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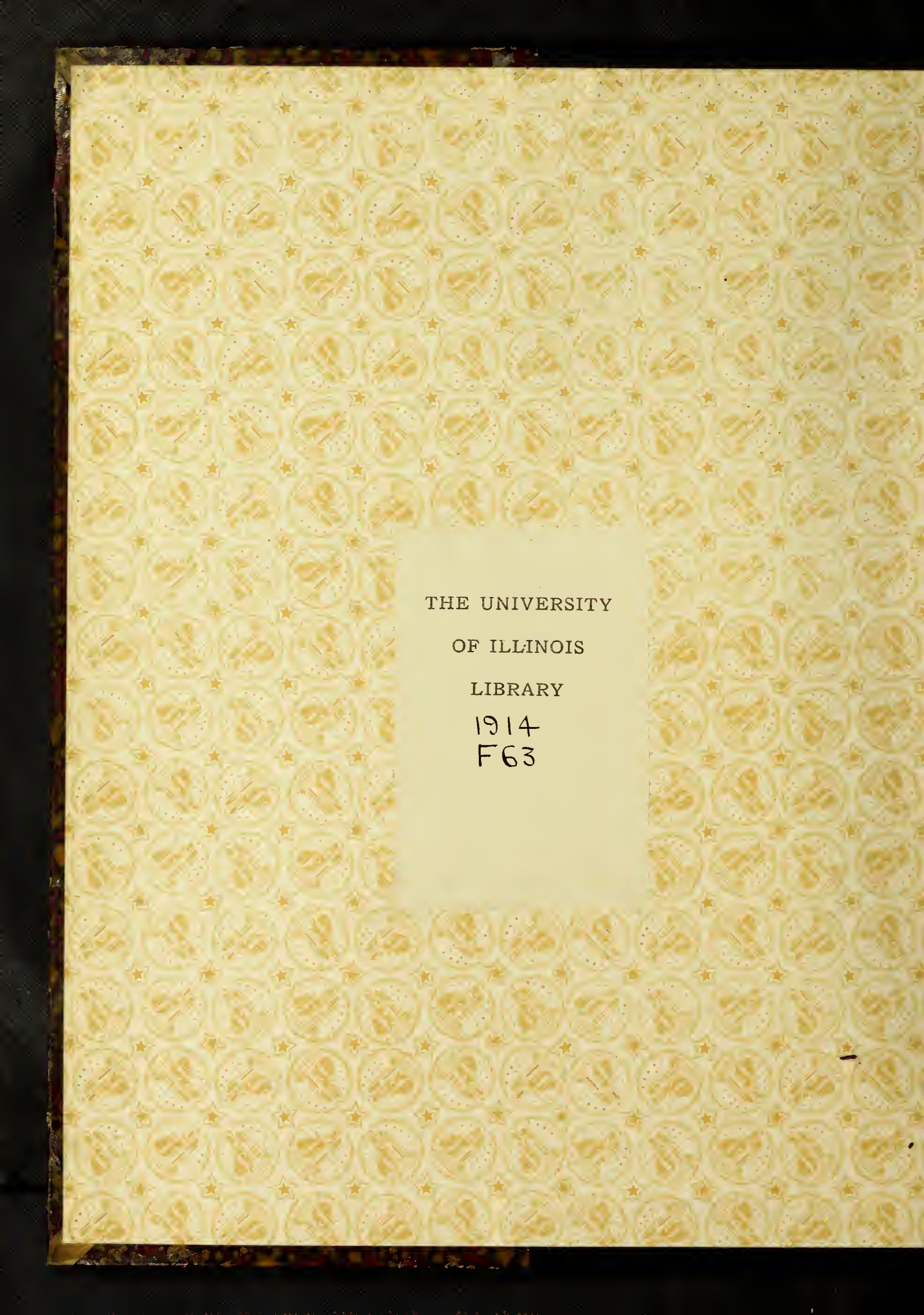
The Valuation of Railroads

