point on his line, and he does so by means of daily reports which show him both what his own people are doing and what the competitors are doing, so far as the competitors' work can be sized up by outsiders. In rare cases this amounts to espionage; ordinarily, it is simply the gossip of the soliciting agent, who knows well that there are 500 bales of cotton or forty boxes of oranges to be shipped on a certain day, and takes pains to inquire the destination of those which he did not himself receive.

The working of the mechanical department is especially susceptible to statistical control. It deals with plain units; tons of coal consumed per specified service, or engine-miles between trips to the repair shop, or axle-miles per hot box. There are almost countless details in the mechanical performance of cars and locomotives which can be standard-

ized by means of statistical records, so that deviations from the normal or the ideal standard will stand forth plainly, and investigations can be set on foot to locate the cause. The superintendent of motive power and his subordinates are constantly engaged in these investigations, which serve to determine, with great exactness, the most efficient type of locomotive for a given service, or the kind of car wheel which is cheapest in the long run, or the comparative cost of using existing shop facilities or of providing new ones. The accompanying extract (Table XXV) from one of the monthly locomotive performance sheets of the Louisville & Nashville Railroad illustrates a familiar form of mechanical-department statistical control.

The actual performance sheet covers eighteen divisional classifications—we have reproduced but seven—and has columns analyzing the cost of coal, roundhouse expenses, and the cost of waste for lubrication, besides the items noted. A car performance sheet, giving similarly classified lubrication costs, is also issued monthly.

Statistics of earnings and expenses are the ultimate check on all the other records, and, when taken in conjunction with the statement of work done, present the final picture of the operations of the road. Without knowledge of the work done, however, earnings and expenses are not an adequate means of control. Many roads west of the Transcontinental Divide operate for fifty per cent of gross earnings or less,[1] while in the eastern states the average is well above sixty per cent. Thus, the operating ratio is an

[1] The Oregon Short Line usually operates for about forty per cent.

TABLE XXV

LOUISVILLE AND NASHVILLE RAILROAD

EXTRACT FROM LOCOMOTIVE PERFORMANCE SHEET, NOVEMBER, 1908 AND 1909

Divisions.	Kind of Service.	Number of Locomotives in Service.		Mileage.		Average Mileage.		Valve Oil. Pints.		Valve Oil. Miles to One Pint.		Lubricating Oil. Pints.		Lubricating Oil. Miles to One Pint.		Cost of Valve and Lubricating Oil. Total.		Cost of Valve and Lubricating Oil. Per 100 Miles, Cents.	
		1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.
Kentucky Div.	Passenger	17	13	79,972	61,911	4,704	4,762	775	582	103.19	106.38	2,568	2,487	31.14	24.89	139.21	112.31	17.41	18.14
	Freight	28	29	107,377	94,517	3,835	3,259	1,872	1,582	57.36	59.75	4,205	3,806	25.54	24.83	266.95	236.18	24.86	24.99
	Mixed	1	.....	1,794	.....	1,794	.....	38	.....	47.21	.....	52	.....	34.50	.....	3.68	.....	20.51	.....
	Switching	10	9	33,854	30,891	3,385	3,432	435	362	77.83	85.33	688	670	49.21	46.11	44.99	40.44	13.29	13.09
	Work Train	2	3	3,858	7,142	1,929	2,381	66	116	58.45	61.56	157	300	24.58	23.81	9.62	17.92	24.94	25.09
	Total	58	54	226,855	194,461	3.911	3,601	3,186	2,642	71.20	73.60	7,670	7,263	29.58	26.77	464.45	406.85	20.47	20.92
Cincin. Div. Lexington Br. Shelby Branch. Bloomfield Branch and Frankfort & Cincinnati Ry.	Passenger	12	12	62,063	56,979	5,172	4,748	654	532	94.90	107.10	2,364	2,278	26.25	25.01	123.38	117.49	19.88	20.62
	Freight	16	18	75,262	71,222	4,704	3,957	1,279	1,249	58.84	57.02	2,527	2,372	29.78	30.03	180.17	171.87	23.94	24.13
	Mixed	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Switching	15	16	62,879	53,337	4,192	3,334	819	699	76.78	76.30	1,166	1,055	53.93	50.56	80.72	70.50	12.84	13.22
	Work Train	1	1	1,958	2,509	1,958	2,509	30	41	65.27	61.20	68	79	28.79	31.76	4.54	5.64	32.19	22.48
	Total	44	47	202,162	184,047	4,595	3,916	2,782	2,521	72.67	73.01	6,125	5,784	33.01	31.82	388.81	365.50	19.23	19.86
Main Stem 1st Division B. & S. Branch Lebanon Branch. Greensburg Br. Glasgow Ry.	Passenger	15	14	68,884	62,581	4,592	4,470	676	722	101.90	86.68	3,283	2,814	20.98	22.24	166.94	151.16	24.23	24.15
	Freight	48	42	168,021	144,806	3,500	3,448	2,904	2,545	57.86	56.90	7,801	6,272	21.54	23.09	498.71	425.41	29.68	29.38
	Mixed	3	3	7,152	6,706	2,384	2,235	82	84	87.22	79.83	146	184	48.99	36.45	8.77	10.44	12.26	15.57
	Switching	19	19	61,451	59,486	3,234	3,131	863	841	71.21	70.73	2,023	1,014	30.38	58.66	106.11	80.65	17.27	13.56
	Work Train	1	1	3,016	2,977	3,016	2,977	48	52	62.83	57.25	105	141	28.72	21.11	6.88	9.51	22.81	31.94
	Total	86	79	308,524	276,556	3,587	3,501	4,573	4,244	67.47	65.16	13,358	10,425	23.10	26.53	787.41	677.17	25.52	24.49
Cumberland Valley Div. M'boro R.R.	Passenger	4	4	18,790	19,454	4,698	4,864	200	186	93.95	104.59	396	478	47.45	40.70	27.30	29.32	14.53	15.07
	Freight	27	22	83,663	70,914	3,122	3,234	1,510	1,414	55.41	50.15	2,404	2,696	34.80	26.30	190.83	186.45	22.81	26.29
	Mixed	2	2	2,864	2,700	1,432	1,350	56	142	51.14	19.01	110	96	26.04	28.12	6.75	12.07	23.57	44.70
	Switching	3	2	8,555	7,056	2,852	3,528	116	108	73.75	65.33	148	158	57.80	44.66	11.85	12.20	13.85	17.29
	Work Train	.....	.....	627	243	.....	.....	12	4	52.25	60.75	19	8	33.00	30.37	1.30	.45	20.73	18.52
	Total	36	30	114,499	100,367	3,181	3,346	1,894	1,854	60.45	54.14	3,077	3,436	37.21	29.21	238.03	240.49	20.79	23.96
Main Stem 2d Division Chesapeake & Nashville Br.	Passenger	6	5	24,533	24,853	4,089	4,971	226	272	108.57	91.37	810	977	30.29	25.44	42.17	52.68	17.19	21.20
	Freight	14	13	51,133	46,900	3,652	3,634	903	868	56.62	54.03	1,647	1,849	31.05	25.37	120.69	133.54	23.60	28.47
	Mixed	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Switching	1	1	1,434	1,179	1,434	1,179	20	20	71.70	58.95	20	20	71.70	58.95	1.75	1.75	12.20	14.84
	Work Train	1	.....	3,083	344	3,083	.....	33	5	93.42	68.80	62	6	49.72	57.33	3.98	.49	12.91	14.24
	Total	22	19	80,183	73,276	3,645	3,857	1,182	1,165	67.84	62.90	2,539	2,852	31.58	25.69	168.59	188.46	21.03	25.72
N. & D. Div. N., F. & S. Div.	Passenger	9	9	45,476	45,025	5,053	5,003	458	510	99.29	88.28	1,479	1,543	30.74	29.18	78.47	82.53	17.25	18.32
	Freight	35	34	118,883	107,751	3,397	3,169	2,326	2,328	51.11	46.28	5,541	5,182	21.45	20.79	369.77	347.55	31.10	32.25
	Mixed	1	.....	1,768	.....	1,768	.....	54	.....	32.74	.....	88	.....	20.09	.....	5.58	.....	31.56	.....
	Switching	6	5	17,386	16,443	2,898	3,289	289	230	60.15	71.49	461	501	37.71	32.32	29.59	29.06	17.02	17.67
	Work Train	1	1	1,498	3,080	1,498	3,080	25	45	59.92	68.44	32	104	46.81	29.61	2.58	6.17	17.22	20.03
	Total	52	49	185,011	172,299	3,558	3,516	3,152	3,113	58.69	55.34	7,601	7,330	24.34	23.50	485.99	465.31	26.27	27.01
S. & N. Ala. R.R. and M. & P. Branch.	Passenger	9	9	46,924	48,021	5,214	5,336	468	453	100.26	106.00	1,876	1,810	25.01	26.53	107.34	100.61	22.87	20.95
	Freight	49	44	153,382	148,268	3,130	3,370	2,760	2,741	55.57	54.09	7,579	7,613	20.23	19.47	508.98	493.47	33.11	33.28
	Mixed	2	2	2,555	1,660	1,278	830	49	30	52.14	53.33	102	77	25.05	21.55	7.14	4.67	27.94	28.07
	Switching	15	13	48,133	44,293	3,209	3,407	765	788	62.91	56.20	1,101	1,195	43.71	37.06	75.85	85.45	15.75	19.29
	Work Train	1	1	1,262	1,606	1,262	1,606	22	9	57.36	178.44	49	19	25.75	84.52	3.41	1.28	27.02	7.97
	Total	76	69	252,256	243,848	3,319	3,534	4,064	4,021	62.07	60.64	10,707	10,714	23.55	22.75	702.72	685.48	27.85	28.11

uncertain test of efficiency; the high rates in the newly settled parts of the country make relatively easy a showing which the best operation in the world could not accomplish in a region of intense competition of long standing, where the struggle for business has reduced the margin of profit to the railroad to a minimum.

