A COMPARATIVE STUDY OF RAILROAD ORGANIZATIONS IN THE UNITED STATES WITH SPECIAL REFERENCE TO THE EFFICIENCY OF OPERATION

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ARRANGEMENTS OF GENERAL ORGANIZATION OF RAILWAY.

Section 1.

Works necessary to make a railway profitable.

The function of a railway is to transport both goods and passengers. This is the only service which a railway needs to perform and it is one which the public expects a railroad to perform properly. For the successful performance of this function, various kinds of works or preparations are absolutely necessary; these must be ready and in good working order before transportation can be carried on. Just as every industry must have its tools and equipment, so the railway has its tracks, bridges, tunnels, and various other structures, its rolling stock, and the coal, water, etc. as materials. Skillful laborers, professional men, talented organizers, administrators and financiers are also essential. Every road needs engineers to build and maintain its structures and machinery, business men to watch its traffic, operators to secure the movement of its equipment, financiers to supervise its fiscal arrangements. No matter how different internal organization may be, the requirements for a good organization are about the same for all roads.

In order to operate a road efficiently, the maintenance of way and structures must receive proper attention. The maintenance of way may be generally summarized as follows:-(1) "to permit safe passage of trains at usual speeds, (2) to permit comfortable passage of trains at usual speeds, (3) to improve the appearance of the property, and (4) to reduce the cost of future maintenance; while the aims for repairs of structures may also be summarized (1) to secure their safe use for the purposes for which they are intended, (2) to
prevent deterioration, (3) to improve appearances, and (4) to reduce future cost of maintenance." #1

The main parts of the work of maintenance of way are track maintenance, renewals, roadway policing, general cleaning and miscellaneous roadway maintenance. #2

In case of maintenance of structures, the works to be taken care of are as follows:—bridges and culverts; fences, road-crossings, signs; buildings and grounds; docks and wharves; interlocking plants and signals; telegraph and telephone lines, and other miscellaneous and minor structures.

Co-ordinate in importance with maintenance of way and structures is the maintenance of equipment. This involves (1) repairing of locomotives and cars, (2) maintenance of the repair plant, such as shop machinery, tools, etc., (3) preparation of locomotives and cars for service, and (4) instruction of enginemen and firemen in regard to the proper care and handling of their engines, and in regard to economical fuel and supply consumption. #3

Third in order is transportation, i.e., the movement of passengers and freight. Of vital importance in this department are the train rule and train schedule. If these two are carefully planned and well organized, the operation of transportation is likely to be efficient. Besides the careful arrangement of the train service, there is the work at stations, the most important divisions of which are:—(1) station service, (a) switching, (b) freight house operation and (c) car-load freight; (2) yard service, (a) receiving and forwarding of trains and (b) handling of cars, such as weigh-

#1Byers' Economics of Railway Operation, p. 217.  
ing, repairing, classifying and transferring. Inefficiency of railway operation sometimes results from the incompetency of yardmasters to supervise train-loading efficiently, leading to congestion of traffic.

Another important branch of railway operation is the determination of charges and the solicitation of business. In order to induce people to travel more extensively than usual railways offer special excursion rates, and sometimes do a large amount of circular and newspaper advertising. They frequently pay considerable attention to the stimulation of immigration into the sections of country in which they may be interested. Freight traffic solicitation demands more individual canvassing, especially in competitive territory. An important part of the work of the freight department is the study of the conditions of other lines both competing and cooperating, the investigation of the relations of the line with lines of other companies, the making of arrangements with regard to the interchange of business, the stimulation of industry in the territory tributary to the line.

During the past quarter of a century the control of rates has passed gradually into the hands of the Interstate Commerce Commission. It is now illegal for a line to give to a particular shipper special concessions in any form such as reduced rate, special rate, rebate, etc. It may be proper, however, for a line to charge all shippers alike at a rate per ton mile different from that of another line if conditions are different, and the published rates of different lines serving the same points may be different, though one line may purposely publish a lower rate than the other in order to compete with the other line. Rates of different lines are liable to
change from time to time and a certain line which fails to change its rates to meet new conditions may lose part or whole of its traffic, since competing lines will attract shippers to them by lowering the charges. The railway that is in ignorance of the conditions outside is liable, therefore, to suffer much loss. It is plainly to be seen, therefore, that the observation of the rates of competitors is an important function of the traffic officer.

The increase or extension of the facilities of competitors also needs to be watched. The significance of this in affecting the business of a company is obvious, and as soon as it is discovered that competitors are extending or increasing facilities, the company should at once devise plans to meet the new situation.

There are other factors which need detailed attention, such as car supply, car service, terminal and other facilities, extensions of competing lines likely to divert traffic. Shortage of cars is a prominent cause of loss of traffic.

Lastly, the traffic officers need to keep themselves alert to the development of new industries and to the general traffic situation.

Another important function of a railway is the adjustment of its relations with other lines and with government, either state or federal. When the public makes claims upon the railway for loss, damage, personal injury by fire, or by any other accident, the interest of the company must be properly protected. A line may own property such as real estate, collieries, timber lands, and the title to the properties must be properly safeguarded. Agreements with other lines and other companies, as the Pullman Car Company for instance, need to be carefully prepared and scrutinized. There are
often disputes between different lines, frequently from misinter-
pretations of legal technicalities. Consequently, the service of
legal advisers is a very important one.

The Interstate Commerce Commission has extensive jurisdic-
tion over railways in matters of rate-making, methods of accounting,
and statistics. Where shippers or commissioners take action against
a railway company, the latter's interest and rights must be properly
defended. Misunderstandings need to be cleared away and the public
as well as the commissioners properly informed. In the question of
taxation, the company's interest has also to be carefully guarded.

The necessity of proper record of the receipts and expen-
ditures of the railway, of careful compilation of statistics, needs
no proof. Accounting plays a vitally important part in business
success, since its purpose is "To enable the owners of the property
to judge as to its value and as to the efficiency of the management,
to aid the officers of all grades in their efforts to secure economi-
cal results in that portion of the company's operations intrusted
to their charge and to prevent dishonesty." ¹

A railway often absorbs millions of dollars for capital,
commands a large army of employees and covers a great variety of
business, administered over a wide extent of territory. It is abso-
lutely impracticable for a manager personally to be in touch with
everything. It is through reports and statistics that he learns the
actual conditions of the line under his control. A poor system of
accounting can never produce a reliable statistical report, and must
endanger the efficiency of control. Recently the Interstate Commis-
sion has laid down certain standard forms of railway accounts, the

¹ Byers' Economics of Railway Operation, p. 96.
employment of which is compulsory. The necessity of this absolute regulation arises from the fact that a uniform system is indispensable to the production of comparative statistics.

Last but not least in this list of functions of the railway is that of finance. The term "finance" does not include all the financial organization at the time of the promotion and construction of the railway, nor does it refer to speculative operations such as those of Wall Street. Still less does it relate to the operations necessary for the consolidation, control or reorganization of roads, because the effects of such transactions upon the entire organization of a railway are so tremendous as to revolutionize the whole administrative machinery; consequently their consideration is beyond the scope of the present discussion. The railway finance with which we are concerned relates only to those operations which have a direct bearing on the efficiency of daily operation.

The revenue of some large roads amounts to millions of dollars a year. In the case of such roads, it is not necessary that deposits in banks and cash on hand be kept in balance with disbursements. The company also has an enormous sum of money ready for investment, such as sinking funds, appropriations for betterments, additions and improvements, depreciation and renewal funds, and sometimes an undivided surplus. The financial operations should be so systematized that the company would be able to meet any demands requiring immediate payment while, at the same time, no considerable sum of money should be left idle. If a railway corporation can work out such a sound financial system, it has accomplished very much in regard to the efficiency of operation.
Section 2.

The duties of the principal officers.

In Section 1 the kinds of work relating to operation which a railway needs to carry on have been discussed, and the next step is to note the assignment of these to various officers. In this regard, only the principal officers will be mentioned and they are not in the order of authority but, as in Part I, rather in the natural order of development. As our object in this place is not to present a complete system of organization but to describe the assignments of duties to principal officers, the emphasis will be on the assignment, and not on the system, which will be discussed in the next chapter. Those officers not specialized but important for all, such as directors, presidents, and certain other general officers are omitted. The omission is made not in the idea that principal officers of specialized duties are more important than any other officers, but for the reason that the importance of general officers as mentioned above is self-evident and their work, though not professional, is initiative, directing and instructive.

After a railway is constructed it needs to be maintained. In this maintenance we refer to the ways and structures as distinct from rolling stock. On most railroads in this country there is usually one man at the head, called the chief engineer, in charge of maintenance of way as well as of the construction of new roads. Many railroads separate maintenance of ways and structures from new constructions, assigning them to two entirely different sets of officers. The organization of the Rock Island line in 1907 illustrates this point very clearly. The chief engineer had the charge of new construction, bridge work, and architectural work, each of which was
given, in turn, to different engineers; while the maintenance of way was in the hands of an engineer of maintenance, who was responsible to the 4th vice president in charge of the operating department. This is rather characteristic of the organization of large roads, as may be seen in the cases of the New York Central and Hudson River, the Pennsylvania, and the Norfolk and Western. Many roads have engineers in charge of maintenance, subordinate to the general superintendent and with the title of resident engineers.

When the road is new and most of the work on the line is in construction, the department of maintenance of ways and structures is often absorbed into the construction department. The Virginia Railway is a road of this kind. If the road is a large one, of considerable traffic, new construction forms an entirely separate department, and is not infrequently under the direct supervision of a vice president, as on the Pennsylvania, where the chief engineer reports to the second vice president. The title, chief engineer, is not always applied to those who are in charge of line officers. For instance, on the Union Pacific, the chief engineer is responsible for standards, while the division engineers, being responsible for maintenance, are under the division superintendents. In case new construction is as important and as busy as maintenance work, there may be a consulting engineer, an engineer of construction in charge of construction, and a chief engineer of maintenance of way in charge of maintenance work, as in the case of the Missouri Pacific. From the examples mentioned above, it is seen that the duties of the chief engineer may vary on different roads.

Division engineers, supervisors, or roadmasters are the officers in charge of maintenance of way. On the Pennsylvania Rail-
road, they directly report to division superintendents; on the Buf-
falo, Rochester, and Pittsburg they report to the chief engineer, 
who in turn reports to general manager. The duty of the division 
engineer is to supervise the materials used and the men employed in 
the maintenance of tracks, bridges, and buildings. When there is a 
wreck or any accident on the company's property he is expected to 
attend to the matter within the shortest time possible and reduce 
the interruption of traffic to its minimum. Since many wrecks and 
other accidents of train movements are due to bad track, the division 
engineer should keep the track in level and the alignment free from 
irregularity.

In regard to the maintenance of structures there are vari-
cous officers for different kinds of work, such as bridge engineer, 
signal engineer, electrical engineer, mechanical engineer, designing 
engineer and architectural engineer, commonly reporting to the chief 
engineer. The organization of maintenance of structures is differ-
ent from that of maintenance of way. The supervision of the latter 
is provided for by geographical allocation of officers, namely by di-
visions. The supervision of maintenance of structures presents a 
different feature. The engineers in charge of that work are not lo-
cated uniformly and systematically along the line, since the condi-
tion of structures does not demand it, and the men working on these 
structures resemble staff officers in the army. There is, however, 
a general foreman of bridges and buildings, or an equivalent officer, 
on each division.

Next come the officers who take care of equipment, con-
sisting of (1) the motive power, (2) the passenger cars, (3) freight 
cars. In this country, cars and engines are as a rule built by inde-
dependent companies, while the railways maintain shops simply for repairing works, and these shops for various kinds of works are located conveniently along the line. At the top of the group of officers in charge of equipment is the general superintendent of motive power. On large roads, he, under the direction of general manager, has supervision of all matters relating to the construction and maintenance of locomotives, cars and machinery. As all know, the most economic and efficient operation of railway service is dependent upon the efficient management of the department of motive power. This department not only deals with efficiency of tractive power, combustion of fuel, water supply, speed of train, and capacity of cars, but also, of course, with repairing work and renewals.

The man who has the direct control of a shop is a master mechanic. He is responsible for all local repair works and for the proper condition of engines and cars, reports to the superintendent of motive power on standards, and to the superintendent, general superintendent, or general manager on matters having connection with the operating department. He is assisted by an engine-house foreman, shop foreman, and sometimes also by a road foreman of equipment whose duties are on the mechanical side of operation.

The duties of officers having charge of transportation are very important. The general manager is in charge of this department, to whom report one or more general superintendents; to these general superintendents, in turn, the division superintendents report.

On larger roads a general superintendent has approximately the same kind of work as a general manager. For instance, the Chicago, Burlington & Quincy Railroad has a length of about 9000 miles, and the operation of the whole line is vested in two general mana-
gers, who, in turn, have five general superintendents, each controlling 1500 miles of line. It is obviously impossible for a general superintendent to watch every detail upon his grand division; he would be liable to give insufficient attention to general working. At best, he can hardly expect to keep in touch with more than the division superintendents.

We have seen that the work of a general superintendent is largely general, and, to a less extent, so is that of a division superintendent. He has the direct charge of operation on his division, and, on most railways, is responsible for the proper maintenance of ways, structures and equipments, for the prompt and safe movement of trains, and for promptness and expediency of yard service. In case of emergency or accident he must take immediate steps to insure the safe movement of trains. He reports to the District Counsel and General Claim Agent in case of accident to persons or property. The division superintendent should also know something of the commercial development of his division, through co-operation with the traffic department. He has direct authority over train masters and dispatchers, roadmasters and master mechanics. In case of a purely departmental organization, the division superintendents are in charge of train movements only, and on other matters he is merely an inspecting officer rather than executive. He may appoint and remove division engineers with the approval of the general superintendent and chief engineer, appoint and remove trainmasters, chief dispatchers, station agents and yard masters with the approval of general superintendent and general superintendent of transportation, and appoint and remove master mechanics and road foremen of engines with the approval of the general superintendent and general superintendent of
equipment. The amount of railroad which a division superintendent can manage averages from 250 to 500 miles. For instance, the Chicago, Burlington and Quincy Railroad has about 409 miles of line for each division superintendent.

Now it is desirable to say something about the duties of special officers who carry on the actual work of transportation. First, there is the train master. He is an "outside" officer, i.e., an officer whose main attention is to matters out-of-doors. His chief duty is to aid the division superintendent in maintaining the character of train service, and the discipline of employees. Movement of traffic, personal supervision over the movement and handling of trains, prompt and efficient service and the reduction of damage to lading, and immediate supervision over the men employed on the trains are all included among his duties. He needs to be promptly on the spot in case of detention caused by accident or any other obstruction, in order to clear the way for movement of trains.