Civil Engineering

B. S.

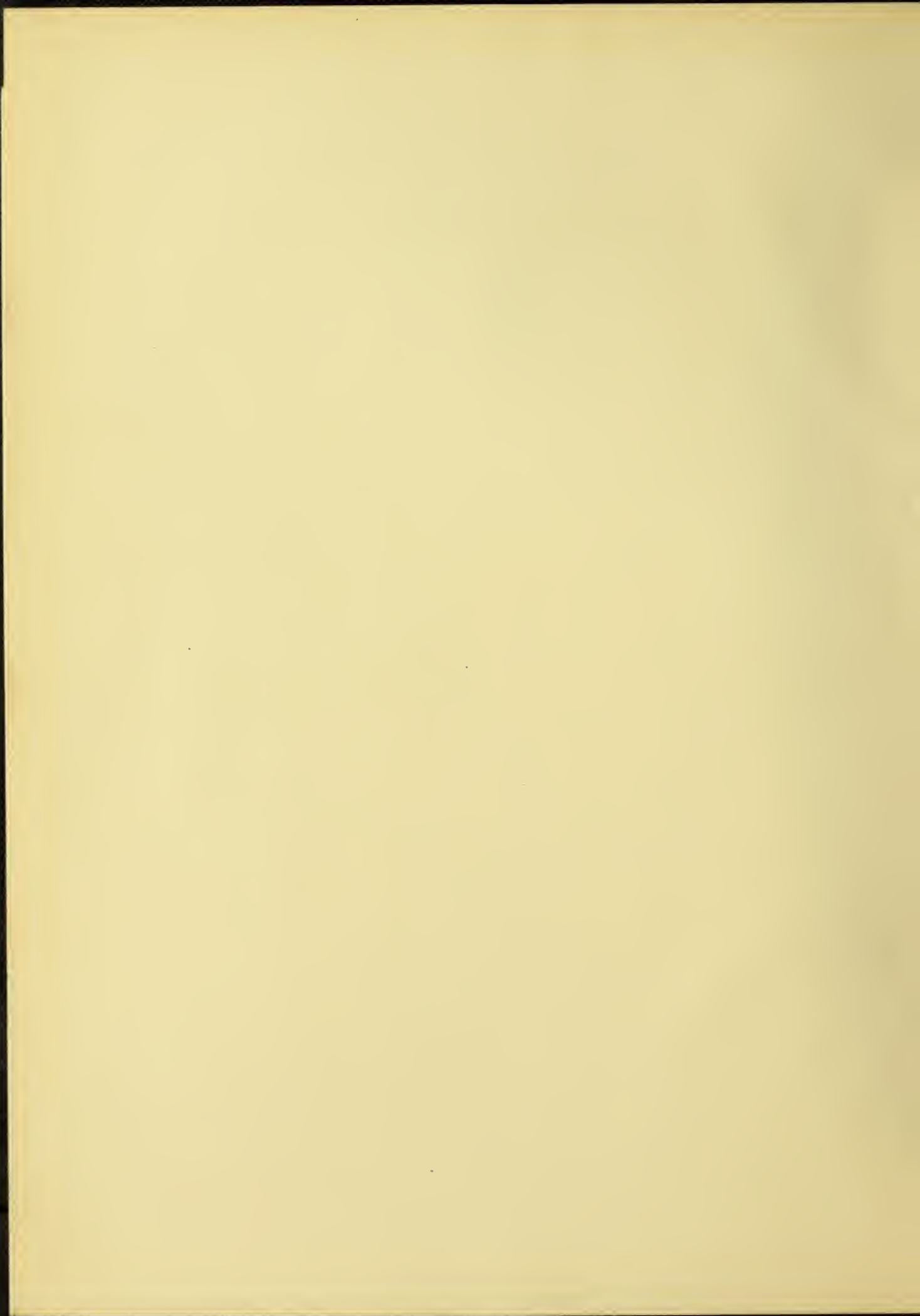
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THE VALUATION OF RAILROADS