These comments apply primarily, of course, to the statistical use of the operating ratio by the banker, or broker, or student of railroad affairs who is trying to judge one property in terms of another. The manager of the road, confronted habitually by the same set of conditions, can form a great many accurate opinions from the reported earnings, and they are of the highest statistical importance to him. Where detail knowledge of the property is absent, however, there could scarcely be a more perilous standard of railroad efficiency than the relation which operating expenses bear to net earnings. A road in mountainous country, like the Denver & Rio Grande, must pay a relatively high sum for every ton moved because of the necessity of double-heading, or of breaking up trains into short sections; a road operating in swampy country, like the Yazoo & Mississippi Valley, is likely to have an abnormal track maintenance cost; a road hauling large proportions of merchandise will have a high ton-mile rate, but also a high ton-mile cost, because of the necessity of partial loadings and rapid service. A railroad operating in the cotton belt or the wheat belt will fluctuate greatly from one season to another; a railroad in Canada, or close to the Northern border, will report a marked increase in operating costs during the winter months.

Similar difficulties confront the outsider in making comparisons of efficiency based on the ton-mile. When 1,000 tons are moved 100 miles, a service of 100,000 ton-miles has been performed, regardless of the nature of the commodity. The Virginian Railway, built to haul coal from the West Virginia fields to tidewater, and nearly perfect in its physical equipment, frequently produces 100,000 ton-miles by moving a 4,000-ton train 25 miles, with a single engine and train crew. On the other hand, a road loading light manufactured articles—baby carriages and bird cages, to use a historic example—would do well to load three tons per car, and it would take a single train moving approximately 1,000 miles, or forty trains moving each 25 miles, to produce 100,000 ton-miles, under ordinary service conditions. The worst of it, from a statistical standpoint, is that most railroads are moving a thousand different kinds of traffic, all at the same time, and cannot always manage even to haul their coal and their baby carriages in separate trains. The ton-mile, in consequence, is an average figure, composed of a multitude of dissimilar parts.

This does not confuse the general manager, however. He has been watching the operations of the Great Valley division for twenty years, and if his new superintendent there increases the average train loading from 280 tons to 310 tons, he regards it properly as a measure of efficiency, because he is comparing the results of a known territory operating during a certain season under known circumstances, with the same territory and the same circumstances in another season.

Even this intelligent and discriminating use of the ton-

mile, as expressed in the terms of average train load, often leads to its own peculiar form of error, however. Provided traffic is handled smoothly, at efficient speeds, big train loads almost always mean economical working, because they indicate that the business is being done with the fewest possible locomotives and train crews. But if freight is held at terminal points longer than competitors are holding it, in order to get a maximum loading, or if the ratings are pushed to the limit, with resulting engine failures, blockaded traffic, overtime for the crews, and abnormal coal consumption, the big train load may prove a very expensive economy. Seven or eight years ago we passed through a period in this country when there was a disposition in Wall Street and elsewhere to admire the train load for its own self, and there were a good many instances where conditions existed not unlike those described.

This example of an overdone economy is doubtless chargeable to control through statistics, but it serves to illustrate a point already noted. Statistics are only of use comparatively, when measured against similar performance elsewhere, or against a standard arbitrarily calculated and assigned in advance. But the analogy must be a real one; it is useless to compare results obtained with dissimilar commodities, or with the same commodity handled under different conditions of grade, curvature, and motive power.

The following statistics gleaned from the current Louisville & Nashville annual report show some of the measures of operating efficiency commonly employed. These are the final, audited figures presented to the public as official, but they differ only slightly from the more hastily prepared

statistics which are set before the management for its daily, weekly, and monthly use:

Account No.	Freight Traffic.	1908–9.	1907–8.	Per Cent.	
				Increase.	Decrease.
25	Miles run by revenue trains	15,351,129	16,367,659	....	6.21
30	Loaded cars per train	13.57	12.32	10.14	
36	Number tons carried 1 mile	4,255,981,335	4,020,348,694	5.86	
37	Number tons per mile of road	968,785	924,686	4.77	
38	Miles each ton was carried	174.40	172.87	0.88	
39	Tons per train	262.9	233.6	12.5	
40	Tons per loaded car	19.36	18.96	2.11	
45	Freight earnings per mile of road	$7,390.20	$7,207.08	2.54	
48	Freight earnings per revenue train mile	$2.00	$1.82	10.14	
57	Freight earnings per ton-mile	0.763	0.779		2.05

The total items of passenger and freight statistics presented in the annual report embrace sixty-three accounts, of which only ten have been quoted. But it is clear from the figures herewith that the road has done several interesting things this year. Ton-mileage was nearly six per cent greater than in the year previous, yet revenue train-mileage was more than six per cent less. This indication of better loading is illustrated again in the tons per train, twenty-nine tons greater this year. Thus, in spite of an average rate 2.05 per cent less per ton-mile than in 1908, revenue train mile earnings were greater. The Louisville & Nashville does not publish commodity statistics in its annual reports; if it did, we should probably find part of the causes for these changes in a largely increased movement of coal,

taking a low rate per ton, but lending itself to large train loadings, and hence to better revenue-train-mile earnings.

Of course it is understood that the current operating control of a railroad is based on many kinds of reports besides the ones made public annually. It has been mentioned that ton-miles are approximated daily; usually from the conductors' reports, based partly on special records carried with the car; partly on enlightened guesswork. But these current approximations run usually within six or seven per cent of the final figures; often closer than that.

CHAPTER XI

TENDENCIES OF RAILROAD DEVELOPMENT

The tendency toward government ownership—The situation in England and America contrasted—Government under a democracy does not conduct public business very efficiently—Tendencies of governmental regulation—Four types of railroad combinations in the United States—Laws to prevent them have not been effective—The tendency to physical betterment—The labor situation—The principal groupings of railroads in the United States and the leading characteristics of each group—Traffic resources of territory not yet fully developed—The situation in the East, the South, the Central West, the Pacific States, and the Canadian border.

THE trend of railroad development in a special country, or in a group of countries, is a thing that has very important bearing on the way the properties there are handled. This book is not intended to deal primarily with railroad development; that is a very big and important subject by itself, but it is necessary to glance at it in order to grasp the problem which confronts the administrators.

The tendency toward government ownership of railroads has been a progressive one, making headway not quite evenly, but with a constantly increasing amount of mileage finding its way into the hands of the government. In many countries, including France, Germany, Belgium, Russia,

India, and Japan, government ownership and private ownership are going on side by side; in Italy there has been first one thing and then the other, with unsatisfactory management both ways. In Germany all but about nine per cent of the railroads belong to the various states of the Empire, by far the largest mileage being in the hands of Prussia. Spain has privately owned railroads, not very efficient; Austria has rather more private than state railroad mileage; Russia has more state than private; so have India, Australia, and Africa. In Sweden the private railroads have much greater mileage than the state railroads; in Norway the reverse is true. It would be a bold man who would state from the known results of railroad working in Europe, Asia, Africa, and Australia that the state operation in those countries, viewed as a whole, was more or less efficient than private ownership in the operating results achieved.

Professor Johnson has well said that government ownership is a question of expediency, not of principle; for various reasons, it is becoming increasingly expedient in a number of countries. The two principal examples of successfully managed railways under private ownership are the United States and Great Britain; the United States with about 230,000 miles of railroad; Great Britain with about 23,000 miles. Yet there seems to be fair likelihood that government ownership will become an active issue before very long in British politics.

The reason for this is special. There never has been any thought in Great Britain of building railroads to open up new country, as was the case in the United States. Conse-

quently, the railroads have always been obliged to bid for the right to build, while in this country extraordinary inducements have at various times been offered them. The British people were willing that railroads should be built, but they imposed rather severe requirements, which went into much detail with regard to station structures, overhead crossings, and many other physical features. Compliance with these orders has been very costly; moreover, the earliest railroad builders in Great Britain made the grave mistake of assuming that they could foresee conditions long years ahead, and they built massive structures of stone and brick so close to the rails that it has been impossible to widen the clearances to allow operation on the most economical basis.