Second, the chief despatcher under the authority of the division superintendent controls the train movement of the division. He must also look after the condition and proper working of wires and instruments and see that there is prompt transmission of messages, which must themselves, of course, conform to the instructions of the department of telegraph. Train orders and orders for the distribution and prompt movement of cars on the division are issued by him monthly in the name of the superintendent. Dispatchers and telegraph operators are directly under his control.

Third, the yard master is responsible for receiving and forwarding of trains, distribution and classifying of cars, disposing of engines and cabooses. It is his duty to make up trains and
to avoid traffic congestion. He has the direct control of yard engine crews, switchmen and engine house forces with the aid of various foremen.

The traffic department will now receive our attention. It divides naturally into (a) the freight traffic department and (b) the passenger traffic department. In the freight department of a large railway a freight traffic manager is usually at the head, but the working head is the general freight agent. His duty, under the direction of the freight traffic manager is to name the rates for transportation of freight traffic and generally to look after the solicitation of traffic and the conditions under which it is handled. He is aided usually by several assistant general freight agents and by division freight agents.

Division freight agents are responsible for procuring freight, and for the recommendation of suitable local freight rates on their respective divisions. They need to be familiar with the industrial and commercial interests. They should keep in touch with the various division superintendents on all operating matters bearing upon freight traffic interests.

In the passenger traffic department of such a road there would ordinarily be a passenger traffic manager at the head. With the approval of the vice president in charge of traffic department, he makes passenger rates and arrangements with other companies and supervises the facilities of passenger transportation. He also has charge of printing and distributing passenger tickets and signs the orders for redemption of tickets. He has authority, with the approval of the vice president in charge, to appoint all officers in his department and all necessary employees. He is assisted usually by
assistant general passenger agents, division ticket agents, district passenger agents and a general baggage agent. He endeavors to build up a maximum business, and therefore gives attention not only to rates, but also to advertising, special facilities, excursions, train speeds, and so forth. In a word, a passenger agent pays special attention to the service in order to attract travelers.

Division ticket agents and district agents have almost the same kind of work and, where both are employed, their difference is only in that a division covers a smaller area than a district. They supervise the passenger business and facilities of their districts or divisions, under the direction of the general passenger agent.

The adjustment of the relation of the railway company to the shipper and government is the function of the legal department. The principal officer of this department is a general counsel or general solicitor, with a number of district counsel under him. All matters pertaining to legal technicalities must pass through his hands. A railway company often has transactions with outsiders; there may be claims against or by the company; and this step very often needs a considerable amount of legal knowledge. In case of issuing bonds, the wording is the most delicate part of the issue so that the approval of the general counsel is first obtained with regard to the sufficiency of surety, before the approval of the financial committee is secured. All forms of bonds are prepared and printed under his direction. It is also his duty to supervise the preparation of contracts which are to be executed by the company. In the institution or compromise of law suits by the company or to which the company is a party, the general counsel is the proper authority to conduct such matters for the company.
According to the usual practice of most roads, the entire line of railroad together with its leased lines is divided into legal districts which are not necessarily coincident with the operating divisions. For each of these districts thus created there is one or more counsel who are appointed by the general counsel with the approval, perhaps, of a certain vice president in charge of the legal department. It is the duty of the district counsel to prepare all deeds, leases, releases and documents and briefs of title for real estate and rights of way, in their respective districts, when authorized to do so by the general manager or the general solicitor. In case of any accident, claim or liability against or by the company, their duty is to represent the company, to take immediate steps for the investigation of facts and the protection of the company's legal position. They report to the general counsel, all legal proceedings and all business transactions of importance in connection with legal proceedings. It is also their duty to adjust assessments, to examine bonds, and to verify bills for taxes.

Besides, there are also special counsel for special districts or cases; they are appointed by the general counsel with the approval of the vice president in charge of this department.

In considering the financial operations, it is not meant to give a statement of the railway financial organization which is directly in the hands of the president, the executive committee, the board of directors, or the financial committee. In the railway organization, however, there is a department which bears a close relation to financial operations. It is the treasury department. The function of this department is simply to be the custodian of the company's money and credits, disbursing the same on proper order. The
treasurer is an important officer of financial matters, for he often acts as an adviser to the president, and the financial committee, in matters of raising funds. It is also his duty to see that all issues of stocks, bonds, notes, are in accordance with the regulations which govern their issuing and to watch the time on which the issued bonds and notes will fall due (in which case very often a renewal is necessary). He is also a paymaster for the company if there is no special officer for that particular work. He procures surety on bonds given by shippers for credit privileges. On most roads, he is assisted by a cashier and a registrar of bonds, but on certain lines there is a chief paymaster under him.

Another department which is closely related to the treasury department is that of accounting. At the head of this department is a comptroller or general auditor, having several auditors under him. He has charge of all the books and accounts of the company's receipts and disbursements. He devises means to safe-guard the receipts of current funds from station agents and verifies the cash balance shown by the general ledger. Under him there are auditors for various kinds of works. On the Pennsylvania Railroad there are six auditors in all. They are:— auditor of merchandise freight receipts, auditor of coal freight receipts, auditor of passenger receipts, auditor of miscellaneous receipts and accounts, auditor of disbursements, auditor of Union Line, and one or two assistant auditors for each. On the Norfolk and Western, there are two, viz., (1) auditor of receipts and (2) auditor of disbursements. Their duties are self-explanatory and may be summarized as follows:— (1) to see that there is no deviation in the system of accounts, (2) to collect and remit money and (3) to sign orders for settlement of balance.
Thus far we have discussed the duties and importance of officers who perform some specified duties. Above them all, there is a president, with several vice presidents, a secretary and a treasurer. Above him again there is the executive committee, the board of directors and the shareholders. This arrangement constitutes a complete system of railway organization.
Section 3.

The selection and qualifications of officers.

The owners of a railway are shareholders. They are scattered at different parts of the country - not only in this country but abroad. It is usually impossible to have all the owners meet together in order to execute the business. With a view of overcoming this difficulty, the only expedient and efficient way is to vest in the hands of a group of selected shareholders the authority which naturally belongs to the whole body of shareholders to transact the business of the corporation. To make the execution of the affairs of a company more effective than if all the shareholders tried to work together, while still fairly representing the opinions of each shareholder, a board of directors is elected by the shareholders. Through this board the railway company is managed.

On most roads, the custom, in regard to the method of voting, is the single vote for each share. Recently for the purpose of remedying the disadvantages of the minority resulting from the old custom of voting, a new scheme has been devised called cumulative voting. By this method, minority interests are better protected. Its utility can be better understood by an illustration, taken from Lough's Corporation Finance.

"Take a corporation in which there are 1000 voting shares and five members of the board of directors to be elected; each share, then, is entitled to five votes. We will suppose that there is an organized majority of 550 shares and an organized minority of 450 shares. Under the usual arrangement a majority vote would be cast for five nominees, all of whom would represent the majority stockholders. Under the cumulative voting system, however, each share..."
having five votes, the majority would cast altogether 2,750 votes and the minority 2,250 votes. The majority could safely give 916 2/3 votes to each of three nominees and thus elect a majority of the board, leaving the other two directors to be elected by the 2,250 votes of the minority. But if the majority should attempt to elect four directors, they could give only 687 1/2 votes to each of the four, whereas the minority, if well organized, could concentrate their votes on three directors and give each one 750 votes, thereby electing a majority of the board. 

This method of voting, though not yet universally adopted, becomes more and more popular. It is required by the law of certain states, Pennsylvania and Illinois for instance.

On all roads, the election may be carried out by either the personal voting of shareholders or by proxy. Under the pressure of strong rivalry among influential shareholders, manipulations in the matter of election are often practiced. At the annual meeting for the election of directors, delegates often carry with them a large number of proxies. A more formal development of the proxy principle is to be found in the so-called voting trust, which concentrates under the care of a trustee the voting powers of stockholders, who wish their interests to be protected, as in the case of minority stockholders and so forth.

Sometimes the actual stockholders buy shares and give them to a certain person stock outright in order to qualify him for the position of director, his vote being under their control. Such a person is called a "dummy" director. Sometimes he is given actual ownership of these shares, or sometimes a certificate of stock duly

#1. Lough's Corporation Finance, p. 75.
transferred to him on the books of the company is given to him, the certificate being endorsed back to the real owner. If the actual owners of stock are not satisfied with the "dummy" director, they may transfer all the stock back to themselves, thus disqualifying the "dummy". Thus we have proxy and "dummy" directors, both of whom are mere instruments for influential stockholders. If the great shareholders are all fair-minded and unselfish, there may be equitable relation between large and small holdings. This expectation is hardly realized, since the great shareholders always look after their own immediate interest. With the privilege of a better knowledge of the condition of the company, they elect directors for their own plan, sometimes even at the expense of small holdings. Thus we see that the stockholders may not be at all fairly represented in the board of directors. Unless the method of cumulative voting is introduced, the minority may be entirely without representation on the board of directors.

The powers of the board of directors are complete, i.e., "the stockholders give them complete control over the corporation's assets and officers." The directors have a free hand in all actions except those concerning the sale or mortgage of the corporation's permanent assets. Of course, they should perform their services in good faith and for the benefit of stockholders in general. Thus, theoretically a board of directors should represent all the stockholders equally.

In regard to the personal responsibility of directors, a short statement will be sufficient, since they are held responsible for only a few matters which are fundamentally important. They are

#1 Lough's Corporation Finance, p. 46.
responsible for any of the following: any loss to the company re­sulting from the negligence and wrongdoing on their part, the short­age of payment on stock which should be fully paid, the declaration of dividends out of capital, and the performance of certain actions which are positively forbidden by the state. #1

A standing committee is frequently elected by the directors from among themselves, while it is inconvenient for the board of directors to assemble together at frequent intervals. All the pow­ers of the board, received from the stockholders, may be delegated to the standing committee. The general officers of the corporation, the president, vice presidents, secretary and treasurer are chosen by the directors, and are responsible to them alone. The authority they receive is not delegated to them by the owners but obtained from the directors.

The powers and responsibilities of the executive officers of a railway company are not very different from those usually given to the corresponding officers of any corporation. Since they are executive officers, their powers are, of course, limited in their scope and in like manner, are their responsibilities. A president's approval is often sought for all important actions performed by any vice president; the secretary and the treasurer, though elected of­ficers, sometimes have to report to the president and to certain vice-presidents. They have full responsibility for all matters in their respective departments, while the president supervises all things in general.

All officers below those mentioned in the preceding para­graph are appointed by their superior officers and not elected by

#1. Lough's Corporation Finance, p. 47.
the directors. They are directly responsible to their respective superior officers. Their duties and authorities are definitely defined in the government of each road, and, in a general way, it may be said that the officers of one road occupy a similar position, assume similar duties and responsibilities to those of the corresponding officers of other lines. They are paid employees and in many cases have no stock interests in the company. This lack of ownership interest in the management of the company's property may possibly lead in some cases to a narrow conception of their duties to the company. High salary and reputation of honesty and their profession will induce them to do good work. But all that is usually accomplished by these inducements, is the skill of work that can be expected from any well-qualified man, while the unusual enthusiasm for improvements to bring about efficiency and economy is not always called forth spontaneously under such conditions. It is desirable for the railway administration to have its system of organization adjusted in such a way that all employees will manage the company's property just as their own.
Section 4.

Essentials of an efficient organization.

We have now outlined the various kinds of railway work, defined the duties of officers, and discussed the choice of officers, but we are not yet sure of the efficiency of railway operation. There are guiding principles to be noted which are essential to satisfactory working. When a company is about to be organized, everybody knows, of course, that laws and regulations need to be worked out. Here, one would ask the organizers in what way such regulations and rules of government, as they contemplate drawing up, are likely to give them the desired results. A number of able administrators and organizers learn their lessons through years of experience. The problem of organization is so complicated and varies so with changing conditions, that it would be impossible, or rather imprudent, for anybody to attempt to summarize in a few words the fundamental principles of a good organization in a scientific way as one can express, for instance, the Law of Gravitation. What we can do is simply to gather the experiences of organizers and administrators and to group them as intelligently as lies within our power. Our task is to answer the question - what are the desirable features that an organization should possess, and what are undesirable?

In many cases a capable subordinate is unfit for a position which needs originality, a professional expert is often without executive ability. If the organizer creates a position that requires a technical expert to have a department in charge, he may experience great difficulty in finding a proper man for the post. It is desirable, therefore, to be very careful in outlining the duties of various positions in such a way that they can conform to the capabilities
of those occupying them.

The duty of a chief executive requires him not to put most of his time at a desk and to fill up his time with details, but to devote his attention to the general performance of his subordinates. He should have a sufficient staff so that he himself may be freed from all routine. Thus, he is able to devote most of his time to study the conditions of the road in general with a view of bringing about improvements of efficiency and economy.

Salary is one of the devices that can be used to retain the services of good men. Officers should be so paid that the line will have the best men that its means make practicable, and will constantly keep a high grade of men in service.

Once a man is assigned to a post it is desirable to avoid unnecessary disturbing him in his position. Improvements are often brought about by a man's familiarity with his work, constant observation, and years of experience. If employees are transferred here and there very frequently, there is not only much waste of time in their familiarizing themselves with changing duties, but improvements in organization are rendered difficult under this condition, as they do not stay long enough to know what is right or wrong. Thus, reasonable permanency of office is one of the factors that produce an efficient administration.

Without exception, able men are ambitious. If they make a brilliant show of their talent and ability when occupying inferior positions, the chief executive should keep in mind the matter of their ready promotion not only as a reward for their good services but also as an encouragement to others.

The best type of organization is not the one that can only
produce the most obedient type of employees who will act faithfully and industriously under the absolute direction of their superiors, but it is such a one that can develop independent thinkers, self-reliant and originative, while the binding force of an organization, i.e., subordination, is not endangered. In order to accomplish the desired results, departmental heads should be given full authority and responsibility on all matters within their respective jurisdiction. As long as they have full power over all the subordinates and all matters in their own department, they have more freedom to act independently. It is the only way to develop a high type of railway officers, and on those lines that adopt this principle we find the most efficient officers.

On all well organized roads the authority of the departmental chief is almost complete, except that, in case of appointing subordinates, an approval of a certain vice-president is necessary. President or vice-president should hesitate to interfere within the department, because "any interference is simply to discourage the departmental chief and demoralize the departmental organization and progress." The most important requirement for an organization is to have a particular person responsible for a particular class of work. If the departmental chief is interfered with by his superiors, it is unfair and unjust to hold him responsible for work with reference to which he cannot act independently; the natural consequence of interference is that nobody would be responsible for the work, and to go a step further, nobody would do the work.

There is no fixed rule to govern the choice of the type of organization. Before the administrator can definitely choose a particular type of organization for a particular road the conditions of...
the road need to be examined, analysed and studied from different phases. The type of organization suitable for a particular road may vary not only from that suitable to another road but also from that suitable to the same road at different times.

Stability of principles and methods is an important attribute of an efficient railway administration, and the best way to secure it is to develop the organization to such an extent that its government is self-supporting and its men self-reliant. The principles and methods of the organization should live; when the organizing head is absent or resigns, the organization should be as strong as if he were at the head. We have already mentioned several requisites of a successful organization, namely, the selection of the appropriate type of organization, a definition of general policy, and the selection of the best men obtainable, but these fail to insure us that principles and methods will be continuous. Now if the chief executive takes in young men of promising character and ability, educates and develops them in their line of work, after a certain period, strong men, thoroughly imbued with the fundamental principles necessary for the progress of the organization, will be ready for the service of the company. In training young officers the important point is to appeal to their good nature, sense of justice, ambition, and pride of work. Development of a sense of responsibility is essential and they should be exercised in the use of disciplinary authority.

Let us now consider some of the features which an organization should not have. First of all, trouble often arises from absence of a definite final authority for all matters upon which action is necessary. The logical consequence of such a defect in an organization is indecision, which may develop into general disorder. Ri-
Valry and jealousy are the natural results, and cooperation and interdependence can hardly exist. In such an imperfect organization, the best possible solutions of controversies between contending parties, which can be obtained, are compromises, a kind of settlement apt to be the very opposite of efficiency and economy.

A second source of trouble is divided authority. When two or more officers are equally responsible for a certain work, they can evade the responsibility. The result of this defect is as injurious as interference. Interference means too much authority, while divided authority is too weak. They seem utterly different, but both of them result in a failure to hold a particular officer responsible for it.

A third difficulty comes from the unequal loading of different officers. When an officer is overburdened with responsibility and work, he will become incompetent, however able he may be originally. He is unable to study, to digest, and to understand the problem thoroughly on account of insufficient time devoted to it. His judgment may be entirely unsound and his action may be abnormal. When, on the other hand, an officer does not have enough work to do, his activities may be killed; his faculties may lose their vigor; and finally he may deteriorate both mentally and physically.

Another source of trouble is double subordination, i.e., the subordination of an officer to two or more authorities. The difficulty lies in the fact that it is often not easy to draw definitely a dividing line in order to separate sharply the authority of one from the other. There are, however, exceptional cases. When the two authorities cover two entirely different fields, there is no conflict at all. For instance, a master mechanic may report to the mo-
tive power superintendent on standards and to the division superintendent on conditions of shops, roundhouse and engines. Conductors may report to the operating department on movement of trains and to the traffic department on sale of tickets.

The effects of decentralization are very apparent. In a weak organization, centralization of authority is rather impossible while the power of the local officers is unrestricted. Interest of the system is lost to view and the general policy of the organization cannot be carried out. This is not the only result of decentralization. Harmony of action and uniformity of results are impossible, while standardization of work is also seriously interfered with, though special authorities are provided for the particular purpose. The business of a railway differs from that of certain manufacturing concerns in that the former has a system of line widespread over a large territory and the latter is enclosed within a limited space. For this reason, a railway organization has a great tendency toward excessive decentralization, unless it is carefully constructed. The Harriman System has 18,600 miles of lines under a single, highly efficient administration and the operation has been very successful. If an organization as large as this were less centralized, the general policy of the administration and the common interests of the line would soon be lost sight of.

But mischief may result also from a too centralized organization. It is possible for an organizer to have his system highly centralized, all matters both general and detailed being originated at headquarters. If the line is short, traffic not heavy and consequently subordinate officers not very numerous, the administration may be handled successfully under this condition. This kind of or-
ganization, however, is absolutely unfit for large roads. When large roads adopt an organization like this, the results are very disastrous. If everything originates from headquarters, detailed work will flood the office, and great delay is the logical consequence. When the officers at headquarters cannot study local conditions, they can only lay down general rules, and if there arise special cases, these general rules are the only ones they can apply. Hence general rules apply to special cases. In time of emergency promptness and effectiveness are mostly required. We can not expect these two qualities in an over-centralized organization, and we find that the officers at headquarters are unable to cope with emergencies. Work becomes so congested that all kinds of evil and corruption creep into the system, and the organization may finally collapse.

The success of an organization is not solely due to the perfection of the organization itself but also to the merits, skill, ability of officers. In any kind of organization, there are always two factors essential to successful administration. One of these factors we can put in writing, namely, the government, by-laws, etc., but the other, the spirit of the organization, is not to be found there. To this latter factor, it is now necessary to devote our attention.

In connection with this, it may be asked what kind of man is fit for a chief executive. Everybody knows that a man of special ability should be at the head. But what is meant by special ability? The following throws some light upon this point.

"Such a man, not necessarily well versed in the detail of departmental works, is in many ways benefited if reinforced by techni-

#1 A. M. Waitt in the Railway Gazette (1904).
cal knowledge of the profession of railroading in some one or more of its various departments. He should be a man of good judgment, fairness coupled with the education furnished by a broad field of observation - these being characteristics essential to a successful manager."

"One of the very able chief executive officers of a great American railroad said, 'I never attempt to do the work that I can hire others to do for me. When problems arise that my subordinates can not solve, then I am always ready to have the case referred to me.'"

Several qualifications should mark the successful departmental head. As Mr. Waitt says: "Such a man not only possesses ability from a technical standpoint of view, but the ability as an organizer in his particular department and also possesses good judgment in selecting and dealing with men. The most successful man for the head of a department is not the man who can put in most hours at a desk and can work hard himself but rather the one who has the faculty of keeping others at work to good purpose and knows how to keep in touch with his subordinates as to know what they are doing and to direct their general movements."

It would seem that great organizers are born so and cannot be taught to be such by education. Education and experience improve men's ability simply in developing the faculty of common sense. Persons who attain the highest development of common sense often become great organizers.
Section 5.

Relation of the size of the road to the organization.

The influence of the size of the railway upon organization is well brought out by the following extracts.

"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 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."

"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."#1

#1. Ray Morris, Railroad Administration, p. 47.
According to the statement quoted above, it is seen there is a decided difference in the nature of a small and a large road, and consequently the organization of roads of different sizes cannot be identical. A system of organization which is best fitted for a large road, is not necessarily good for a small one, while another system of organization well adapted to a small one may be totally unworkable if applied to a large one.

On a large road wherein the division of labor is highly developed, there are various divisions of work, each having a set of officers whom we may call "specialists." The term "all round officer" is hardly applicable to the officers on a large road, since their work is so specialized that not infrequently they do not understand anything at all but a limited part of the work in their respective departments. The advantage of specialization which is carried to such an extent is that improvement in regard to efficiency can be brought about as the result of years of experience.

On a large road the officers, who are less specialized, are general managers, general superintendents and division superintendents. Even in this case there is great difference when we compare the work of a division superintendent on a large road with that of a general manager on a small one, though each of them may have approximately equal mileage of roads under their respective control. Usually the jurisdiction of a general manager, or general superintendent on a large road is limited to operation or to operation and maintenance, leaving the traffic side to another independent department. But in the case of a general manager of a small road, everything may be under his control, his authority may be complete.

The organization of the Pennsylvania is typical for larger
roads, and the Jamestown, Chautauqua & Lake Erie Railway illustrates well the organization of a small road. The chief of the latter is a president who acts as a general manager, and is assisted by the following officers:

- One superintendent
- One general auditor
- One purchasing agent
- One freight claim agent
- One freight agent
- One passenger agent
- One chief engineer
- One electrical engineer

He has direct control of all affairs on the line, these eight officers reporting to him directly, though the mileage in his charge, which is only 32 miles, is far less than that under a division superintendent of a large road. In comparing the jurisdictions of the president of a small road and the division superintendent of a large one, the president has direct control of traffic, accounting, purchasing, operating, and maintenance; while the division superintendent, in case of departmental organization, is generally in charge of transportation alone, which covers station service, yard service and train service, or, if the organization is divisional, in addition to transportation, maintenance of ways and structures and maintenance of equipment.

On a large road like the Pennsylvania there are positions of prominence that are not represented at all on a small one. For instance, the Pennsylvania has a general counsel for legal matters and a chief engineer for construction work, each having a separate department; but the small road has neither of the officials. This does not mean that there is no new construction nor legal matters to

be taken care of by this road, but that the occurrence of these matters is comparatively infrequent so that it is not economical to have special officers for the limited amount of work required. Such economy is characteristic of many small roads. Whenever the president needs legal advice, local attorneys are called upon for aid, receiving compensations for their services. If the consultations are quite frequent, they may be paid regularly, though they are not regular officials of the road. Small roads seldom undertake new construction, and, when they do, they often let the work to construction companies.

Since the president of the small road, frequently acting as its general manager, has direct control of all matters on the line and of the small territory over which the property extends, he is able to approach his subordinates personally and look into the details of their work. Since the control of traffic and transportation is combined in his own person, he is capable of adjusting the relation between the two branches more harmoniously. The advantages of a small road over a large one may be enumerated as follows: (1) no danger of decentralization, (2) no construction department needed, (3) no special legal counsel needed, (4) simplicity of auditing, and (5) personal contact of the general manager with his subordinates.

The Jamestown, Chautauqua & Lake Erie Railway is somewhat too small to consider its organization typical, and so we may take another road for illustration. The Bangor and Aroostook Railroad has a total mileage of 628, and is engaged in general traffic.

The organization of the Bangor & Aroostook Railroad.

Directors
Treasurer
Cashier
President

General Auditor

Traveling Agent

Freight Claim Agent

Vice President

Superintendent of Motive Power & Equipment

Chief Engineer

Passenger Traffic Manager

General Freight Agent

General Superintendent

Terminal Agent

Division Superintendents

Special Agents

The general nature of the duties of principal officers of this road is indicated by the following extracts from a letter by Mr. F. W. Cram, President of the road.

"The President and the Treasurer are chosen by the Directors, and are directly responsible to the corporation."

"The Cashier reports to the Treasurer."

"All departments other than the Treasury are subordinate to the President."

"The Vice-President is in charge of the management of property, and to him the following officers report directly:

A. The General Superintendent, in charge of operation

B. The General Freight Agent, in charge of freight traffic

C. The Passenger Traffic Manager, in charge of passenger traffic

D. The Chief Engineer, in charge of roadway and structures

and E. The Superintendent of Motive Power and Equipment, in charge of the physical condition of locomotives, cars, repair shops, etc."

"The Superintendents are really Division Superintendents, and the Terminal Agent is in charge of the ocean terminal. They are subordinate to the General Superintendent."

"The Special Agent is to encourage new industries along
the line and he reports to the Vice-President."

"The General Auditor is in charge of accounts, and reports to the President. His subordinate officer, the traveling auditor, audits those accounts of the company which are located outside the General Auditor's offices."

"The Freight Claim Agent is in charge of freight claims, and reports to the General Auditor."

On many roads the treasurer reports to the president, though the former is often elected by the directors. It is rather a general practice for president, vice-president, secretary, treasurer, and other departmental heads, to constitute a kind of executive department with the president at the head, so that there is a common authority in this department, the president only being responsible to the directors. The organizations of the Pennsylvania and of the Baltimore and Ohio are worked out in this manner. But the organization of the small road we are considering presents a distinctive feature. The treasurer as well as the president is made directly responsible to the directors,—thus the executive authorities are divided between the president and the treasurer.

As a result of this feature of the organization of this road, the auditing and treasury departments report to separate authorities, the former reporting to the president. On many other roads, especially large ones, the two branches are under one head, usually a vice-president or treasurer, who is subordinate to the president: For instance, on the Virginian Railway, the secretary and treasurer has an assistant treasurer and auditor under him; the Norfolk and Western Railway puts treasurer, comptroller and statistician under the 1st vice-president; the organization of the Buffa-
lo, Rochester & Pittsburg combines the duties of auditor and treasurer in one person. On the Pennsylvania, however, according to the organization effective in 1909, the treasurer is under the 4th vice-president, while the comptroller is under the 2nd vice-president, both the 4th and 2nd vice-presidents being under the president as their common authority.

The third peculiarity in the organization of this road is the position occupied by the freight claim agent. On other roads like the Pennsylvania, the freight claim agent is subordinate to a vice-president, while the freight traffic manager and the passenger traffic manager are his coordinate officers. On the small Gulf Line the claim agent has the traffic manager as his coordinate officer, and reports to the president. On the road we are now considering, the freight claim agent reports to the general auditor, his coordinate officer is the traveling auditor, while the respective traffic managers for passenger and for freight report to the vice-president who is coordinate with the general auditor. On most large roads, the freight claim agent is in the traffic department, but he may be in the legal or operating departments. On the Pennsylvania, the officers are in the same department; on the Norfolk & Western Railway the general claim agent is in the transportation department instead of in the traffic department. In examining the organization of other roads it is seen that the claim agent is not often subordinate to an auditor. The reason is that, since the duty of a claim agent is to determine whether all claims for damage to or loss of freight are valid or not, the inquiry rather refers to the nature and conditions of damages so that the legal points and quality of traffic play an important part in the course of examination. For this reason, many
Organisation of the Pennsylvania Railroad Company 1900.

General Selectors
District Selectors

Vice-Pre-Secretary

Chief Claim agent
Special Agents

Chief of Police

5th Vice-President

Ass't to Gen. Mgr.:
Chief Engineer
Superintendent
Telegraph

Gen. Mgr.:
Superintendent
Chief Engineer

Chief Supt. Traffic

Chief of Police

4th Vice-President

Ass't Treasurer

Vice-President

Comptroller

Chief Engineer

Assistant to Vice-President

Transfer Clerk

Secretary

Assistant to President
roads put this officer in the same department either with traffic agents or legal agents, though the auditing of charges may occur in examining the claims.

The vice-president of this road corresponds to a general manager on other roads. He has direct control not only of transportation, but also of traffic. This combination of transportation and traffic under one manager is somewhat unusual. On large roads like the Harriman Lines, the Pennsylvania, and others traffic and operation are kept separate.

The organization in this regard is rather departmental, and the natural advantage of a small road is that the general manager may be able to look after the details of work under his control. The superintendent of motive power and equipment and the chief engineer report to the vice-president directly instead of to the general superintendent; so the general superintendent merely has charge of transportation such as train movement, train dispatching, station service and yard service, this arrangement being a typical feature of a departmental organization. In comparing the organization of this road with that of the leased and operated lines of the New York Central & Hudson River Railroad\(^\text{1}\) effective in 1909, it shows that the two roads are organized under the same system, i.e., departmental.