Another fact needs to be taken into account: the tendency on the part of British railroad management from the earliest days to meet current expenses, keep the line up to the condition in which they found it at the beginning of the year, and then divide the balance of receipts among the shareholders. A very small margin has been left to provide for improvement work of various kinds, and most of this work has been charged to new capital. But it has not always been directly productive, since a good deal of it has been done to meet the competition of other companies; to hold traffic rather than to create traffic.

In any business, as soon as nonproductive work is charged to capital account, an unsound condition is created, and the British railroads now find themselves saddled with enormously high fixed capital charges which must be met annually, while these charges tend, on the whole, to

increase somewhat faster than the surplus earnings increase.[1] Consequently, old railroad shares which have been regarded as the strongest kind of securities by their holders, have been falling off severely in value during the last ten years; the average dividend rate has declined, and the British railroad system, as a whole, seems to be drifting very slowly but quite surely toward final insolvency.

This being the case, it may well be that some form of government control will provide a present remedy for the situation when it becomes acute. The government can borrow more cheaply than the railroads can, and some form of substitution of government securities for railroad securities could doubtless be arranged which would reduce the annual outlay for funds, although the effect of so tremendous a transaction on the credit of the government would be bad.

In the United States the conditions have been wholly different. The very fact that much of our early financing was unsound has brought its own remedy, and a very wholesome one. There are few railroads that have not passed through receivership or severe financial embarrassment at one time or another in their career, but values have been readjusted and the managers have learned the importance of making all changes which are not clearly productive from current income rather than from capital account. As a result, American railroads, on the whole,

[1] Strictly speaking, dividends are not charges, but the British investor has been trained to rely on them, and the credit of the company depends on its ability to pay something like the "usual rate."

have tended to get stronger and stronger every year, and there has been a marked tendency for the average dividend to slant upward rather than downward, although our years of sharp commercial depression have changed the trend of the curve temporarily.

On the grounds of solvency, therefore, there is no reason to anticipate a move for government ownership in the United States. It is quite possible that the demand may be made by one or the other of the great political bodies; but for reasons quite different from those prevailing in Great Britain.

It is not overstating the case to say that government under a democracy is among the worst possible devices for the efficient conduct of most public business. The qualities required to handle a railroad or a great manufacturing industry with skill and efficiency are not at all the qualities which attract the mob; the closer the so-called common people get to the selection of their representatives in the government, the surer we are that those representatives will have to depend for their public existence on a group of traits almost the exact opposite of those which we associate with administrative judgment and capacity.

The organization of our political system on the basis of a periodic contest between two or more great parties, however, supplies a rather important offset to the danger of government ownership in this country. If one party is in favor of it, the other party will be against it, and, by a piece of statistical good fortune, the arguments against government ownership in the United States far outweigh the arguments in its favor. Any statistical comparison of

charges on the railroads of the United States and the railroads of Europe indicates that the railroads of this country do their work far more cheaply than the railroads of Europe. As regards long movements, they certainly do, but the fact must be kept in mind that this is a country of great distances; that we move our raw materials from California and Oregon to New York and Massachusetts, and that our railroads do not mix in their average freight rates the charge for express service and for collection and delivery, which commonly figures in European statistics. Without elaborating on this subject, it is sufficient to say that a tonnage movement, composed, to a predominant degree, of raw materials going long distances and maintained independent of collection and delivery service, cannot very well help showing a low ton-mile rate.

But the person to whom the politician makes his appeal is not skilled in statistics, and he is not accustomed to having abstract arguments presented to him. Consequently, the fact that our average freight rate is extremely low is of real importance in a campaign on the subject, and is a strong argument in favor of leaving present conditions undisturbed.

It is unnecessary to summarize the reasons which lead most economists to believe that government ownership and operation of railroads would be a great national misfortune in the United States. The subject is scarcely an urgent one at present, since the strongly expressed trend of popular thought in the country is in favor of government regulation of railroads rather than of government ownership. One comes near to being a substitute for the other;

as a matter of fact, it is probable that the government would be averse to operating railroads itself under the conditions it has imposed on private corporations. In the work on the Panama Canal the government has found both its railroad laws and its navigation laws far too severe for its liking, and has paid very little attention to either.

The tendency for continuous and progressive consolidation of transportation units into larger and larger systems has been a marked one, all over the world, ever since railroads began. Yet, wherever operation has been carried on by private corporations instead of by the government, constant efforts have been made to resist this tendency by laws requiring competition. Charles Francis Adams has pointed out that it had always been the theory in England that the railroads ought to compete, until the commission of 1872 demonstrated that in the forty years since railroads began English railroad legislation had never accomplished anything which it sought to bring about, nor prevented anything it sought to hinder. Thirty-three hundred useless enactments had cost the companies 80,000,000 pounds, but the commission reported that competition between railroads existed only to a limited extent, and that it could not be maintained by legislation. The commission cited the case of the North Eastern Railway, formerly composed of thirty-seven independent competing and more or less bankrupt companies, but in 1872 (as to-day) prosperous, and giving general satisfaction, and found that in view of such facts as this it was clear that amalgamation had "not brought with it the evils that were anticipated, but that, in any event, long and varied experience had fully demonstrated the fact that, while Parliament might hinder and thwart, it could not prevent it, and it was equally powerless to lay down any general rules determining its limits or character."

The railroad law in this country rests on the assumption that the roads must compete—and then a commission is placed over them with elaborate powers which tend to reduce competition to a minimum. The chapter on public relations has discussed somewhat more fully this aspect of the situation; the point now to be observed is the perseverance with which railroad consolidation in this country has gone on. If pooling was not to be allowed there must be established some other form of joint control, either through "community of interest," or through actual consolidation, or through the device of the holding company.

The Sherman antitrust law will probably prevent the operation of "parallel and competing lines" under common ownership. We say "probably," because the courts are still far from deciding what this law means, or from giving it a broad and general interpretation, and the obscurity of the original act has been much intensified by the obscurity of the decisions intended to clarify it. At present nobody knows how to define parallel and competing lines, but it is reasonably certain that there are a lot of them now operated in this country under common ownership.

It seems fairly well established, however, that the law does not prevent the consolidation of lines which are not parallel and which do not directly compete with one another, and this kind of consolidation is going on all the

time. The groups of roads embraced in the Gould control and the Vanderbilt control and the Pennsylvania control have been the subjects of a good deal of attention and of considerable economic literature in this country; the attempt and failure of the Hill lines to obtain definite centralized control through the device of a holding company (the Northern Securities Company), because the law did not permit them to exercise this control directly, has also been widely discussed. The expansion of the Harriman lines has been extremely rapid in recent years; at the time of Mr. Harriman's death he exercised control, direct and indirect, but always influential, over more than 50,000 miles of railroad and over a large group of steamer lines as well. More recently we have seen the formation of the Hawley group of roads, which now embraces the Chicago & Alton; St. Louis & San Francisco; Missouri, Kansas & Texas; Chesapeake & Ohio; Toledo, St. Louis & Western; Minneapolis & St. Louis; Iowa Central; Texas Central, and the Kansas City, Mexico & Orient, with a total extent of between 14,000 and 15,000 miles.

It is possible to distinguish more or less clearly four types of railroad consolidations in the United States, and it is worth while to compare them. The kind of consolidation exemplified by the major Harriman lines, the Pennsylvania system or the Vanderbilt roads, may be described as strong, since it has been brought about by actual majority ownership of the capital stock of the properties represented. This majority ownership may be vested in any one, or in two or three of the roads embraced in the group. If vested in two or three roads, it is apt to be progressive;

for example: road A owns the securities of roads B and C; road D owns the securities of road A and road E; road F owns the securities of road D.

A weak combination, or one controlled through minority ownership, is represented in the Hawley roads. No one of these roads and no single corporation or individual owns or holds actual control of the stock of all the rest of them; but the same group of capitalists has a good-sized minority interest in all of them; and, in the absence of any organized opposition by the majority stockholders, this serves well enough for the purpose of securing temporary control of the executive committee of each road by persons representing the same party. In the specific case of the Hawley roads there exists a mixture of the strong and the weak forms of combination, since one of the properties has been made a holding company for actual control of three of the others. By far the largest proportion of the system mileage, however, is outside the specific grasp of this little holding company.