The Chicago, Indianapolis & Louisville Railway also illus-

\(^\text{1}\) Vice-president and General Manager is assisted by 1 Superintendent of Telegraph, 1 Assistant General Manager of Transportation, 1 Superintendent of Freight Transportation, 1 General Superintendent of Electric Division, 1 Chief Engineer, 1 Assistant and General Manager of Maintenance of Way, 1 Assistant General Manager of Public Relations, 1 Manager of Marine Department, 1 Superintendent of motive Power, 1 Superintendent of Rolling Stock, 1 Superintendent of Dining Service, 1 Assistant to General Manager on Statistics and Contracts, and 1 General Storekeeper.
trates well a typical system of organization for a small road. The president is the active chief executive and is assisted by a vice-president, a general manager, a secretary, a treasurer and assistant secretary, a general solicitor, an auditor, a general passenger agent, a general freight agent, a superintendent of motive power and equipment, an engineer of maintenance of way and a superintendent, each of whom is reported to by his own subordinates.

The superintendent of motive power and equipment is in charge of motive power and cars, the engineer of maintenance of way has charge of maintaining roads - including roadbed, rails, ties, bridges and other minor structures, the superintendent takes charge of transportation - all reporting to the general manager. The general manager is the busiest man on the road. He is the man responsible for the actual operation and maintenance of the line in his hands. These three officers - superintendent, superintendent of motive power, and engineer of maintenance of way - work cooperatively, since their duties are to provide service for the business which the traffic department secures.

The traffic department is represented by two principal officers - the general passenger agent and the general freight agent, who are coordinate with the general manager and report to the president. Their business is to sell the transportation which the general manager offers. A certain amount of business will come to the road by itself but a great deal more may be secured through the activity of these agents.

The general freight agent of this road is responsible for freight traffic. He is assisted by an assistant general freight agent, for office work; a chief of tariff bureau, for tariff making;
a division freight agent, for district freight; a freight claim agent, for freight claims; three general agents; nine commercial agents and three traveling agents, for soliciting. The general freight agent of this road looks into the quality of the service rendered to the shippers by the road; he makes rate schedules, studies the transportation demands of special industries; he is kept properly informed about the natural advantages concerning certain kinds of industries, manufactures or agriculture along his line. For these various purposes, the road provides three traveling agents and seven commercial agents. Besides securing new business he must see if the existing business is given satisfactory service; that the station agents carry on their work with due regard to economy and efficiency, and that, with the aid of the assistant general freight agent, the clerical forces of his department keep their work in good order.

The general passenger agent is responsible for passenger traffic and he is assisted by an assistant general passenger agent, three district agents, two city ticket agents, two general agents, and two traveling agents. With the aid of the assistant passenger agent he is responsible for the headquarters' clerical force; he must cooperate with the general manager and the superintendent in laying out the passenger time table; he must ask for additional trains to be run when he needs them. If he finds opportunities to create new business, he runs special excursions, advertises and secures fairs, conventions, etc.

The auditor maintains the relation with the treasury department in the same way as the traffic to operation. The treasurer is the custodian of the company's funds and the auditor examines all
accounts and bills, collects the funds and brings them to the treasurer. The treasurer of the road is located at Chicago, and for this reason, besides his regular duties of receiving and disbursing money, he also performs duties of secretary in Chicago, while the secretary, on the other hand, also performs such duties as an assistant treasurer in addition to his original duties such as keeping records of Board of Directors and the meetings of the executive committee. Here this is the peculiar feature in the organization of the small road, as the duties of secretary and treasurer are not distinctively separated.

The general solicitor, who is assisted by four subordinates, is the head of the legal department. He, as a vice-president, acts also for the president in the latter's absence. The general solicitor has in charge of legal matters in Indiana, the attorneys for Illinois for legal matters in Illinois, the attorneys for Kentucky for legal matters in Kentucky - all reporting to the general solicitor. The general claim agent is in charge of claims for personal injuries and damages to property. He reports to the general solicitor and the general attorney.

A comparative study of the organization of this road and of some other small road, for example, the Bangor & Aroostook, shows that the latter has no legal department, though having a greater mileage than the former. The reason for this omission is that when the company is to undertake extension work, when it has legal difficulties with certain public authorities, with customers or with claimants, and when legal questions of any kind come up, the small road may call for legal aid on some advisor or advisors and the latter probably has no official connection with the company and their
services are likely paid on the basis of professional work done. Sometimes the legal advisor or a firm of legal advisors are paid to keep them from being employed against the company. It also shows that the general manager of the road we are studying occupies a somewhat similar position as the general superintendent on the Bangor & Aroostook Railroad; the difference in authority being in that on the Chicago, Indianapolis & Louisville Railway the general manager has direct control of the motive power and the roadway departments, while the general superintendent on the latter has not. The vice-president on this road acts in absence of the president and the authority of the chief executive on this road is more complete since the treasurer is also subordinate to him. The commercial agent may take the place of the industrial agent and is in the freight department instead of a separate one as on the Bangor & Aroostook. There are not such departments as purchasing, construction and real estate.

In comparing the organization of this road with that of some large ones, we see that the organization of the Chicago, Indianapolis & Louisville Railroad is fairly comparable with that of the Pennsylvania on a small scale with the omission of a few departments, since the business of the road does not demand their existence. The organization of the large railroads is based practically on the same principles as that of the small roads. It is for this reason that so much space has been given above to this particular road. The difference between a large and a small one is chiefly in the subdivision of authorities.

The working organization of a short line which has a mileage less than one half as much as that of the Chicago, Indianapolis & Louisville but is operated as an independent road may be illustra-
ted by the Toledo, Peoria & Western Railway. The executive head is
the president, who is assisted by a secretary and treasurer, a superin­tendent, a general passenger agent, a general freight agent and an
auditor. The secretary and treasurer is in charge of cash and pay­rolls; the superintendent, in charge of all transportation matters;
the general passenger agent, in charge of matters pertaining to pas­sengers and baggage; the freight agent, in charge of matters rela­ting to freights, rates, claims, etc.; and the auditor, in charge of
accounts and records - all reporting to the president. This organi­zation dispenses with the vice-president, and the duties of secreta­ry and treasurer are combined in one person. Another difference is
that the auditor, in addition to taking care of accounts, also keeps
records, which function is often performed by the secretary and his
assistants on other roads. The organization of this road may repre­sent pretty well very many other roads of about the same size.

York Central and Hudson River Railroads.

At the head of this department is a vice-president and gen­eral manager, to whom thirteen officials report, namely, superintend­ent of telegraph, assistant general manager of transportation, su­perintendent of freight transportation, general superintendent of
electric division, chief engineer, assistant general manager of main­tenance of way, assistant general manager of public relations, man­ager of marine department, superintendent of motive power, superin­tendent of rolling stock, superintendent of dining service, assis­tant and to general manager on statistics and contracts, and general
stokers. Some of these are as staff officers, others as both
staff and line officers, all of them being, however, heads of subde­
partments in effect in 1905.
Part II.

DETAILS OF RAILWAY ORGANIZATION.

Section 6.

A description of different types of organization

Before Mr. Harriman introduced the unit system on his line there had been two radically different types of organization, viz., (1) divisional and (2) departmental. In actual practice, there has never been a divisional system organized in its theoretically complete form, although most roads in this country adopt this system, while the roads organized according to the departmental system are not many, and their administrations have not been very successful.

The chief feature which distinguishes the departmental system from the divisional is found in the operating department. This may be understood better if we give a description of the organization of the operating department of the leased and operated lines of the New York Central and Hudson River Railroad.

At the head of this department is a vice-president and general manager, to whom thirteen officers report, namely, superintendent of telegraph, assistant general manager of transportation, superintendent of freight transportation, general superintendent of electric division, chief engineer, assistant general manager of maintenance of way, assistant general manager of public relations, manager of marine department, superintendent of motive power, superintendent of rolling stock, superintendent of dining service, assistant to general manager on statistics and contracts, and general storekeeper. Some of these act as staff officers, others as both staff and line officers, all of them being, however, heads of subde-
departments. Those whose subordinate officers are distributed over the entire line are the superintendent of telegraph, general superintendent of electric division, chief engineer, assistant general manager of maintenance of way, manager of marine department, superintendent of motive power, and superintendent of rolling stock, while the rest are staff officers. The departmental nature of this organization appears in the fact that the division and general superintendents have charge only of train movements; the maintenance of way and the civil and mechanical forces are subordinate to the general manager alone.

The ideal departmental organization may be illustrated by the following diagram.

According to this diagram outlined above, the departmental system is 

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#1. Byers' Economics of Railway Operation, p. 10.
a complete and perfect one; in actual practice, however, an organization cannot be so uniform and symmetrical. Frequently, the territorial subdivisions of one department are not identical with those of another. The New York Central and Hudson River Railroad also affords an example of this. In the operating department of this line, there are twelve divisions: in the transportation department, six in the maintenance of way, four in the motive power, and two in rolling stock; while in the traffic department there are eight divisions.

These divisions are tabulated as follows.

<table>
<thead>
<tr>
<th>Transportaion Department</th>
<th>Main Divisions:</th>
<th>Subdivisions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A. Eastern Division</td>
<td>Hudson Division</td>
</tr>
<tr>
<td></td>
<td>B. Western Division</td>
<td>Mohawk &quot;</td>
</tr>
<tr>
<td>Maintenance of Way</td>
<td>Rome, Watertown &amp; Ogdensburg Division</td>
<td>Western &quot;</td>
</tr>
<tr>
<td>Department</td>
<td>Mohawk Division</td>
<td>Rochester &quot;</td>
</tr>
<tr>
<td></td>
<td>River</td>
<td>Buffalo &quot;</td>
</tr>
<tr>
<td></td>
<td>Western</td>
<td>Harlem &amp; Putnam Division</td>
</tr>
<tr>
<td></td>
<td>Penn</td>
<td>St. Lawrence &quot;</td>
</tr>
<tr>
<td></td>
<td>Adirondack</td>
<td>Ontario Division</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Penn &quot;</td>
</tr>
<tr>
<td></td>
<td>Rolling Stock</td>
<td>Adirondack &quot;</td>
</tr>
<tr>
<td>Eastern Division</td>
<td>Western</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintenance of Way Department</td>
<td></td>
</tr>
<tr>
<td>Eastern Division</td>
<td>Rome, Watertown &amp; Ogdensburg Division</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mohawk Division</td>
<td></td>
</tr>
<tr>
<td>Maintenance of Way</td>
<td>River</td>
<td></td>
</tr>
<tr>
<td>Department</td>
<td>Western</td>
<td></td>
</tr>
<tr>
<td>Western Division</td>
<td>Penn</td>
<td></td>
</tr>
<tr>
<td>Maintenance of Way</td>
<td>Motive Power</td>
<td></td>
</tr>
<tr>
<td>Department</td>
<td>Western Division</td>
<td></td>
</tr>
<tr>
<td>Eastern Division</td>
<td>R. W. &amp; O.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Penn</td>
<td></td>
</tr>
<tr>
<td>Traffic Department</td>
<td>Passenger</td>
<td></td>
</tr>
<tr>
<td>Besides many city agents there are two dis-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
An examination of these divisions shows that each department has the Eastern and the Western Divisions which are main divisions, and that the remaining divisions of one department do not correspond well with those of any other department. Roughly speaking, the traffic department is fairly close to the transportation department, and the department of motive power to that of maintenance of way. Similar conditions exist in the department organization of the railways of that home of departmentalism - Great Britain, and we may conclude that the ideal departmental organization has never been realized yet.

#1 Great Western (England and Wales)

<table>
<thead>
<tr>
<th align="left">Ways and Works</th>
<th align="left">Rolling Stock</th>
<th align="left">Traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td align="left">:------------</td>
<td align="left">:-------------</td>
<td align="left">:-------------</td>
</tr>
<tr>
<td align="left">:------------</td>
<td align="left">:-------------</td>
<td align="left">:-------------</td>
</tr>
<tr>
<td align="left">Gloucester</td>
<td align="left">Wolverhampton</td>
<td align="left">Chester</td>
</tr>
<tr>
<td align="left">Newport</td>
<td align="left">London, W.</td>
<td align="left">Bristol</td>
</tr>
<tr>
<td align="left">Neath</td>
<td align="left">Newport</td>
<td align="left">Paddington</td>
</tr>
<tr>
<td align="left">Bristol</td>
<td align="left">Newton Abbot</td>
<td align="left">Gloucester</td>
</tr>
<tr>
<td align="left">Taunton</td>
<td align="left">Swindon</td>
<td align="left">Birmingham</td>
</tr>
<tr>
<td align="left">Plymouth</td>
<td align="left">Bristol</td>
<td align="left">Worcester</td>
</tr>
<tr>
<td align="left">Paddington Station</td>
<td align="left">Neath</td>
<td align="left">Pontypool Road</td>
</tr>
<tr>
<td align="left">Wolverhampton</td>
<td align="left">Worcester</td>
<td align="left">Swansea</td>
</tr>
<tr>
<td align="left">Shrewsbury</td>
<td align="left">Port Talbot</td>
<td align="left">Cardiff</td>
</tr>
<tr>
<td align="left"></td>
<td align="left">Plymouth</td>
<td align="left">Exeter</td>
</tr>
</tbody>
</table>

Midland (England and Wales)

(see note, p. 48.)
<table>
<thead>
<tr>
<th>Position</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>President/Chairman of Board</td>
<td></td>
</tr>
<tr>
<td>2nd V.P. General Manager</td>
<td></td>
</tr>
<tr>
<td>3rd V.P. General Manager (Operation)</td>
<td></td>
</tr>
<tr>
<td>Treasurer</td>
<td>Asst Treasurer</td>
</tr>
<tr>
<td>Paymaster</td>
<td>Asst Paymaster</td>
</tr>
<tr>
<td>Asst General Auditor</td>
<td></td>
</tr>
<tr>
<td>Chief Traveling Auditor</td>
<td>Traveling Auditors</td>
</tr>
<tr>
<td>Auditor for Acts</td>
<td></td>
</tr>
<tr>
<td>Auditor for Fitch Acts</td>
<td></td>
</tr>
<tr>
<td>Asst Solicitor</td>
<td></td>
</tr>
<tr>
<td>Asst to General Solicitor</td>
<td></td>
</tr>
<tr>
<td>Attorneys</td>
<td></td>
</tr>
<tr>
<td>Conveyancer</td>
<td></td>
</tr>
<tr>
<td>General Solicitor</td>
<td></td>
</tr>
<tr>
<td>General Attorney</td>
<td></td>
</tr>
<tr>
<td>Master Car Builder</td>
<td></td>
</tr>
<tr>
<td>General Foreman of Shops</td>
<td></td>
</tr>
<tr>
<td>Asst General Manager</td>
<td></td>
</tr>
<tr>
<td>Divisional Manager</td>
<td></td>
</tr>
<tr>
<td>Sub-division Manager</td>
<td></td>
</tr>
<tr>
<td>Traffic Manager</td>
<td></td>
</tr>
<tr>
<td>Freight Agent</td>
<td></td>
</tr>
<tr>
<td>General Bag Agent</td>
<td>Asst General Bag Agent</td>
</tr>
<tr>
<td>General Western Bag Agent</td>
<td></td>
</tr>
<tr>
<td>Freight Bag Agent</td>
<td></td>
</tr>
<tr>
<td>Export Freight Manager</td>
<td></td>
</tr>
<tr>
<td>Export Freight Agent</td>
<td></td>
</tr>
<tr>
<td>Vermont Freight Agent</td>
<td></td>
</tr>
<tr>
<td>Traveling Freight Agent</td>
<td></td>
</tr>
<tr>
<td>(Asst. Gen. Freight Agent)</td>
<td></td>
</tr>
<tr>
<td>Gen. Bag Agent</td>
<td></td>
</tr>
<tr>
<td>Gen. Western Bag Agent</td>
<td></td>
</tr>
<tr>
<td>Asst. Freight Agent</td>
<td></td>
</tr>
<tr>
<td>Asst. Generals Bag Agent</td>
<td></td>
</tr>
<tr>
<td>Traveling Freight Agent</td>
<td></td>
</tr>
<tr>
<td>Roadmasters</td>
<td></td>
</tr>
<tr>
<td>Bridge Supvr</td>
<td></td>
</tr>
<tr>
<td>Bridge Engineer</td>
<td></td>
</tr>
<tr>
<td>Mechanical Engineer</td>
<td></td>
</tr>
<tr>
<td>Gen. Foreman of Shops</td>
<td></td>
</tr>
<tr>
<td>Supt. of Motive Power</td>
<td></td>
</tr>
<tr>
<td>Master Mechanics (3)</td>
<td></td>
</tr>
<tr>
<td>Supt. of Car Service</td>
<td></td>
</tr>
<tr>
<td>Supt. of Telephone</td>
<td></td>
</tr>
<tr>
<td>Asst. Chief Engineer</td>
<td></td>
</tr>
<tr>
<td>Asst. Chief Engineer (2)</td>
<td></td>
</tr>
<tr>
<td>Chief Engineer</td>
<td></td>
</tr>
<tr>
<td>Engineer (4)</td>
<td></td>
</tr>
<tr>
<td>Mechanical Engineer</td>
<td></td>
</tr>
<tr>
<td>Master Car Builder</td>
<td></td>
</tr>
<tr>
<td>Master of Foremen of Shops</td>
<td></td>
</tr>
<tr>
<td>Supt. of Signals</td>
<td></td>
</tr>
<tr>
<td>Purchasing Agent</td>
<td></td>
</tr>
<tr>
<td>Chief Electrician</td>
<td></td>
</tr>
<tr>
<td>Fuel Agent</td>
<td></td>
</tr>
<tr>
<td>Real Estate Agent</td>
<td></td>
</tr>
<tr>
<td>Controller/General Auditor (Financial/Accounting)</td>
<td></td>
</tr>
<tr>
<td>General Solicitor</td>
<td></td>
</tr>
<tr>
<td>General Attorney</td>
<td></td>
</tr>
</tbody>
</table>
The organization of the Boston & Maine is clearly departmental in character; the 3rd vice-president, who is also the general manager, has charge of the operating department and to him ten officers report, e.g., assistant general manager in charge of maintenance of way, general superintendent in charge of transportation, chief engineer, superintendent of motive power, master car builder, superintendent of signals, purchasing agent, chief electrician, fuel agent and real estate agent. The division superintendents report to the assistant general manager on questions of maintenance of way and to the general superintendent on questions of transportation. The master mechanic reports directly to the superintendent of motive power. The organization may be regarded as semi-departmental.

Organization of the Buffalo, Rochester & Pittsburg Railroad.

President:
Chief Engineer:
Asst. Engineer:
Supt. Mo. Power:
Master Mech.:
Supervisor:
Track Foremen:

Operators: Trainmen: Road Foreman: Car Insp.: Foremen: Trackmen:

Engr. & Firemen: Mechanics:

Midland (England and Wales)

Ways and Works: Rolling Stock: Traffic:
South:
Western:

London:
Nottingham: Leicester:
Sheffield: Derby:
Leeds: Sheffield:
Manchester: Leeds:
Bristol: Manchester:
Swansea: Liverpool:
Birmingham:
Bristol:
Secondary Control


:Agents:  :Trainmasters:  

:Enginemen:  :Firemen:

The Buffalo, Rochester & Pittsburg is not a large road but a very busy one. Its organization is departmental, for the responsibility of a division superintendent within his division is limited to train movement and this operation only, while the maintenance of way and equipment is under the supervisor and the mechanic. These three officers, therefore, divide the authority of the division. The division on this road is so short that the general superintendent is able to reach every place on the line at once whenever he is needed, and all the operating control is centralized in his hands. Since the general manager and the general superintendent have full control over transportation and maintenance, the organization seems to be divisional, but the chief difference between a departmental and a divisional road lies in the fact that, under the divisional organization, the division superintendent has control of both transportation and maintenance within the division. Now according to this organization, the division superintendent is in charge of transportation only, which fact is the typical feature of a departmental organization in the operating department. The engineering department reports directly to the general manager.

In early times independent roads were not so large in size as they are today and they did not need such an elaborate system as is used today. Later on with the growth in size of the roads, the
older departmental type of organization was found inadequate, and the organization of large roads had to be changed so as to effect an efficient and economic administration. The tendency in general was to change from departmental to divisional. Most of the large roads in this country have adopted the divisional system, but there are some which still prefer the departmental system.

The ideal divisional organization for a medium sized road would be as outlined as below.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive (Manager)</td>
<td>Executive (Manager)</td>
<td>Staff of</td>
<td>Same as for A and B</td>
<td>Same as for A, B and C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If the divisional organization were carried to its ideal stage the entire line would be divided into territorial divisions, each constituting a unit and with complete control over all matters within it; as outlined above, there would be eight departments in each division. An examination of the organization of the leading railroads shows that no road is organized in this way. Although the Pennsylvania is regarded as a typical example of the divisional system, its application is limited to the operating department. In a word, it might be said that the organization of this road uses the Wi. Byers, Economics of Railway Operation, p. 9.
departmental system as a basis with some modification in the operating department so as to conform to a divisional system. The chief of motive power in charge of standards and the general manager in charge of maintenance of way and equipments and transportation are directly responsible to the 5th vice president. The organization in the traffic department can hardly be called divisional.

The operating organization of the Chicago Great Western is clearly divisional in character. At the head of this branch of the entire organization is the general manager, and to him five officers report: the assistant general manager, the general traffic manager, the general superintendent, the chief engineer and the signal engineer. To the general superintendent five officers report: the car service agent, the weighing inspector, the superintendent of motive power, the superintendent of Celwein terminal and superintendents. The divisional system on this road is carried to the smallest unit, as the superintendents have charge of transportation, maintenance of way and equipment. Division engineers, signalmen, drawbridge engineers and division master mechanics report directly to their division superintendents. The assistant general manager has specific duties which are rather limited in character. The responsibility for operation goes directly through general superintendent to the general manager. Superintendents and division engineers naturally report to the chief engineer with regard to standards and methods, and the signal engineer is a staff officer, reporting directly to the general manager.

The organization of the Philadelphia and Reading is another example of a strongly divisional one. It presents several quite unusual features. There is no separate official with the title of
general manager, but the first vice-president assumes the duties of that officer, together with others that would have fallen on different officials. The purchasing agent, the claim agent, the general storekeeper, the general passenger agent, all report to him. The general superintendent, besides his supervision over the six division superintendents, also receives reports from the general road foremen of engines and from the signal engineer, while each division superintendent has a division engineer, a division master mechanic and a road foreman of engines. The general passenger agent reports to the first vice-president, while the general freight agent reports to the second vice-president. This splitting of authority is due to the fact that the second vice-president of the Philadelphia and Reading Railroad is also first vice-president of the Philadelphia & Reading Coal and Iron Company, and as such, has the entire jurisdiction over all matters pertaining to the selling and handling of the Reading Company's coal business, which constitutes an extremely important part of the entire freight. The secretary has extended powers and under some organizations would have been called a vice-president; his position as head of the auditing department makes his field in certain ways similar to that of the fourth vice-president of the New York Central.

The unit system of organization has been brought into prominence of late, on account of its adoption by the Union Pacific. The Harriman organization is a widespread one and somewhat complex. Under the president there are two directors, one for maintenance and operation and the other for traffic. In order to free these exceedingly responsible managers from all details of work, an elaborate system of subdivision has been established, with the re-
sponsibilities properly graded, and put into the hands of very competent men.

The traffic branch of the company's business is organized without much difficulty. The traffic director has a staff of capable assistants at his headquarters; he has traffic managers located at important points, and these managers in turn have under them a number of agents and solicitors, to do the actual work according to the instructions of their chief.

The operating organization is much more complicated. 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, a consulting engineer, an electrical engineer, a mail traffic manager, two staff assistants, and a special representative. The functions of the office of director of maintenance and operation are the standardization and correlation, the supervision and investigation of the different properties.

Each of the operating vice-presidents and the subsidiary president is at the head of a constituent part of the entire system—such constituent part being in effect a complete road. He has his own chief engineer, general superintendent, superintendent of motive power and purchasing agent. These subsidiary organizations are so shaped that they may be operated as if they were independent roads.

The unit system owes its name to the principle that a division shall be regarded as a unit, the division superintendent being made really general manager of his division and by having the general manager of the constituent part, for example, the Union Pacific, as a unit—which latter is accomplished by putting all the heads of subdepartments under him in his official headquarters. In
applying the unit system to the general offices, 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 are all given the title of assistant general managers with one consolidated office file, and they are coordinated by a senior assistant general manager. In the office of the division superintendent a number of assistant superintendents are selected from among the chief subordinate officers within the division and they are coordinated by a senior assistant. The original assistant superintendent is usually considered the second best man in the unit, having practical outside training, and naturally becomes the senior assistant. On certain divisions if there has not originally been an assistant superintendent the trainmaster usually becomes the senior assistant. In the absence of the superintendent the senior assistant has charge of headquarters, acting as superintendent. There is no definite rule governing the choice of officer to fill up the vacancy left by the absence of the senior assistant and there is also no distinct grade of senior assistant. It is rather an unwritten law that whenever any assistant superintendent is temporarily assigned to the charge of the headquarters office he becomes the senior for the time being. As already said, the division superintendent is, in effect, a general manager of his division and is given charge of division stores and division shops; he must perform services according to the instructions of the general storekeeper as well as the superintendent of motive power, thus the latter two have at their disposal all the administrative machinery of the division. It is also the duty
of the superintendent and the assistant superintendents to watch material costs as well as labor costs.

The division superintendent, who may be called the representative of departments on his division, has as many superiors as his assistants. For example, he has division engineer, trainmaster, master mechanic, and assistant division superintendent as subordinates while in the office of the general manager, where he reports to, there are chief engineer, superintendent of motive power, general superintendent and purchasing agent. This system also makes a distinction between superior or coordinate units and subordinate units. It may be illustrated by describing the manner in which they address to each other. Employees address assistant superintendents on official matters; if they address the superintendent, it is implied that the superintendent’s answer is wanted; if his personal action is desired the superintendent must be addressed by name. As it is assumed that the division superintendent is the responsible head of the office, the reply may be signed by him personally, even if the assistant superintendent is addressed.

According to this system every man in the headquarters office transacts the company’s business in his own name. Communications in official matters should be impersonal, i.e., addressed to the office except when personal; but the action taken is by a definite person who can be identified. The principle of the unit system in regard to communication assumes that except for a strictly personal staff, for example, like a private secretary, all persons report to the headquarters or an office and not to an individual, and it also assumes that the recipient of a communication has the right to know what person is responsible. When they are at headquarters
they have equal ranks except the senior assistant, but out on the road they have their relative rank as indicated by the circular or the current working time table. If two or more are together at the same place, the highest on the list takes charge and becomes responsible; by so doing, the responsibility will be assumed by more officials and the company's interests are well protected.

Another important feature of this system is that in order to make the division unit more complete, it is necessary to move the division master mechanic and the traveling engineer to the same building with the superintendent; while the division shop as a sub-unit is under the charge of a division foreman. The advantage of this arrangement is not only to give a closer personal touch, but to eliminate unnecessary correspondence. Another advantage of locating the assistant superintendents in one building is that unnecessary clerical force is thereby dispensed with and that all the work of the office is transacted by men of practical training. Under this system, stenographers may be pooled, accountants segregated and the clerks concentrated for the general work of the office. Another feature, which is rather a key to the success of the system, is a properly handled file room.

In regard to communications from superior or coordinate authorities, the head of the unit should be addressed, and, in his absence, the senior assistant signs for him on all routine matters for higher or coordinate authorities with the explanatory phrase appended to his title, "For and in the absence of the superintendent"; in case a communication goes down to subordinates on the division, this explanation is not necessary.

In conclusion, since the assistant superintendents under
this system assume more responsibility for all they have transacted, the work is more personal and definite, and the individual may be broadened by daily contact with various kinds of transactions, while the service accordingly will be improved by the introduction of the elastic methods.

Various points of view. Numerous questions present themselves, such as on what basis are these systems organized? That are their chief differences? What is accurate all of these? That is the excellent part of each system? Under what conditions is one type more adaptable than the other? That is the effect of each system on discipline?

The departmental system is not very popular in this country, and few roads adopt this system. It is organized on the basis of a territorial subdivision of each department. In other words, each department is responsible for a particular kind of work for the whole line and the administration of each department is carried out by territorially subdividing the line for the particular work, placing an officer in charge of each subdivision and making him directly responsible to the head of that department. The theory of this organization is that for economical and efficient management, it is necessary to secure the best engineers and best supervisors obtainable and to extend their functions right down to the division of the department. Thus, the work of division superintendent is limited to the control of transportation track sections within the division, the work of the various branches of the division will be supervised by the roadmaster and his force, working under the authority of the engineers of maintenance of way; likewise with the motive mechanical reporting to the superintendent of motive power in matters of equipment. The departmental point of view is that each branch will be under the full control of its specialist.
Section 7.