The Hill roads furnish an example of a different type of combination. The Northern Pacific, the Great Northern, and, to a certain extent, the Chicago, Burlington & Quincy, are all of them to a greater or less degree parallel and competing lines within the apparent meaning of the antitrust law. Yet these three lines are operated under conditions of the utmost harmony, and they adhere to a common and consistent line of general policy. In this case, strong or actual control of the Burlington is held through joint bonds issued by the Great Northern and the Northern Pacific. The Great Northern and the Northern Pacific have not

a single director in common, and are operated by different officers. Yet James J. Hill has in effect directed the general policy of both roads quite closely for a great many years, and harmony between them is established partly through family ownership of securities, and partly through the workings of a minority party of capitalists, somewhat in the fashion of that shown in the formation of the Hawley system. Thus, after all the turmoil of the Northern Securities case and of subsequent Supreme Court decisions bearing on details raised by it, control of the three Hill lines—the Great Northern, Northern Pacific, and the Burlington—has remained in common interest, and the government has failed entirely to make these roads quarrel, or compete, in the ordinary sense of the term.

The form of control exercised in the case of the Gould lines is different from any of these; it may be described as being primarily a strong or majority control exercised by the members of a single family, the descendants of Jay Gould, who actually have majority stock of the various component parts of the system locked up in their own strong boxes. This statement is not exhaustive; the control of the Western Pacific by the Denver & Rio Grande, for example, is direct and proprietary, without any third party intervening. But the actual control of such roads as the Texas & Pacific and the St. Louis Southwestern is supposed to be distributed throughout the Gould family, individual owners in this case performing the same function that is often exercised by a holding company.

In passing, reference should be made to an erratic form of control recently shown, which is of rather curious interest. The New York, New Haven & Hartford had for some time been acquiring actual majority stock control of the Boston & Maine. The Boston & Maine could in no sense be regarded as a parallel and competing line, but the issue unfortunately became entangled with Massachusetts local politics, and the political party dominant at the time so blockaded things that the transfer of this stock could not be made to the New York, New Haven & Hartford in such form that the New Haven road could exercise its full rights as owner. To get around this obstacle, control of the Boston & Maine was transferred to John L. Billard, a banker living in Meriden, Conn.

No contract could pass requiring that Mr. Billard do or refrain from doing any particular things with this stock, for any such contract would have been in violation of the law. Therefore, the New York, New Haven & Hartford directors had simply to rely on the belief that Mr. Billard saw the matter as they did, and that he would act as the railroad company wanted him to. He was well advanced in years at the time of the transfer; if he had died great complications might have ensued. The railroad took the chance, however, and placed control of the Boston & Maine absolutely beyond the reach of the law. It would be hard to devise a statute which could be drawn to prevent a private person from buying a railroad if he wanted to, and legal proof could not be established either that Mr. Billard had not bought the road for his personal use, as he would buy a horse, or that there was any kind of sympathetic relation existing between himself and the New York, New Haven & Hartford Railroad which might be construed as illegal.

Sympathetic relations[1] are pretty well out of the reach of the lawmaker!

We have gone with some detail into these various means of combining into a single more or less efficient organization a number of railroads, because, looking over the American railroad situation as a whole, two indications stand out; one, that the law will probably regard railroad consolidation with suspicion or disfavor for a good many years to come; the other, that consolidation will go right on almost regardless of the law, simply altering its form to meet or to avoid specified conditions. There are obvious economic advantages in large organizations, both in the transportation field and the manufacturing field, and where a situation of this kind exists the law is quite helpless. The world has learned after long years of experiment that laws to regulate the prices of commodities or the interest rate of money either have no effect or else make things dearer; laws to enforce competition are based on a principle which is just as unsound, and in time this will doubtless be recognized, although the time now seems distant in this country.

Although the law is powerless to prevent railroads from being friendly with each other, it is distinctly within its powers to prevent strong consolidation of roads, with one company acting as a holding concern for the shares of the others, and with one full-powered general office which can coördinate and standardize and systematize the work of the whole. This is the worst danger to be anticipated from the present trend of belief in this country that combinations

[1] This expression is borrowed from Clarence Deming.

ought to be broken up. But, viewing the situation largely, it is no very important matter after all. The laws of certain states now require through railroad systems to be broken up into theoretically separate units with separate officers; but it is impossible to prevent the instruction of these officers by wise chiefs, located in some distant city, with regard to the broader details of their conduct. Where control exists organization can be made to exist also, although the way of it may be round about.

In viewing the tendencies of railroad development geographically some facts stand out rather plainly. There is, for example, the constant and obvious tendency for all the roads of the country to improve the physical condition of their lines, taking out grades and curves, substituting heavy rails for light rails and powerful engines for small ones, introducing large capacity cars, installing block signals and paying increasing attention to ballast, culverts, bridges, and all the details that go to make good and sound track, while the standard of both freight and passenger service is constantly improving. American railroads were built rather hastily, to serve great stretches of country that could not be populated without transportation facilities. Consequently the annual toll of railroad accidents in this country has always been a terrible one, because railroads built hastily and cheaply are especially liable to accidents occasioned by purely physical causes. At the present time, however, physical causes account for far fewer accidents than does the national habit of taking chances, which induces the engineman to run by a danger signal and encourages dispatchers and operators and brakemen and switchmen and flag-

men, all of them, to do things which save time or trouble at a possible cost of life and property.[1]

In young countries it is difficult to find men to perform routine service. Where general industrial development is extremely rapid everybody in the commonwealth feels that he must share in the general prosperity, and he does not scrutinize closely his own qualifications to do so. The population of a really new commonwealth is largely composed of men of action and ambition who do not content themselves with routine, except as a last resort in case of failure.

In an older state, however, there grows up a class of men who are less sanguine as to their own earning power, since they are sons and grandsons and great-grandsons of men who have spent their lives in subordinate positions. A man of this habit of mind makes a far better railroad employee in the subordinate grades of service than a young conqueror setting out to make his own fortune in a new country.

If the United States is no longer to be classed as a very new commonwealth, it is certainly not an old one, and it has recently shown in marked degree a trend toward the condition found throughout the older countries of Europe, where there is a clear distinction between the class of people in the community who are rising and progressive and the class of people who are satisfied, on the whole, with subordinate posts. Not much more than a generation ago certain railroad and street railway companies had a pretty

[1] Another expression of this chance-taking habit is found in the fearful death toll of trespassers.

sharp contest with some of their employees on the question of wearing uniforms, the employees maintaining in effect that a uniform was a badge of service, and that they did not propose to serve anybody, in that sense of the word. Nowadays this question never arises, and the theoretical equality of all free citizens, which used to trouble men's minds so much in the earlier days of the Republic, is now recognized to mean little except equality of opportunity. Really safe railroad operation in the United States needs greatly a class of men like that from which the railroad servants in England, France, and Germany are recruited, and there is reason to believe that in comparatively few years, perhaps in another generation, this condition will be realized.

At the present time the railroads of the country may best be considered in six groups, each group having plainly marked characteristics. In the New England states the railroad system is in a good many respects comparable with that in Great Britain. The lines of principal travel are in admirable condition, and do a very heavy business, in which manufactured goods play an important part, with a high average of freight receipts per ton-mile in consequence. In the South an entirely different condition prevails. On the sandy loam prevailing throughout a considerable part of the region east of the Alleghany and Blue Ridge mountains and south of the Potomac River, the construction of railroads has cost very little. Consequently there has been a large overproduction of small and weak lines, with very little business and small present prospects of improving it. Three great companies—the Southern Railway, the Atlan-

tic Coast Line, and the Seaboard Air Line—have gathered together groups of these little roads, and by constant effort have created fairly efficient railroad systems out of them, although the earning capacity of that district has never been great enough to warrant really first-class construction, except in scattered places of small extent.

It took the South thirty-five years to recover from the Civil War; even now, it has its peculiarly difficult labor problem with three well-defined industrial classes: prosperous whites; negroes, who work with their hands; and poor whites, who ought to work with their hands, but will not, because the negroes do. But the areas in the world where cotton can be grown are strictly limited, and the population of the world increases steadily in numbers and in purchasing power.[1] This fact, coupled with intensive cultivation, is the great economic asset of the South. With the increasing tendency to transfer manufacturing to points near the region of production, and the increasing influx of new capital to the South, the outlook is exceedingly bright for these states and their transportation lines. Moreover, the South Atlantic states and the Gulf states both expect an increase in business resulting from their propinquity to the Panama Canal, which is likely to occasion a change in the routing of many commodities moving to the Pacific Coast from the Central states.

For many years the absorption of the short lines, or lateral lines, by the three great southern systems was almost continuous. Recently this process has been checked. Investors have a very proper dislike of a system with a large proportion of weak branch-line mileage; the branch lines perform useful service as feeders when times are good, but seldom carry themselves in dull years, and are a potent cause of receiverships. Moreover, local sentiment has a curious effect on railroad earnings in the South. It is characteristic of this region for the commercial output of each small town to be controlled by four or five citizens. Competition is keen, owing to the cheapness with which the roads can be built, and these citizens like to give their business to local railroads, in which they are stockholders or directors, rather than to the great companies with absentee owners, unknown and distrusted. I have in mind the case of a local railroad which was absorbed by one of the great companies, and proceeded to operate at a cost of one hundred and ten per cent of its own gross earnings. This was expensive, so the road was formally detached and given local directors, with the result that it has since operated for around seventy per cent, although frankly owned and controlled by the system which had previously operated it at a loss.