Analytical study of three systems. In section 6 each of the three systems of organization is described briefly and our next task is to analyze, compare and criticize them from various points of view. Numerous questions present themselves, such as: on what basis are these systems organized? What are their chief differences? What is common to all of them? What is the excellent part of each system? Under what conditions is one type more adaptable than the other? What is the effect of each system on discipline?

The departmental system is not very popular in this country, and few roads adopt this system. It is organized on the basis of a territorial subdivision of each department. In other words, each department is responsible for a particular kind of work for the whole line and the administration of each department is carried out by territorially subdividing the line for the particular work, placing an officer in charge of each subdivision and making him directly responsible to the head of that department. The theory of this organization is that for economical and efficient management, it is necessary to secure the best engineers and best supervisors obtainable and to extend their functions right down to the divisions of the department. Thus, the work of division superintendent is limited to the conduct of transportation; track matters within the division will be supervised by the roadmaster and his forces working under the authority of the engineer of maintenance of way; likewise with the master mechanic reporting to the superintendent of motive power in matters of equipment. The departmental point of view is that each branch will be under the full control of its specialists, and
that thereby greater efficiency and economy will be secured.

The New York Central & Hudson River Railroad seems to be the only large road operating under the departmental system, and it will be worth while, therefore, to examine its organization in further detail to see the actual working out of the departmental system. The main feature of the organization of this railway is the division of the management of transportation and maintenance of equipment and way into five sub-departments - transportation, maintenance of way, motive power, rolling stock and electric division.

The transportation department is the busiest of all, and needs the most elaborate organization, this being based upon a territorial division into two districts - one west of Albany and the other south of Albany. In the south district, there are an engineer of maintenance of signals and a chief of passenger schedules bureau and three division superintendents in charge of transportation - the latter being assisted by a signal supervisor in charge of signals; in the west district, there are six divisions, each having a superintendent respectively, who in turn is assisted by a signal supervisor, and, besides, an engineer of maintenance of signals, and a chief supervisor of signals.

The maintenance of way is subdivided into six divisions, each in charge of a division engineer who reports to the engineer of maintenance of way. Besides the division engineers, there are several staff officers - an engineer of track, an engineer of bridges, a mechanical engineer, a general supervisor of bridges and an assistant engineer in charge of plans. Under each division engineer, there are one or more supervisors of track and a supervisor of bridges and buildings (or one supervisor for both bridges and buildings).
The motive power department is subdivided into four divisions with a division superintendent of motive power for each, and six master mechanics in all. The rolling stock department is subdivided into two divisions only, eastern and western, each having a master builder and, besides, a general car inspector.

It is obvious that the organization is markedly departmental. This feature may be illustrated more clearly by describing the service in connection with signaling. Signaling work is handled in three departments, namely, in the transportation department for the purpose of transportation, in the electric division for the service in the electric division and in the department of the chief engineer for the purpose of construction. There are other roads of small or medium size organized according to the departmental system, but this is the only large road in this country that at present operates under the system.

The divisional organization is based upon territorial subdivision of the property, giving to each territory a more or less complete organization under a single officer. The theory of this organization is that the division superintendent ought to have a comparatively complete authority over all matters arising within the division. The division superintendent is made a kind of general manager over his territory, i.e., he has absolute power over his division. All the operating employees on the division report to him and work under his direction. In a strictly actual divisional organization, the division superintendent should have the sole power over master mechanic, yardmaster, trainmaster, chief despatcher, division engineer and station agent, and nobody can question his authority within the division. But in actual working organization,
his power can not be strictly absolute. For example, the station agent will report to traffic department on questions of rates and tariffs, the roadmaster will report to the chief engineer or the engineer of maintenance concerning the standards, and the master mechanic will report to the superintendent of motive power on standards concerning the maintenance of equipment.

The organization of the Pennsylvania may be taken for illustration. This road has five vice-presidents, a general counsel and a secretary, each having one or two departments in charge. There are only two departments that have their forces distributed over the entire property, and they are traffic and operating departments. In the traffic department, the divisional feature hardly appears, as is shown by the chart of the organization of the Pennsylvania Railroad given in section 6, from which it is plain that the organization is a functional or departmental one.

Next let us examine the operating department. All the officers under the general manager, except the general superintendents with their subordinates, are staff officers or heads of special sub-departments. The nature of the organization is plainly divisional.

The organization of the operating department of the Chicago Great Western, which was shown on page 51 indicates an even closer divisional organization than that of the Pennsylvania. On this road the care of signal and plants is a separate department. Had this department been under the general superintendent, the divisional organization might have been considered almost complete. The operating organization of many other roads which are arranged in accordance with the divisional system, may be fairly represented by the two roads.
The third system is the unit system, which is of quite recent origin and has been adopted on the Harriman Lines. This system is somewhat a modification of the divisional system, eliminating the defects and difficulties of the latter. The framework of the organization under this system is similar to that of the divisional. The chief difference between the unit and divisional systems is that the former makes the division more of a unit by placing the subordinates, such as master mechanic, division engineer, trainmaster, traveling engineer and chief despatcher in the same office with the division superintendent as assistant superintendents, and conducting the office works by these officials in their own names instead of by the irresponsible clerks in the name of the division superintendent. As stated above, the theory of a departmental organization is to have specialized experts to deal with special works while that of the divisional is to have concentrated authority in the office of the division superintendent to govern all actions arising within the division. The unit system is a combination of the two, i.e., it retains the theory of the divisional system, i.e., concentration, but it is supplemented by the theory of the departmental, i.e., to place experts in the offices to deal with specific work. Since the time that this system was originated by Major Hines and used on the Harriman Lines, the administration has been quite successful.

It is plain that no large road can carry out the theory of divisional organization in every branch of its service, for this would necessitate division attorneys, division treasurers, division comptrollers, and so forth. Such an arrangement is unnecessary, since the work in these departments does not demand so elaborate a system of subdivision, and it would not be economical to have these
officers in each division for a limited amount of work. The difference of the two systems, therefore, lies in the operating department mainly. The following two diagrams, contracted from Mr. Morris' "Railroad Administration", show in convenient form the differences of the two systems in this department.

DIVISIONAL

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DEPARTMENTAL

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Crews, switchmen, etc.
From the above it will be seen that in the departmental system, the supervision of maintenance of way, maintenance of equipment, and transportation is assigned to three separate departments, while in the divisional system, they are concentrated in the division. The difference of the unit and divisional systems is not in the arrangement of line officers but in the organization of the headquarter office. In a word, the unit system attempts to combine the line and staff officers in the same officials.

British roads use the departmental system while American roads mostly use the divisional. Geographical conditions may possibly account for the variation. The British roads do not extend over so large a territory as many American roads do, while the density of traffic is generally intense, so that the managers of British railways apparently find little inconvenience or difficulty in administering their roads under the departmental system.

In this country the physical conditions are different. If a road of extensive mileage were conducted under a departmental system having all important matters dealt with directly by a headquarters, there would be a considerable amount of delay in transacting the business.

This is well illustrated by the experience of the Harriman Lines in matters of betterment. Mr. Kruttschnitt mentioned in his address before the New York Railroad Club that the actual time required to pass documents up and down between general manager, the president and intermediate officers 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 non-competitive territory would be alienated from cordial
relations with the road because of the delays in providing needed facilities of one sort or another.\textsuperscript{1} If all operating matters had to be passed upon in the same manner the delay would be immeasurable.

Geographical conditions, of course, constitute but one of the factors determining the choice of system. But a study of the methods of British and American roads certainly leads to the conclusion that if a railway is within a comparatively small compass, a departmental system may be used successfully, no matter how busy the traffic or how great the mileage may be; if otherwise, a divisional system seems preferable.

A further point in connection with this general topic needs brief consideration, namely, the influence of each system upon the discipline. Here we discuss only the influence of each kind of system upon the discipline of the road; the discussion of the organization for the purpose of discipline being reserved for a separate section.

In the departmental organization, each officer deals with a special class of work. For example, the division superintendent of transportation is concerned only with transportation, while the roadway, rolling stock and motive power are under the care of other officers. By reason of concentration on one line of work, the departmental system tends to produce specialists but fails to give broad executive training.

The divisional organization creates an entirely different environment. From the division superintendent, even sometimes the assistant division superintendent, up to the general manager, all deal with almost everything in general concerning operation. On

\textsuperscript{1} Ray Morris' 'Railway Administration', p. 61.
roads that adopt a divisional organization, the general officer occu­
pying the lowest rank is the division superintendent who is usu­
ally in charge of three distinct classes of work,—transportation,
maintenance of way and maintenance of equipment; next comes the gen­
eral superintendent with responsibility for several divisions; then
the general manager in charge of the whole operating department.
The general superintendent and general manager are advised on main­
tenance matters by specialists, who are staff officers. Orders on
such matters go from the general manager's office through the gener­
al superintendent's office to the office of the division superintend­
ent. This system tends to develop broader executive ability.

The unit system presents another different feature with
regard to its influence upon the discipline. These assistant super­
tendents still retain the relation with their original subordi­
nates,—for example, the master mechanic with his shop foremen; they
execute their office work in the same building with the division su­
perintendent; and moreover they may be assigned to a certain busi­
ness which is new to them,—for example, a master mechanic may be
assigned to certain questions concerning tracks.

Under the divisional system, a trainmaster may be promoted
to a division superintendent; as soon as he is on the new post he at
once is confronted with questions with which he is not familiar.
The unit system does away with this advantage. He learns to famili­
arize himself with questions covering other departments when he
acts under the direction of the superintendent, so that until he is
promoted to the position of superintendent he may be well qualified
when he is an assistant superintendent. Hence the advantages of
broad training are still more conspicuous in the unit system than in
the ordinary divisional organization. Mr. Kruttschnitt says, with reference to the introduction of the system on the Harriman Lines:

"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.... 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.

In general, the head of the traffic department has charge of both passenger and freight traffic. He is as a rule one of the vice-presidents and his assistants includes traffic vice-president on the Pennsylvania, and the New York Central & Hudson River Railroad and Director of Traffic on the Harriman Lines. The duties of the traffic vice-presidents on the larger roads are about the same, nearly, in that with the development of traffic, she to control the general policies of the traffic department. It may be noticed that, in the case of the Harriman Lines, there, the traffic vice-presidents of the component roads there is a traffic director, who, with the help of assistant directors, has supreme control, under the president, of the traffic policies of the whole Harriman system.

Under the vice-president come the freight and passenger traffic managers, though in some instances there is but one general traffic manager. The duty of the traffic managers is to keep a somewhat closer supervision over the work of their respective departments than is possible to be exercised by the vice-president, but
Section 8.

The internal organization of the principal departments and their relations to each other.

In the last section we discussed the general organization with the object of distinguishing the three types of organization from each other. In the present section we intend to discuss the internal organization of the operating department of large railroads, including, as appropriate, some reference to the traffic department since this is somewhat closely connected. The influence of the different systems of organization upon the internal arrangements will naturally come within the range of this discussion.

In general, the head of the traffic department has charge of both passenger and freight traffic. He is as a rule one of the vice-presidents and his official title is traffic vice-president on the Pennsylvania, and the New York Central & Hudson River Railroad and Director of Traffic on the Harriman Lines. The duties of the traffic vice-presidents on the larger roads are about the same, namely, to look after the development of traffic, and to control the general policies of the traffic department. It may be noticed that, in the case of the Harriman lines, above, the traffic vice-presidents of the component roads there is a traffic director, who, with the help of assistant directors, has supreme control, under the president, of the traffic policies of the whole Harriman system.

Under the vice-president come the freight and passenger traffic managers, though in some instances there is but one general traffic manager. The duty of the traffic managers is to keep a somewhat closer supervision over the work of their respective departments than is possible to be exercised by the vice-president. But
they do not attempt to take out of the hands of the general freight and passenger agents the supervision of routine work. One of their most important functions is to study and to advise the vice-president upon the specific problems of policy, and to take care of the larger traffic interests connected with their departments.

The actual working heads of the departments are, of course, the general passenger agent and general freight agent. They have immediate charge of the routine work, though, of course, they are expected to give to the higher officials the benefit of their close contact with daily working in the form of suggestions as to improved general policy. In the freight department, the Pennsylvania Railroad has adopted the unusual device of separate general freight agents for through and local traffic. On roads with special interests, certain work of the freight department may be placed in the hands of separate general agents, for example, a general coal and coke agent, a general live-stock agent. The head of the baggage department, the general baggage agent, frequently reports to the general passenger agent, though sometimes directly to the traffic manager. There may be one or two general freight agents on a road. The division of duties in this case is, of course, a territorial one, each of them having charge of solicitation and maintenance and development of traffic in his territory. Rates, overcharges, loss and damage claims, and policy claims, are decided by him except in those cases where it is desirable that higher authority should pass upon them. He looks after the publication of the tariff sheets, circulars of instructions and so forth.

The general agents are assisted by assistant general agents, the number of whom vary with the demands of the road. The
duties of the assistant general agents may be assigned functionally or territorially, one man may be in charge of the coal, ore, lumber traffic, etc., over the whole line, another in charge of cement, livestock, etc., another in charge of the tariff bureau, or one may be placed in general charge of traffic interests (subject to the authority of the general agent) in this district, another of those in that district, and so on. Sometimes, we find, in the same department, certain assistant general freight agents put in charge of special traffic interests extending over the whole line, and others placed in charge of a territorial subdivision.

Under these assistant general freight agents there may be several division agents. These division freight agents are charged with the duty of securing traffic and advising upon local rates and desirable facilities for their respective divisions.

As the geographical condition has a great influence upon the operating organization so it has upon the traffic organization. For instance, the Southern Pacific system runs from Ogden and also from New Orleans westward to the Pacific Coast, while the steamship lines join New York with New Orleans and Galveston. Since the line is thus scattered, a territorial subdivision of system is necessary for efficient administration and hence the traffic organization is divided into divisions, each being in charge of a general freight agent. On the Pennsylvania, the managers of Empire Line and the Union Line form a special feature of the organization. These two lines are integral parts of the system. They are fast freight lines which constitute a convenient medium for the handling of through traffic. Of course, the operation of the equipment is handled directly by the Pennsylvania Company. Nowadays, such lines cannot be
regarded as much other than an accounting and advertising device. The coal traffic manager and the managers of the fast freight lines report to the traffic vice-president.

The motive power department is usually headed by a general superintendent of motive power. He is assisted by a force of clerks to handle the office work and is assisted by the heads of several departments. His subordinates are usually a mechanical engineer, fuel engineer, electrical engineer, shop engineer, wheel inspector, chief locomotive inspector, engineer of tests, and, perhaps, superintendents of motive power. Under each superintendent of motive power, there are several master mechanics in charge of shops, that is, where the departmental system is in force.

For each shop or group of shops, there is a superintendent of shops to whom several foremen and other officers report. For example, on the Chicago, Burlington & Quincy Railroad a general foreman of locomotive department, general foreman of car department, pattern shop foreman report to the master mechanic. The superintendent of shops is assisted by a force of clerks under the charge of a chief clerk. If a shop does all the heavy passenger and freight car repairs for the system, the car department usually has a large force of men, while the heavy repairs of locomotives need a large force of employees in the locomotive department.

Here again we notice the influence of geographical conditions upon the organization of the mechanical department. If the system is a large one but covers a small territory, the head may communicate with his subordinates by telephone, or, in other words, the superintendent of motive power may reach his subordinates personally. The mechanical organization of the New York, New Haven &
Hartford Railroad is interesting in this connection. All the principal officers in this department report to him directly and there is no intermediate officer such as assistant superintendent, and no gradation such as that adopted on certain roads, the Chicago, Burlington & Quincy Railroad for instance. In general the general superintendent has supervision of all matters pertaining to the construction and maintenance of locomotives, cars and machinery. A superintendent under the direction of the general superintendent, supervises over several division master mechanics. A superintendent of shop or shops has a general supervisor of the shop or shops under him and each master mechanic has direct control of the shop. The master mechanic with the assistance of several foremen directs the work of the shop force. In the divisional system, the master mechanic has a close relation to the transportation department because he must report to the division superintendent, though, even in this case, he is commonly required to comply with the instructions of the motive power department on technical matters.

The maintenance of way department is usually under the care of a chief engineer or an engineer of maintenance of way. In case of departmental organization, this department has a complete control of the maintenance of way. The entire system is divided into districts, grand divisions, divisions. For each division, there is a division engineer who reports to the officer next higher than he is. Under the division engineer there are several supervisors (sometimes called roadmasters, or resident engineers). The property under the care of a roadmaster is again divided into sections having a section foreman for each. For instance, the New York Central & Hudson River Railroad adopts the departmental system. Since the roadmasters take
care of roadways only, other classes of property such as bridges, buildings, signals, etc., require the supervision of a signal engineer, an engineer of bridges and buildings, or a separate engineer for bridges and one for buildings, for each division - all of them being generally responsible to the same authority as the division engineer.

In case of divisional system, roadmasters, bridge supervisors, signal inspectors, building supervisors report not to division engineer but to division superintendent, while the chief engineer or engineer of maintenance of way takes care of standards only. Thus the maintenance of way department has not a complete organization of itself but is merged into the transportation department. For example, the Illinois Central Railroad is organized according to a divisional system. In considering the arrangement of details of the organization, there is no fixed rule to govern them, nor any standard to guide them, but at each locality an organization adapts itself to the local needs.

In regard to the size of division under a roadmaster or division engineer, it is also different for different roads. For a roadmaster a division varies from 225 to 486 miles on the Illinois Central, from 140 to 150 miles on the Atchison, Topeka & Santa Fe Railway, from 50 to 75 miles (plus 50 miles sidetracks) on the New York, New Haven & Hartford Railway, 25 miles on the Pennsylvania, about 100 on the Wabash, from 83 to 100 on Lake Shore & Michigan Southern, from 100 to 200 on Chicago, Milwaukee & St. Paul, about 150 on Chicago, Burlington & Quincy, and from 40 to 100 on Baltimore and Ohio. For a division engineer the length averages from 95 to 240 miles on the Baltimore & Ohio Railway. If the line has several
sidetracks or branches, the mileage for each division cannot be very long, or if the line is busy, a road is liable to have many repairing works and the length of each division cannot be very long.

The transportation department should take care of transportation only. In a departmental system, the transportation department may be organized according to this idea. If the general organization is divisional, a division superintendent is in charge of not only transportation, but also motive power and roadway and structures. The details of the organization of this department have been discussed in sections 2, 6 and 7.
Section 9.

Supervision.

In the early days when the railroad system had not developed so far as it is today, and mileage was usually not very extensive, a general manager was able to reach every part of the organization, and had plenty of time to look after the details of the property under his administration. In a word, a railroad could be managed by personal supervision, since the property under the charge of a general manager at that time was not very much more extensive than that under a superintendent today on large systems such as the Harriman Lines, the Pennsylvania, etc. Besides, during that period the railroad network was not so developed as it is today and competition was not so keen that the question of efficiency and economy needed great consideration: the margin of profit was large because cost of operation was low compared with the rates charged. The compactness of the railroad organization, a line extending usually over a limited territory, also made a simple method of supervision effective. For these reasons, an elaborate system of railway statistics was not needed, and the demand for this did not arise until railroads were consolidated into large systems.

Manufacturing plants have been consolidated into large ones just in the same way as the consolidation of railroads into a large system, and their management cannot be worked out by merely personal supervision; for example, the United States Steel Corporation cannot be managed efficiently by the simple method, i.e., personal supervision. In regard to the management of a railway, not only does the largeness of the system render the simple method insufficient for efficient and economical results, but in addition there
are two other distinctive reasons: (1) railroads are often spread over an immensely large stretch of country and (2) greater portion of the organization is a mobile body, since most of the business of a railway is transportation. For the first reason, the control and supervision must be delegated and properly graded; for the second each group of moving employees must have an organization, partly or wholly complete in itself, forming a unit. All these considerations show that the administration of a large railroad can not be a direct (or personal) supervision, but on the other hand, the margin of operating profit is limited, since a slight negligence in car-loading efficiency, or in the maintenance of equipment or roadway or in transportation will eventually result in a great loss to the company. At present, besides these elements, there is still another important one, i.e., competition, since the network of the railway system has been greatly developed. One road may compete with the other lines not only for the same territory, but for the same market, etc. Other elements are costly damages to human lives and valuable property. The general manager of a large road spends part of his time in inspection, of course, but does not attend personally to the execution of the routine work of operation. What he depends upon to enable him to carry out the general policy, to direct the general movement, to keep a constant supervision over the service of his employees, with a view toward economy and efficiency of operation, is an elaborate system of statistics.

The fundamental problem of such statistics is to reduce the bulky accounts and numerous figures into a simple and comparable form. By means of comparison, points of economy and efficiency may be discovered. Before the various accounts and figures can be re-
duced to comparable statements, a certain system of units must be established. It is a simple theory of arithmetic that only common units are comparable. The comparison is usually made between similar accounts of different roads, or different sections, divisions or districts of the same road, or between different months and years of the same section. In this way the question of efficiency and economy is only relative and if an absolute comparison in regard to both efficiency and economy is sought, it is necessary to have definite standards, which may be determined either by theoretical calculation or by practical experience. In this way the results of all operations are reduced into rigid, well-defined units. Stated briefly, railroad statistics is simply a process of finding a unit in each operation so as to render the accounts comparable and to reduce figures in terms of these units to rigid and definite forms; the control through statistics is a process of collecting these units thus found and figures reduced, of reporting accurately and promptly, of examining carefully and of discovering the defects which need to be corrected.

The units for statistical use are few in number. The commonest are ton-mile and passenger-mile. The first is the multiplication of tonnage by mileage traveled. The ton-mile is calculated from way bills, the passenger-mile from ticket sales. Another unit of importance is the train mile, upon which most English railways rely entirely, not preparing their ton-miles. In this country the ton-mileage figures are given great attention.

In the use of the ton-mile and passenger-mile as units, there are several defects which put difficulties in the way of discovering from them efficiency and economy of operation. First of
all, there are many items of expenses which are difficult to divide between the passenger and freight traffic. For instance, signalmen, station agents, telegraph operators perform their services both for passenger and freight traffic, not to mention the general officers. It is not an easy task to determine in what proportion the expenses for these officers should be divided. Tracks, bridges, signals and other minor structures on the roadway are used by both, and it is also impossible to determine the percentage of wear and tear and of the cost of maintenance to be assigned to each. Amount of wear and tear varies with speed and weight and since passengers and tons are of different units, it is impossible to apportion the value properly between the two. Even when a passenger train and freight train are of equal weight and equal speed they do not cause wear and tear to an equal amount, but sometimes a lighter train may do more damage to a bridge than a heavier one and frequent impacts of empty freight cars may do much harm on bridges and tracks than evenly loaded passenger cars. If the statistical reports of different sections of the line are to be used for comparison there are other factors deserving consideration. Geographical conditions have a great effect upon the expenses of operation. For instance, wear and tear varies when a train goes uphill or downhill, or over straight or crooked lines. In case of construction, the cost of one mile at one locality may differ very widely from that at another locality. Very often a particular section of the country needs expensive structures and constructions, and these expensive properties need expensive maintenance. In regard to loading, a ton of hay may need more tractive power than a ton of iron, since the former occupies more space and hence the locomotive has to haul more dead weight of the car for a
ton of hay than for a ton of iron.

All these difficulties and defects in using the statistics are encountered when they are used simply to discover relative efficiency and economy. If the administrator endeavors to discover the absolute efficiency and economy, further difficulties arise. By absolute efficiency and economy is meant that the theoretical efficiency and economy is assumed to be one hundred per cent and taken as a standard; all the operating results are compared with this standard so as to determine the percentage of their efficiency and economy. The difficulty, however, is in that the theoretical results are impossible to secure, and for this reason the judgment of railway managers in respect to bringing about improvements is based upon a relative comparison.

The control through statistics begins with the reports of the primary officers. These officers prepare statistics based upon detailed information concerning the working of the road within their respective fields and report to their superiors. These superiors receive reports from two or three officers and after going through another process of concentration and condensation, report to still higher officers. Thus the workings of the road are reported with details which are successively reduced by a gradual process of concentration and condensation. When the officer is higher in rank he receives reports more reduced in bulk; when the reports reach the president, a limited number of sheets contains the working results of the entire property. The most important primary officers in the operating department are, in the case of the departmental system, division superintendents, division roadmasters, division master mechanics, division master car builders; or, in case of the divisional
organization, division superintendents. These officers receive daily returns from operation and other performances within their respective territory.

In regard to returns from operation, the reports usually state the total number of through trains, of loaded cars, of empty cars, and total number of cars received and forwarded in each direction at each terminal. They also state the entire train movements, both passenger and freight, in each direction, together with the number of cars in each train and tonnage moved. The division superintendent also receives reports concerning the condition of each yard on his division. He knows how many freight cars are needed and how many freight cars are at hand ready for service.

Besides these daily returns, there are a number of statistical statements prepared monthly. These cards show the comparative results of different kinds of operations on the division, month against month, year against year, day against day.

Several of the important current statistics as used on the Harriman Lines are as follows: (1) statement of all expenditures on account of road and equipment, itemized, received monthly from each grand division. (2) Comparative statement and explanation, itemized, of all large increase or decrease in amount of traffic and in operating expenses, reported monthly. There are many other forms of reports which are listed as follows.

1. Statement of gross and net tons handled in revenue and non-revenue freight and mixed trains.
2. Yearly report on receipts and expenditures from operation.
3. Monthly statement of expenditures on account of the construction of road and equipment.
4. Monthly statement of expenditures on account of the construction of road and equipment.
5. Comparative statement of operating revenues and operating expenses.
6. Statement of large increases and decreases in amount of traffic, and in operating expenses, for the month of say January with corresponding month of the previous year.
   (a) Maintenance of way and structures.
   (b) Maintenance of equipment.
   (c) Transportation expenses.
7. Superintendent's statement of operating expenses.
8. Monthly operating statistics for a certain division.
9. Comparison of monthly accounts with accounts of the same period of previous year by division superintendents.
10. Same prepared by general superintendents and general managers.
11. Analysis of operating expenses and results for maintenance of way.
12. Cars undergoing and awaiting repairs.
13. Condition of locomotives.
17. Locomotive performance in freight service.
19. Statement of expenditures incurred on account of the maintenance and operation of the interlocking plants.
20. Statement of expenditures incurred on account of the maintenance and operation of automatic block signals.
22. Statement of serious accidents to trains.
23. Monthly summary of operation of rolling mill in regard to distribution of cost of fuel, material, labor, etc.
24. Operation of brass, iron and wheel foundries.
25. Earnings and expenses of dining car service.

Besides these, there are other forms shown in graphs and are prepared for ready reference by the director of maintenance and operation and his staff. The graphical presentation of the principal operating statistics covers the following investigations:—(1) Gross earnings; (2) net earnings; (3) operating expenses; (4) percentage operating expenses to gross earnings; (5) expenses per train-mile; (6) earnings per freight train-mile; (7) tons of freight per loaded car; (8) tons of freight per train; (9) freight rate per commercial ton-mile; (10) train accidents per million locomotive-miles; (11) foreign freight car mileage, net payments and conductor's commercial and company ton-mileage.

The information which is reported monthly in connection with transportation is as follows, "number of freights originating at station; loaded by station men, number of freight cars handled in station yards; tons of freight loaded by station men into cars passing stations; tons of freight unloaded by station men; total tons of freight handled by station men; total tons of freight handled by station men, shippers, etc.; average tons of freight loaded per car by station men, into cars originating at station; agency expenses for freight service, agents and clerks; agency expenses (dollars) for station labor; agency expenses, total; expenses, yardmen and switchmen in freight service; total agency and yard expenses for
freight cars handled; cost of agents and clerks per ton handled by station men; cost of station labor per ton handled by station men; miles run by switch locomotives; number of cars interchanged with connections (a) received from (b) delivered to (c) total. In connection with locomotive performance the following to be reported: (1) engine miles, (2) potential ton-miles, (3) actual gross ton-miles. For train service, the report contains the following items: average mileage operated, freight locomotive mileage, ton-mileage (net and gross), tons of coal consumed, locomotive miles run, cars per locomotive, net tons, cost per locomotive mile, cost per 100 gross ton-miles, fuel pricks, average miles run daily per freight locomotive, gross ton-miles per locomotive and a comparison with previous year."

On the Erie Railroad 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.

Report on the number of cars on storage at 5 A. M.

Report by stations of the number of cars of merchandise on hand today 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 conditions, etc.

Detailed report of the situation at Buffalo in car loads classified into grains, iron ore, package of 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.

It is of course impossible for the general superintendent
to scrutinize every item of these daily reports but to get a general
idea of the daily operating results from them. What a general super­
intendent needs to watch in these reports is the deviation from the
usual practice which he expects. The reports received by higher of­
ficers are generally of the same kind but contain the operating re­
sults over a large territory.
Section 10.