This disposition to provide for the main routes and let the laterals stand on their own ballast—or lack of it—is undoubtedly a sound principle, and should tend to increase the financial and the physical stability of the principal lines, which, though competing at most of the largest cities, are now agreed in avoiding new competitive entrance into each others' territory.

Between the Alleghanies on the East and the Dakota

[1] Perhaps the clearest statement ever made of the present economic condition of the South is that running through the novel called "The Southerner," written by the author signing himself Nicholas Worth.

Bad Lands and the Rocky Mountains on the West, and extending from the Canadian border on the North to about the thirty-fifth parallel of latitude on the South, is the great Central district of the country. Although many kinds of conditions prevail in this big territory, it may fairly well be considered as a unit in studying the tendencies of railroad development. The characteristic change which is taking place in this region is the substitution of the cultivated farm for the open prairie, while, at the same time, there is a rapid increase in manufacturing, and the principal cities and lesser towns alike are showing tremendous growth from year to year. Railroad construction is reasonably easy in most parts of this territory. The lines cannot ordinarily be laid on an unprepared right of way and left to take care of themselves, as they can in Georgia, but there are no important mountains to be crossed, and the chief obstacles to railroad building are the rivers.

Year by year the railroad occupation of this territory has been made more complete. Forty years ago there was substantially no local railroad development west of Omaha and Topeka, except in California. By 1880 this development of local lines had been pushed more than half way across Nebraska and Kansas, and there was also development in the Rocky Mountain region. During the next ten years Kansas became well filled with local lines, and the development was very marked in the northern part of this Central district, in the eastern part of North and South Dakota, and in Minnesota.

Since 1890 there has been a constant tendency to build additional branch lines throughout the states lying just east

of the Rocky Mountains. Railroad gross earnings in Ohio, Indiana, Illinois, Wisconsin, and Michigan have rather more than doubled in the last ten years; and gross earnings in the group comprising Iowa, Minnesota, Nebraska, North and South Dakota, Wyoming, and Montana have increased about two and a half times within the same period.[1]

The characteristic trend of railroad development in these Central states has been quite unlike that in the South. Although natural difficulties were not very great, they were too great to permit the easy construction of short local lines by men of small capital; consequently a good part of this development has been in the form of branches built by more or less strong railroad systems. The map of the Burlington, or of the Chicago, Milwaukee & St. Paul, or of the Great Northern, or of the Chicago & North Western, shows well the way in which these branch lines have been run out wherever there was promise of traffic; farther south the same thing is shown in the development of the Santa Fé or the Rock Island. Each of these roads has been increasing its branch-line mileage at the rate of several hundred miles a year for a good many years, and yet the portion of this territory lying west of the Missouri River and of the western border of the state of Missouri is by no means overdeveloped as yet.

Between the Mississippi and the Missouri rivers, and in that part of Missouri south of the Missouri River, the territory is now quite well occupied, and new construction is

[1] The progressive development of railroads all over the United States is well shown graphically in the series of maps accompanying Professor Johnson's "American Railway Transportation."

not likely to go on as rapidly as it used to. Between 1860 and 1900 Iowa built almost 9,000 miles of railroad; since 1900 the increase has been not quite 1,000 miles. North Dakota, however, has increased its mileage from 2,731 miles in 1900 to about 3,910 miles in 1908, and Oklahoma has increased from 828 miles in 1900 to approximately 3,000 miles at the present time. The indications are that the western part of this Central territory will be occupied within the next fifteen or twenty years almost as fully as such states as Kansas and Minnesota are now, and that there will be the same kind of growth of manufacturing industries which has characterized some of the states farther east, particularly with regard to handling raw materials as near as possible to the place where they are produced.

The same thing that applies to the Central portion of the country applies in general to the Southwest also, except that here we are considering two entirely different kinds of country. In the East agricultural conditions are extremely good, whereas in the West there are alkali plains where there is no agricultural development at all, and the only hope lies in irrigation. The railroads crossing the great stretch of territory lying between the Colorado River and the good lands in eastern Texas practically serve as a traffic bridge over which passengers and freight are carried from the East to the West and the West to the East; the intervening region produces almost nothing. It has one strong traffic town, El Paso, which is a gateway to Mexico, and is reached by all the through lines crossing this barren land in the Southwest. It seems improbable that there will

be much new railroad development of this region or much change in the present general plan of railroad control there, except in so far as good farming lands can be produced by irrigation.

West of the Transcontinental Divide the situation changes radically. There are four great Pacific cities—San Francisco, Seattle, Los Angeles, and Portland. Spokane, west of the Divide but east of the Cascade Mountains, and situated in a tremendous valley, well described as the "Inland Empire," also belongs in this group, though far from the coast. By rail distance, however, Seattle is 185 miles from Portland and 400 miles from Spokane. Portland is 772 miles from San Francisco, and San Francisco is 475 miles from Los Angeles. The Columbia River lies between Seattle and Portland; the Cascade Mountains between Seattle and Spokane; the Cascade and Shasta ranges between Portland and San Francisco; the Coast range and the San Bernardino Mountains between San Francisco and Los Angeles.

These are natural difficulties of the first magnitude. Southern Pacific freight trains crossing the Shastas and the Siskiyous are usually handled by four locomotives apiece, while the Coast range presents not only the difficulties of rugged and lofty mountains, but also of a geological structure which, in places, causes diagonal strata of rock to become lubricated in severe rains, and to slip, taking the track with them.

But the Pacific Coast has great traffic resources. Besides the tremendous stand of uncut timber in Washington, Oregon, and California, there is the mineral wealth of the

mountains, and the valleys are exceedingly fertile, enjoying a climate much more like that of Southern France than of any eastern state. Moreover, San Francisco, Seattle, and Tacoma are great gateways to the Orient, with its unbounded possibilities as a consumer of American products if only its purchasing power can be a little increased. They say on the coast that if Columbus had landed at San Francisco, New England would not yet be discovered—a phrase which rests on something more substantial than the California state of mind.

In the early days California was reached via Panama, the Straits of Magellan, or Cape Horn. Then, when the Union Pacific Railroad was completed, manufactured articles moved west over it if they could afford to pay the freight rates, and there was some compensating eastbound movement of California raw materials and of Oriental goods. It is still true that the Pacific Coast is backward in manufacturing, but it has had an extraordinary growth since the Civil War, and it is now reached directly by eight lines of railroad—the Canadian Pacific, Great Northern, Northern Pacific, Chicago, Milwaukee & Puget Sound, Union Pacific and allied lines, Western Pacific and allied lines, Atchison, Topeka & Santa Fé, and Southern Pacific. The San Pedro, Los Angeles & Salt Lake, owned jointly by the Harriman interests and Senator Clark, connects Salt Lake City with Los Angeles; the Denver, Northwestern and Pacific has made a start west from Denver; the Kansas City, Mexico & Orient has a line half built from Kansas City to Topolobampo, at the mouth of the Gulf of California, and the Tehuantepec route crosses the narrowest part of Mexico with a substantial and economically worked railroad, connecting with steamer lines at both ends.

Much of this development has taken place in the last decade for reasons which may perhaps best be summarized in the following comparison of recent building operations on the coast and in the eastern and central states.

Building Operations, 1908

San Francisco	$31,668,341	Philadelphia	$28,408,580
Seattle	13,777,329	Pittsburg	12,141,138
Portland	10,405,151	Kansas City	11,670,468
Los Angeles	9,931,377	Boston	8,552,425
Spokane	5,927,548	Baltimore	6,544,706
Salt Lake City	4,728,380	Cincinnati	6,428,888
	$76,438,126		$73,746,205

The traffic situation in this far western country is complicated by water competition at all the ports, and felt even at points located well to the eastward, by reason of the back movement from the ports. As a result of this, rates to the coast cities from the East are relatively low; rates to interior points, where water competition is felt remotely, if at all, are relatively high. The interior points complain bitterly of this, and the Interstate Commerce Commission, though recognizing the principle of water competition, has recently shown a disposition to order arbitrary reductions in the rates to the interior cities.

Thus, on one hand, we have a region where construction is exceedingly costly; where there is little short-haul, high-rate movement of manufactured articles, and where water competition at exterior points causes rate reduction which cannot fully be compensated at interior points. The

railroads cannot equalize by raising rates to the coast cities; if they did, the water routes and the Tehuantepec route would get the slow freight away from them. If they equalize by reducing rates to interior points to the same distance basis as the coast rates, the total profits would be so small that it would not be attractive to them to spend large sums for new construction in this mountainous region.

Like most economic developments this situation seems likely to work out along lines of compromise. The interior cities will get part of what they want; the railroads, part of what they want. Meantime, it seems inevitable that there will be a heavy growth of new communities in this great, fertile, empty, western section of the country, so that increasing density of traffic will make it possible for the railroads to charge lower rates and at the same time to work at a profit. The outlook for the next ten years, however, seems likely to include a good deal of pretty sharp competition between certain lines working now with no semblance of harmony.

The railroad situation in Canada and along the northern border of the United States combines two elements: through traffic to and from the Pacific Coast, and originating traffic in raw materials, especially wheat and lumber. More and more of the wheat-producing area within the United States is occupied every year for other purposes, while the consumption of this staple increases rapidly all over the world. Consequently, Canada is becoming the granary for America and much of Europe, and Canadian wheat-growing is being pushed farther and farther north, into the Hudson Bay region. The Canadian Northern is

now the great wheat-country explorer; the Grand Trunk Pacific is building through to the coast; the Canadian Pacific has been there for a good many years. The Great Northern has thrown many branch lines into the border wheat country, and all the northwestern lines report enormous traffic both in wheat and lumber, combined with their through, far-western business. Thus, in 1909, the Canadian Pacific carried 97,000,000 bushels of grain and 1,750,000,000 feet of lumber.

Now it is characteristic of this mixture of exceedingly long-haul through business in merchandise, etc., and of grain and lumber traffic, also taking a long-haul, but originating at intermediary points, that there is not much to attract the little fellow among railroad builders. Construction may be quite economical or quite costly, according to the locality, but the great distance separating cities and towns is the controlling factor. There is no local business, in the eastern sense of the word; consequently local lines in the Northwest are scarce, and seem likely to remain so for a good many years. It is possible that the settlement tendencies of the Middle West will, in time, manifest themselves along the border, but there is no indication of this yet, and Washington, Oregon, and California have such superior attractions to offer that the settling of the western portions of the Canadian border may be postponed for generations.

This study of the topographical and sociological conditions that favor or hinder railroad development in various portions of America does not purport to be exhaustive. There are many minor topographic divisions lying within

each of the principal ones which have been outlined, just as the lesser conditions affecting lawmaking and the labor situation are innumerable and unstable. But certain main tendencies have had a reasonable amount of time in which to show themselves, since the beginnings of railroads in this country, and there now is reason to believe that changes in development are likely to be progressive rather than fundamental.

APPENDICES

APPENDIX A

THE UNIT SYSTEM OF RAILROAD ORGANIZATION

MAJOR CHARLES HINE is attached to the staff of the director of maintenance and operation of the Harriman lines, his duty being to report on matters relating to organization. He has devised, and put into effect on a number of divisions, his unit system of organization, which is, in effect, a continuance of the divisional system below the grade of division superintendent, partly with a view to the elimination of correspondence, partly to train young officers broadly, and partly to promote general administrative harmony. Major Hine described this system as follows, in a recent address before the Western Railway Club:

The most difficult task in any organization of human endeavor is to correlate the activities of the workers on the outside with the necessary requirements of correspondence, records and accounting on the inside. The artisan in the shop, the traveling salesman on the road, the soldier in the field, the sailor at sea, the railroad man on the line, all have their troubles with the man in the office. When the inside man knows the outside game at first hand such differences in points of view are minimized, friction avoided, and therefore money saved. Railway operation is the most

exacting of human tasks. Like the conduct of a household, a farm, a hotel or ship, it is a continuous performance. Unlike those exacting occupations it must maintain its own communications over hundreds or thousands of miles of territory. So complex is its administration that chances should not be taken of losing money through half baked decisions of partially trained office occupants. Most railway officials flatter themselves that when on the line they maintain a grasp on the office. Yet every hour in their absence action must be taken on matters which, apparently trivial in themselves, have far-reaching results. This statement is not a reflection upon the splendid ability and earnestness of railway officials. It is merely a recognition of the fact that a man can be in only one place at a time; that there are only 24 hours in the day and only 365 days in the year. The salary of one official is negligible as a percentage of the operating cost of the average unit. Accordingly the system insists that the second best man of the unit, with practical outside training, shall stay at headquarters and sit on the lid. In some cases it has been found necessary to appoint another official to perform the previous outside duties of the senior assistant. In other cases it has been found that the outside work could be divided up among the other members of the staff.

In any system of organization the most important unit is the individual. It is claimed that when one man signs the name of another the first by so much loses initiative and individuality. A man's name is his birthright, his signature his patent of enlightened manhood. Long habit on railways has perhaps minimized the pernicious effect of

unconsciously building up one individual at the expense of many. Such industrial feudalism, however, can no more permanently endure than did the feudal serfdom of the middle ages. The unit system, therefore, insists that every man shall transact the company's business in his own name. There is nothing new in this. The whole system is really an extended application of the simple principles of train dispatching. A train order is addressed impersonally "Conductor and Engineman." Where proper discipline obtains, the signatures to the orders are genuine. When the oldest conductor lays off, the youngest extra man does not sign the former's name to orders and reports. Addresses in official matters should be impersonal because of the possible difficulty of identification; because of the resulting elasticity in interior administration. One does not ordinarily address a letter to an individual attaché of a firm, a bank, a hotel or a newspaper. He does not normally attempt to dictate who shall handle his communication. He leaves that to the intelligence and discretion of the organization that he is addressing. Under the unit system communications are addressed to the office—except when personal. The action taken, however, is by a real live man, whose identity is not concealed. The position is assumed that the recipient of a communication has the right to know what person is responsible therefor. The principle is established that except for a strictly personal staff, as for example a private secretary, all persons report ordinarily to a headquarters or an office and not to an individual. The authority of such headquarters or office is always exercised by an individual. Authority, in an enlightened organization of

society or industry, should be impersonal. Its exercise is highly personal.

The application of the above established principle to the reorganization of an operating division requires that the assistant superintendent shall become the senior assistant. If previously there is no assistant superintendent the train master or most probable successor of the superintendent becomes the senior assistant.

The next step in making the division a complete unit with its head, the superintendent, in effect general manager, is to move the division master mechanic and the traveling engineer (road foreman of engines) to the same building with the superintendent. The division shop as a subunit is left in charge of a general foreman. The old theory has been that a master mechanic if located at the shops can better supervise the shop forces. It is believed that the volume of business and complexity of modern conditions have outgrown this theory. It is found in practice that the master mechanic spends much of his time in an office near the shop writing letters to the superintendent, the superintendent of motive power, and other officials. Again, human nature is such that the master mechanic so located may unconsciously dwell on the plane of the division shop foreman at the expense of the former's mechanical responsibilities along the road and at outlying terminals. When this results his value as a division official is diminished. The governing reason for locating the master mechanic and the traveling engineer with the superintendent is not only to gain a closer personal touch. Such contact is largely a matter of personal equation and of training regardless of

location. The main object is to eliminate red tape by making possible a consolidation of files in one office of record. It has been demonstrated that relieved of a bureau of unnecessary correspondence the master mechanic can and does spend more hours among his men whether in shops, on the road, or at terminals.

Assuming that the division engineer, the train master, and the chief dispatcher are already located in the same building with the superintendent, the division is ready for reorganization. The general superintendent and the instructor visit division headquarters where are assembled the division officials and their old chief clerks. In an informal lecture of two or three hours' duration the principles of the system and its unwritten laws are outlined. Explanations are given of the revised standard circular of organization, which reads as follows:

..... RAIL.... COMPANY.
..... DIVISION

OFFICE OF SUPERINTENDENT

CIRCULAR NO. ....

.....191....

Effective ..... 191...., this Division discontinues among its officials the use of titles—Master Mechanic, Division Engineer, Train Master, Traveling Engineer, and Chief Dispatcher.

The following-named officials are designated:

1. Mr. E. F. .....Assistant Superintendent.
2. Mr. G. H. .....Assistant Superintendent.
3. Mr. I. K. .....Assistant Superintendent.
4. Mr. L. M. .....Assistant Superintendent.
5. Mr. N. O. .....Assistant Superintendent.
6. Mr. P. Q. .....Assistant Superintendent.

They will be obeyed and respected accordingly.

Each of the above-named officials continues charged with the responsibilities heretofore devolving upon him, and in addition assumes such other duties as may from time to time be assigned.

Such of the above as are located in the same building have one consolidated office file in common with the superintendent.

All reports and communications on the company's business, originating on this division, intended for the superintendent, or for any assistant superintendent, should be addressed simply. "Assistant Superintendent" (telegrams "A. S."), no name being used unless the communication is intended to be personal rather than official, in which case it will be held unopened for the person addressed. It is intended that an assistant superintendent shall always be on duty in charge of the division headquarters offices during office hours. The designation of a particular assistant superintendent to handle specified classes of correspondence and telegrams is a matter concerning only this office. Each official transacts business in his own name, and no person should sign the name or initials of another. The

principle to guide subordinate officials and employees is to be governed by the latest instructions issued and received.

Train orders will be given over the initials of the train dispatcher on duty.

The modifications of preëxisting organization and methods herein ordered have been carefully worked out to expedite the company's business by the reduction and simplification of correspondence and records. It is expected and believed that officials and employees will insure a successful outcome by lending their usual intelligent coöperation and hearty support.