Discipline, training and education.

In considering the problem of securing efficiency on the part of railway employees, attention needs to be given to the methods of discipline, training and education. In early days, railroad administration and operation did not involve so many complicated problems and the work did not demand a large number of skillful employees. Thus the railway officers paid special attention to the discipline of employees and less to training. As railroads have gradually consolidated into large systems, the difficulty of securing the right kind of service has become more prominent, and accordingly the railroads have come to give greater attention to training and education. In some instances the knowledge required can be better acquired if the teaching is connected with practice; this is particularly true in the case of the shop forces. Large roads demand a large body of employees in their shops and it is advisable to institute a system of apprenticeship, even if additional expenses are incurred by the company.

In recent years, railway operation has tended to be conducted on more scientific lines. Many problems in railway management may be treated and solved in a scientific way. Rate theory, traffic administration, and other transportation problems are discussed by economists from a scientific point of view. Railroad engineering, railroad accounting, and so forth, are no longer merely a matter of practice and experience. Their principles, theories, definitions have been put into a systematic order. For this reason, the railway company today requires more men who are properly educated in these special branches of sciences.
We shall give our first consideration to the method of discipline that has been adopted by most roads as the most effective. The old plan was to suspend the offending employee for a certain number of days. This was apt to work injury both to the employee and to the railroad, and so it has been superseded, largely, by the system of "discipline by record", or "discipline without suspension". This method was originated by Geo. R. Brown and hence was known as the Brown system but the working details of the system have since been greatly improved and modified, though still retaining the essential principle as advanced by the originator.

It is a system of merits and demerits. A certain number of days of nominal suspension is recorded against the employees for certain demerit marks. For acts of special merit he is credited with merit marks which may cancel a like number of demerit marks. Employees having a clear record for a given period of time are entitled to a certain number of merit marks while the punishment for a bad record is dismissal. Thus the employee is given a chance to improve himself and to raise his standing by canceling demerit marks.

A bulletin board is provided and on the board are posted brief accounts of mishaps, irregular conduct and other occurrences, pointing out errors and consequences, with criticism thereon, but the names of individuals are omitted, and even their identification is carefully avoided. Sometimes merits of special acts are also posted.

The advantage of the Brown system over the method of suspension is this:—The system does not cause the employee to lose time, and his family to suffer from his enforced idleness. The company is also benefited, for the use of substitutes who may possibly
make still more serious mistakes, is avoided. Employees are less likely to make mistakes in the future after the warning given by the record, which serves also indirectly as a warning to others. "The aim of discipline should be to produce a self-governing being; not to produce a being to be governed by others," and the Brown system helps to accomplish this. The benefits of using the system may be more clearly seen by a quotation of Mr. Brown's own words: "With this system the good men are retained, developed, benefited and encouraged, and the culls are got rid of to the betterment of the service all round. Every wreck, every accident, every mistake, every loss has taught a lesson, and these are of no less value to the railroads and to the railroad men than the successes. It often happens that an accident, or a close 'shave' for one, is the best kind of a lesson to the man who could be blamed; and if he is retained in the service, he is a more valuable man than he would otherwise be who could be hired to take his place."#1

The Brown system was adopted first by the Atchison, Topeka and Santa Fe Railway in 1897. Since that time, railway managers have worked out detailed schedules applying to different branches of the organization. The same principle of recording merits and demerits marks has recently been applied to promotions.

In 1908, Mr. Buehring recommended a modification of the system which may be taken as representing the most recent development.

"Employees will be promoted according to the character of their service, and without regard to seniority.

"Violation of any rule which is essential to safety will be considered a dischargeable offense.

#1. Cump's Notes on Tracks, p. 1099.
"A book record will be kept of the service rendered by each employee, in detail, which will be balanced once each year, and summarized. Each year's record for merit and demerit to stand unchanged throughout the period of service with the company.

"The work performed by each man will be classed as 'Excellent', 'Good', 'Indifferent' or 'Poor' for each day's service and his rating established accordingly - 100 per cent being considered 'Good'.

"Each day's work will be considered to have a value of 100 per cent or points for conduct and efficiency. An infraction of the rules, or failure to meet the standard of efficiency, will involve the cancellation of from 1 to 100 points, while excellent service will entitle employee to additional points of from 1 to 100; but in no case will more than 200 points or per cent, be allowed for one day's work.

"Conduct represents the behavior of employee both on and off duty as regards drinking, fighting, disorderly conduct on one side; and especial courtesy and acts of heroism on the other. It is presumed, of course, that employees will observe general good behavior, and therefore no special emphasis is placed on this phase of discipline.

"Efficiency. This is subject to subdivisions according to the conditions prevailing at different points, but, broadly, it should cover the salient points of each class of service. For instance, take train service: It being understood that both train and engine crews are considered as a unit in giving credit for train movement, a conductor's trip report is suggested, and sample is attached showing its purpose and consist.

"Conductors should make a monthly report on service rendered by their brakemen, which report should be used in the interest of the brakemen; that is, it should involve the special examination or instruction regarding those rules whenever the conductor considers him efficient.

"This would apply to enginemen as well as to other classes of the service.

"Employees whose ratings fall below a certain standard are subject to dismissal without further cause, and employees who do not manifest a proper interest in their work will be dropped from the service.

"All employees will be entitled to a fair and impartial hearing concerning any entries made against their records, subject to appeal to the superintendent, or higher authority in regular order.

"The superintendent will have the right to charge demerits against the record of any employee for infraction of rules, where the offense is not sufficiently serious to justify discharge; but such discipline shall not involve more than the number of points said employee is expected to earn during the current year."

Mr. Beuhring suggests the following forms of reports.

1. Conductor's report.

<table>
<thead>
<tr>
<th>Item</th>
<th>Value Claimed Allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Making schedule or better</td>
<td>40</td>
</tr>
<tr>
<td>B. Getting out terminal promptly</td>
<td>20</td>
</tr>
<tr>
<td>C. Observance of signals</td>
<td>10</td>
</tr>
<tr>
<td>D. Handling of equipment</td>
<td>10</td>
</tr>
<tr>
<td>E. Protection of train (seals, etc.)</td>
<td>10</td>
</tr>
<tr>
<td>F. General conduct</td>
<td>10</td>
</tr>
</tbody>
</table>

Supplement from 1 to 100.

H. Efficient service at wrecks
I. Repairs, equipment, track, structures, etc.
J. Exercise good judgment, emergencies.

Remarks:

2. Station and telegraph service.

<table>
<thead>
<tr>
<th>Item</th>
<th>Value Claimed Allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Handling train orders</td>
<td></td>
</tr>
<tr>
<td>B. Handling of messages</td>
<td></td>
</tr>
<tr>
<td>C. Promptly answering calls</td>
<td></td>
</tr>
<tr>
<td>D. General conduct (telegraphers)</td>
<td></td>
</tr>
<tr>
<td>E. Reports to general office</td>
<td></td>
</tr>
<tr>
<td>F. Reports to superintendent's office</td>
<td></td>
</tr>
<tr>
<td>G. Station records</td>
<td></td>
</tr>
<tr>
<td>H. Seal record</td>
<td></td>
</tr>
<tr>
<td>I. General conduct (station men)</td>
<td></td>
</tr>
</tbody>
</table>

Meritiorious service (1 to 100 points)


<table>
<thead>
<tr>
<th>Item</th>
<th>Value Claimed Allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Number of trains moved</td>
<td></td>
</tr>
<tr>
<td>B. Number of train orders issued</td>
<td></td>
</tr>
<tr>
<td>C. Minutes train delayed - meets</td>
<td></td>
</tr>
<tr>
<td>D. Minutes waiting for orders (note should be made of any delay account operator's not answering)</td>
<td></td>
</tr>
</tbody>
</table>

Remarks.

4. Yardman's daily report.

<table>
<thead>
<tr>
<th>Item</th>
<th>Value Claimed Allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Fireman</td>
<td></td>
</tr>
<tr>
<td>B. Switchman</td>
<td></td>
</tr>
</tbody>
</table>
### Item |
| A. Delays to trains switching | Value Claimed Allowed |
| B. Handling of equipment | 40 |
| C. Observance of signals | 20 |
| D. Blocking trains | 10 |
| E. General conduct | 10 |

Meritorious service (1 to 100 points).

The detailed working orders of the method of discipline by personal record suggested by Mr. Beuhring is simply a natural development of Mr. Brown's original plan and its aims may be well stated in the words of Mr. Brown himself: "(1) To secure a higher state of efficiency; (2) To avoid loss of time and wages of employees; (3) To avoid unnecessary severity in the dismissal of an employee; (4) To remove false, but too common impressions in the minds of employees; (5) To avoid frequent service changes; (6) To advance the education of employees through the medium of bulletin rates, and (7) To establish in the service a feeling of security."  

Efficiency of service is increased by proper training and education as well as by effective discipline, and the former calls, therefore, for some consideration. As late as four or five years ago apprenticeship was unknown on some railways, but recently considerable progress has been made.

The purpose of apprenticeship on railways is to supply a particular branch of the railway such as the machine shop, different classes of metal shops, and other technical departments, with skilled workmen who know the trade and understand its relations to the work of others. Since the apprentices are generally poor and have to earn money, they cannot afford to spend their time for education at their own expense, or at least, without pay. Besides, there is much knowledge which can be acquired only at places where the actual

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#1. Byers' Economics of Railway Operation, p. 79.
work is done. For these various reasons, it is necessary to move the school to the shop. The advantages of this arrangement are:-

Boys learn the manual work under the direction of skilled teachers of their trade and their brain is trained as well as their hands; in the course of acquiring education, they familiarize themselves with their places among men and are educated in the same trade while at work. All the good points of this type of school may be expressed in a few words, i.e., "directness, definiteness and conservation and concentration of the attention and the mind of boy". During the period of their apprenticeship they are fitting themselves to the trade so that as soon as the period is over they are ready for advancement.

The difference between the old and the new apprenticeship is that the old system did not provide teachers but the foremen were supposed to act as teachers, while the new system separates the foreman from the teacher. The reason of the separation may be briefly stated as follows:- Foremen usually pay special attention to getting the greatest output at the least expense, within the shortest time possible, while the apprentice school aims at making skilled mechanics for the future. As all know, division of labor is a general law of efficiency, so that with as many as 15 or more apprentices, it is advantageous to have an instructor for the educational work who does not have the additional duties of a foreman. Although instructor and foreman are separated, they do their work harmoniously. For instance, a piece of work which is assigned to an apprentice by the foreman is given to the latter, through the instructor, who knows better the standing of the apprentices.

The following are extracts from an account of the new apprentice system of the Lehigh Valley at the Sayre shops.¹

Purpose:— To provide the motive power department with an adequate recruiting system which will eventually produce from ranks skilled workmen, foremen, draftsmen.

Subjects to be taught:— Shop instruction of the apprentice in the trades and also for their instruction in mechanical drawing, practical mathematics and shop problems.

Schedule:— Shits are made every four months and four boys are graduated at the end of every such period.

Sessions:— From 7:30 to 9:30 A. M., Monday, Tuesday, Wednesday, and Thursday and from 10 to 12 A. M. on Monday and Thursday.

Attendance:— Two hours a week for each apprentice.

Courses given:— Mechanical drawing, mathematics, drawing, blue print reading.

Equipment:— Each apprentice is provided a complete draftsman's equipment, the first and second year apprentice being not permitted to have any inking instruments. The room is well supplied with models of shop and locomotive parts. The school room contains a file of the best railway magazines. The school also receives from the shop superintendent all trade catalogue.

Entrance requirements:— Applicants must not be less than 16 years of age, must have good health and good sight and hearing.

Discipline:— Records of each apprentice are kept by the apprentice instructor for the entire four years. Monthly reports are received from the foreman of each department on workmanship, class of work, conduct, number of days worked. These reports are entered by apprentice instructor. The principle of discipline is rather to direct their efforts to better things than to punish them.

Recently, a new system of training, applying to men out on the line as well as those in the shops, has been developed along the lines of a correspondence school. The plan is to have a certain number of experts constituting a standing board, who are responsible for the working out of the details of the plan. The purpose of the organization is to give to employees opportunities of acquiring better and broader knowledge of their own lines of work and to prepare themselves for advancement.

The Union Pacific, through its "Educational Bureau of Information", commenced this experiment in September, 1909. Since its establishment, the bureau has enjoyed a substantial growth. "Of the

total number of students sent out from this training school up to Dec. 9, 1910, 18 per cent have been promoted, about 10 per cent more are ready for promotion and awaiting positions, and only 5 per cent of those who have received instruction in the training school have left the service."

The main objects of this bureau are "(1) to help employees to assume greater responsibility, (2) to increase the knowledge and efficiency of employees, and (3) to prepare prospective employees for the service." The work of this bureau is purely educational and has nothing to do with the operating department. The courses are offered free of charge and made to fit for certain minor officers as well as for the lower grade of employees. The course of study is arranged somewhat as follows. 1. Primer which has the title, "How to Study"; 2. History of Union Pacific 3. Geography of Union Pacific. 4. A list of studies such as section work, mechanical engineering, transportation, traffic, maintenance of way, civil engineering, station work, air-brake operation, locomotive firing, locomotive running. The chief function of the bureau is to answer questions and in this regard the questions are separated into two classes according to their nature: 1. those which are desired by employees for their special needs, 2. those sent in by officers for information.

The chief aim of this plan is twofold first, to give more education to employees, 2, to improve their knowledge so as to fit for promotion. The records of their results serve their supervisors as a guide in determining the character of the particular employee. For this reason, their supervisors advise with them in the choice of 

#1 Railway Age Gaz., Vol. 49, p.1118. Dec. 9, 1910.
studies. Thus no employee is allowed to choose a course of study outside the department where he is working, unless his choice is approved by the general superintendent. In case of a man of promising character, a plan is worked out by his superior to prepare him for advancement.

Besides the executive board of the educational bureau, there is an advisory board acting with the chief of the bureau. This board is composed of important railway officials, and its function is to plan various courses of study and reading, decide questions on application for enrollment, on assignment of studies, and other important matters of like nature.

The papers are prepared by experts and specialists and after being approved by their immediate superiors are submitted to the bureau for criticism. After they are corrected and revised they are submitted to the chief engineer to be edited.

It is seen clearly that the educational bureau is, of course, very different from the apprenticeship system previously referred to and it is also not like any technical school. Although the courses given here seem to cover the same ground as those in any school, the difference is that the problems here treated are on practical matters, and the solution is rather for practical use than for theoretical demonstration. For the same reason the nature of this bureau is different from other correspondence schools, although the bureau is administered after the same manner as a correspondence school.
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