Officials and other persons outside the jurisdiction of this division are requested to address official communications, intended for the superintendent or any assistant superintendent, "Superintendent, ... Division, ..." (telegrams "Supt."), without using the name of the Superintendent except for personal matter.

C. D.
Superintendent.

Approved:

A. B.
General Superintendent.

It will be observed that no distinct grade of senior assistant is created. The unwritten law is that whatever assistant is assigned to the charge of the headquarters' office becomes the senior for the time being. It was originally intended that different assistants should be detailed as the senior for certain definite periods. In some cases such a rigid rule may be necessary. The experience of a

year indicates that the incidents and casualties of the service may usually be depended upon to let the situation work itself out. This is gratifying, since in such matters self-suggesting procedure is preferable to rigid rules. For example, if an assistant sprains his ankles or mashes his foot the superintendent can assign him to the office and send the then office man out on the road. Vacations and enforced absences afford the superintendent an opportunity to cover the situation by a common-sense assignment. On one division the senior assistant was necessarily absent for some weeks. The maintenance assistant who happened to be next in rank was busy outside relaying the division with new steel. The third man, the mechanical assistant, had few troubles of his own in summer, and to him fell the opportunity to be broadened by a tour in the office. The superintendent and the other assistants, including the old traveling engineer, did the engine chasing. No circular was necessary, and there was less confusion than if two dispatchers had exchanged tricks.

In order that their authority may not be restricted when meeting a given emergency it is necessary to give the division officials the uniform title of assistant superintendent, without the limiting effect of a descriptive phrase. If anyone can coin titles that will describe duties and not, under railway customs, restrict authority, such titles will be welcome. When a vacancy occurs the circular states, "Mr. ..... is appointed an assistant superintendent vice Mr. ....." His assignment to duty by the superintendent is verbal. If a superintendent should find himself with an assistant unfitted by temperament or ex-

perience to cope with a wider range of duties he could quietly restrict such assistant to a prescribed limit.

The assistant superintendents when at headquarters, except the senior assistant, have equal rank. On the road they have the relative rank indicated by the circular or the current working time-table. In case two or more find themselves together and an interruption to traffic or other emergency requires, the highest on the list takes charge and becomes responsible. The system forces more officials to assume responsibility and by so much increases the protection to the company's interests. More and more is heard about "this division," and "the company," and less and less about "my department."

Most division officials have welcomed the title of assistant superintendent as a real promotion and as an increase in opportunity. Some still feel the loss of a distinctive title. Time alone will prove that railroading has become great enough as a profession to carry its own marks of distinction and to permit of a properly balanced specialization along the lines of greatest aptitude. Men like Julius Kruttschnitt, James McCrea, L. F. Loree, Epes Randolph, J. W. Kendrick, F. A. Delano, and W. W. Atterbury have not lost any reputation as civil and mechanical engineers because of their greater prominence as railway executives. For the same reason that a chief engineer blushingly accepts the title of vice president, a division engineer should modestly aspire to the position of assistant superintendent. This is one of the features of the unit system that it will take a generation to work out. Eventually an official cannot hope to perform the duties of chief engineer, or super-

intendent of motive power, until he has had experience in the grade of division superintendent. When superintendents are selected from diversified sources this will be possible. An advantage of the uniform title of assistant superintendent is that, as in the case of vice presidents, it necessitates speaking of a particular official by name. When any official is away from his headquarters, he is addressed by name.

The unit system makes a distinction between superior or coördinate units and subordinate units. Employees address " assistant superintendent." If they addressed " superintendent " there would be an implied obligation on the part of the superintendent to answer. If his personal action is desired he must be addressed by name. Even though " assistant superintendent " is addressed, the reply may be signed by the superintendent himself. Subject always to his superior's wishes, the superintendent makes his own office rules as to what he shall personally handle. It is up to him to see all, a part, or nothing for a given period, just as he sees fit. Should the superintendent's letter call for further information from the employee, the latter's reply would still be addressed, " assistant superintendent." For all that the sender knows the particular official may be necessarily absent when the letter is received. Numerous old conductors have expressed their appreciation of the fact that a man knows what official has addressed him, and that it is no longer possible to be jacked up by a clerk using the name of an official.

Communications from superior or coördinate authority are addressed to the head of the unit, the superintendent.

In his absence routine matters for higher or coördinate authority are signed by the senior assistant who appends to his own title the explanatory phrase, " For and in the absence of the superintendent." Going down on the division no such explanation is necessary, as the authority of any assistant superintendent carries over the division itself.

The superintendent being in effect general manager of his division is given charge of division stores as well as division shops. He must, therefore, obey the instructions of the general storekeeper as well as the superintendent of motive power. The general storekeeper has thus placed at his disposal all the administrative machinery of the division. Instead of a lack of practical sympathy between the stores and the users of material, it is made the duty of the superintendent and the assistant superintendents to watch material costs as well as labor costs, to help keep down interest charge on stocks as well as overtime. A railway company harnesses the forces of nature, including its divinely human elements, for one purpose, the manufacture and sale of an intangible commodity, transportation. The more closely interwoven the constituent parts of production the more efficient and economical should be the output. When weaknesses develop, when education is needed as to the increased importance of a given element, the remedy is not necessarily the creation of a separate department. A general storekeeper there should be, whatever his title, technically expert in his important specialty, responsible to the general manager and in a position to insist upon efficiency to the extent even of ordering material moved in special trains when it is true economy for the company to do so.

It will be noted that the superintendent, as the representative of all so-called departments on his division, has about as many superiors as he has assistants. The work of these superiors is balanced by the general manager. The scheme will not be fully effective until the unit system is applied to the general offices, making the general superintendent, the chief engineer, the superintendent of motive power, the general storekeeper, the car service agent, the superintendent of telegraph, the signal engineer, and the superintendent of dining cars all assistant general managers with one consolidated office file, and their activities coördinated by a senior assistant general manager at headquarters. Thus far only one general office, that of the new Oregon & Washington Railroad at Seattle, has been reorganized in accordance with this conception.

The number of divisions now reorganized is twenty-one with eleven still to follow. The number of assistant superintendents on a division varies from three to twelve. Every superintendent has shown his ability to handle as many assistants as the management may give him. The most gratifying feature of the reorganization is the fact that in all cases the talent at hand has been sufficient. No importations have been necessary. The incumbents of official positions have responded splendidly to the confidence reposed in their ability. Some divisions have gone farther than others. This always has been and always will be the case. Everyone, however, has made real progress, some of it unconscious. The human element has been recognized. Division officials who from lack of early breadth of opportunity have not the qualifications for senior assistant are

not required to fill the position. Their services to the company have been too faithful to warrant humiliation or elimination. Their grasp of present conditions is greater than could be that of student successors. When, in the course of nature, a new crop of officials matures it will be ripened younger but attain a fuller growth.

Consideration has been shown for the clerical forces affected by the changes. No individual has had his salary cut. As vacancies occur through natural causes salaries are readjusted; some increased, some diminished to meet the new conditions. All of these matters are left to the local officials. Principles are enunciated, suggestions made, but responsibility for details is left to the officials on the ground. The system means more officials and eventually fewer clerks. Probably by a cheese-paring effort enough clerks could be eliminated to offset such increases in official salary lists as have been found necessary. The management has felt that increased supervision will warrant the outlay. This liberal policy is justified by good business sense rather than by the prosperity of the Harriman lines. The poorer a road the more money it should spend for supervision and the development of *esprit de corps*.

Formerly office work was grouped around officials. This resulted in petty principalities and bureaucratic administration. By tearing down some office partitions there were razed those figurative department walls, which so often operate to keep in the man who is trying to keep the other fellow out. Under the new conception the work is grouped by classes. The technical term among business experts is "The concentration and coördination of routine and re-

lated processes." At a small roundhouse a handy man may be machinist, boiler maker, and car repairer. In a large shop for obvious reasons the boiler makers and machinists are segregated. So, in an office, stenographers may be pooled, accountants segregated, and clerks concentrated for the general good of the office work rather than for the fancied importance of a particular phase. The key to success in the unit system is a properly handled file room. It is given preferred attention and whatever force is necessary. When all the clerks of the division are pooled no difficulty is experienced in finding sufficient to handle the file room. Williams's Railroad Classification is being installed with a view to uniform filing over the Harriman lines.

As a general proposition officials at headquarters should not exchange written communications among themselves. Superintendents must apply this principle without hard and fast rules. For example, the superintendent of a heavy division being on the line some 200 miles from headquarters very properly addressed a joint letter to each of his ten assistants, calling their attention to a wreck he had just picked up and as the lesson to be learned enjoining upon them a vigilant enforcement of certain rules. It has been found possible to reduce the correspondence of divisions reorganized from thirty to fifty per cent. Even with reduced clerical forces night and Sunday office work have been eliminated. The great reduction is made possible by the constant presence of the senior assistant who is alert to discourage the letter-writing propensities of headquarters. It is expected that when all of the units under the Chicago office are reorganized there will be a net saving of at least

500,000 letters per year. Every letter costs a few cents to produce. Its retarding effect upon administration cannot be measured in money. Its dwarfing influence upon the individual initiative of the man below is likewise indeterminate. It is expected also that when the reorganization is completed numerous routine reports can be dispensed with.

It is not expected that a mere change of title or an assignment by a superintendent will make a man a skilled mechanic or an experienced engineer. For technical questions arising on a division the most expert knowledge available will continue to be utilized. It is claimed, however, that as the average division official has been in the service at least ten or fifteen years, he cannot fail to have acquired some familiarity with the requirements of the various branches of the work. The old train master may as third trick dispatcher have ordered an engine taken down and towed in without awakening the master mechanic. By so much more should he with wider experience be able to say whether or not the company's interests are being best observed in the handling of a locomotive that may happen to come under his notice. The mechanical assistant cannot be everywhere, and any help that his fellow officials can render the company should receive. Conflict of authority is avoided by the common sense and courtesy of the assistants, and by the attention of the superintendent. Nothing makes men so conservative as responsibility. It is claimed that the superintendent on the ground is better able to decide these questions intelligently than is a hard and fast code formulated by a man behind a distant desk. What is construction to-day will be maintenance to-morrow. What

is motive power at the turn-table becomes transportation at the switch.

Each official continues responsible for his branch of the work until otherwise indicated by the superintendent. The maintenance assistant is not allowed to plead transportation duties as an excuse for defective track. With him track must come first. When the train stops he cannot inspect track until it resumes. Meantime he may be able to minimize the delay by seeing that employees perform their duties promptly. He is not allowed, except for insubordination, to discharge employees on another assistant's payroll. He is expected, however, tactfully and politely but forcefully, to insist that the rules be obeyed. The faithful old employees need only encouragement to perform their duties well. The young and inexperienced require constant supervision and instruction. Due to its great extent of territory a railway exercises less control over its employees than any other line of organized effort. The safety of lives and property demands the greatest possible intelligent supervision.

Adaptability to changed conditions is largely a matter of temperament. Among his intimates one can usually predict in advance what position a particular person will take on a question of politics, religion, or organization. Some men believe in an early convergence of authority, in wide latitude of discretion. Others believe that the best results are obtained by postponing decisions until the highest possible authority is reached. On important questions there are usually two schools of opinion. Nearly every civilized country has two great political parties. On the railways

of America there will always be diversity of opinions and practices as to the organization of forces. The executive officers of the Harriman lines have felt that the individual will be broadened and the service correspondingly improved by the introduction of the elastic methods herein outlined. While many are enthusiastic, not all of the persons affected are convinced. It is to the credit of the latter that in spite of honest doubts all have contributed more or less to the success of the scheme. The work is being kept on a high plane, guided by those exalted ideals of duty: freedom from personalities; and the good of the service.

APPENDIX B

FRENCH RAILROAD ORGANIZATION

For comparative purposes the diagrams (Tables XXVI and XXVII) of two great French companies, the Paris-Orleans and the Paris-Lyons-Mediterranean, are shown herewith. The scope of the present volume does not permit an extended discussion of these organizations. It will be noted, however, that the functions of getting the business and of moving it are combined in the "Service de l'Exploitation," much as in England. The P-L-M Company has a president and two vice presidents, whose supervision is scarcely direct enough to enable them to be placed, comparatively, at the head of the diagram. It has also twenty-one active "Administrateurs" and a "Secrétaire du Conseil," ranking the central administration. French practice absorbs the carriage and wagon departments in the mechanical departments, as we do in this country, instead of separating them, as in England. In general, it will be observed that the organization is strongly departmental, except for the concentration of authority upon the chief traffic manager.

TABLE XXVI

ORGANIZATION OF THE PARIS-ORLEANS RAILWAY COMPANY, 1910

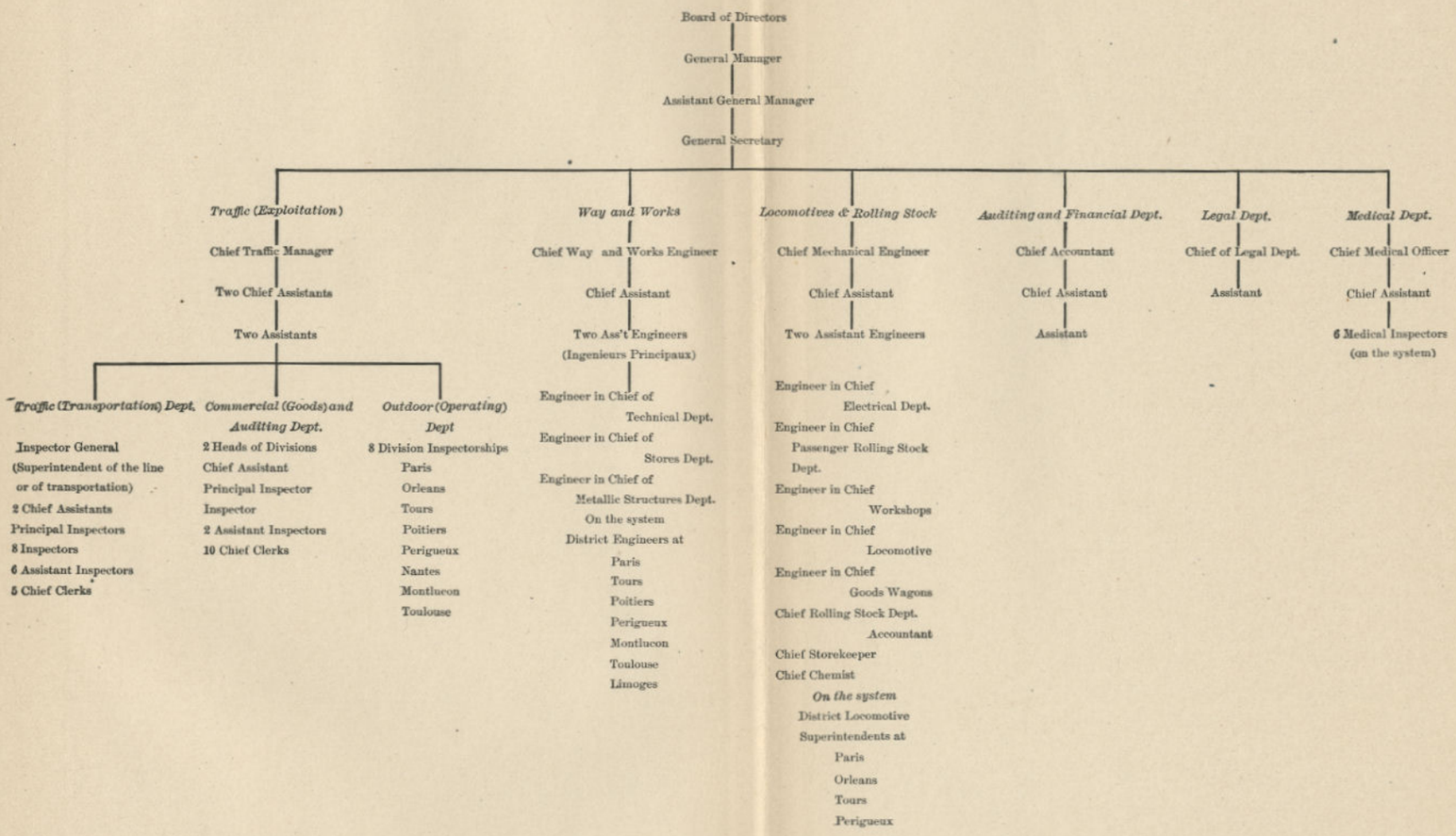
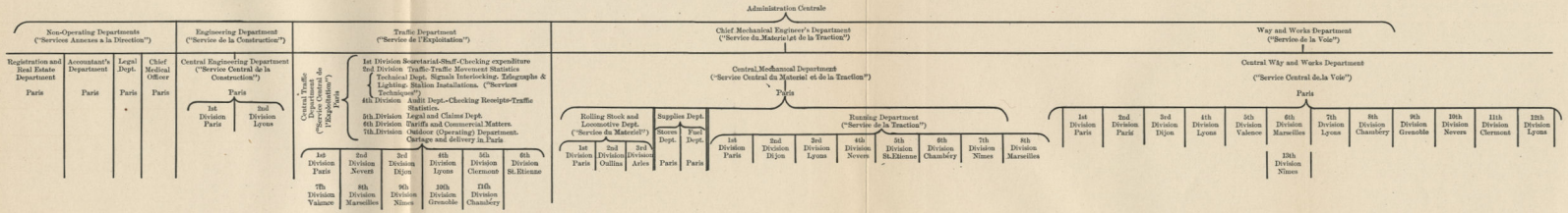


TABLE XXVII

ORGANIZATION OF THE PARIS, LYONS AND MEDITERRANEAN RAILWAY COMPANY, 1910



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