BY

CASSIUS PAUL FLETCHER

THESIS

FOR THE

DEGREE OF BACHELOR OF SCIENCE

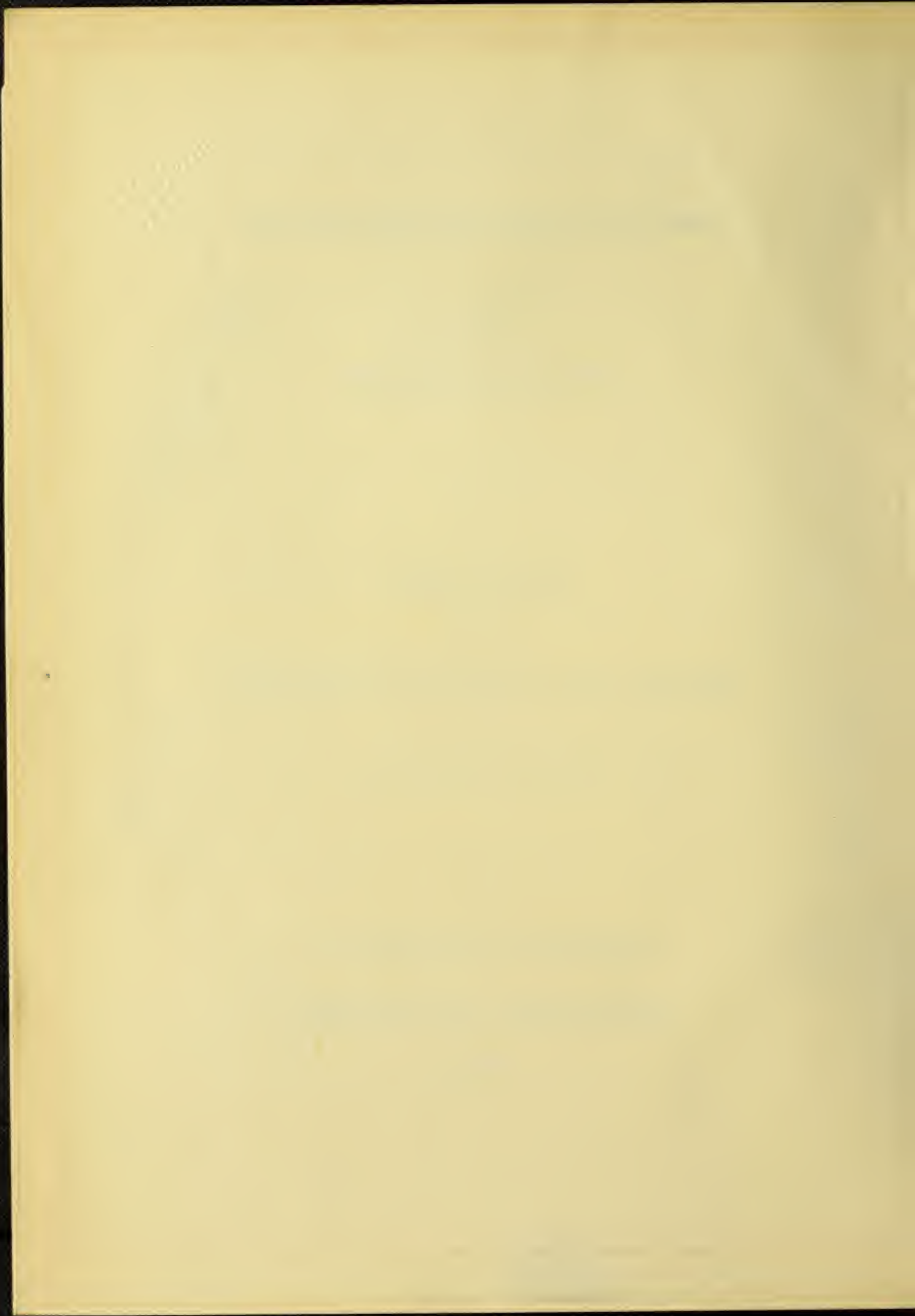
IN

CIVIL ENGINEERING

COLLEGE OF ENGINEERING

UNIVERSITY OF ILLINOIS

1914



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UNIVERSITY OF ILLINOIS
COLLEGE OF ENGINEERING

May 25, 1914.

I hereby recommend that the thesis prepared under my direction by CASSIUS PAUL FLETCHER entitled THE VALUATION OF RAILROADS be accepted as fulfilling this part of the requirements for the degree of Bachelor of Science in Civil Engineering.

Ira O. Baker.

Head of the Department of Civil Eng'g.

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1850

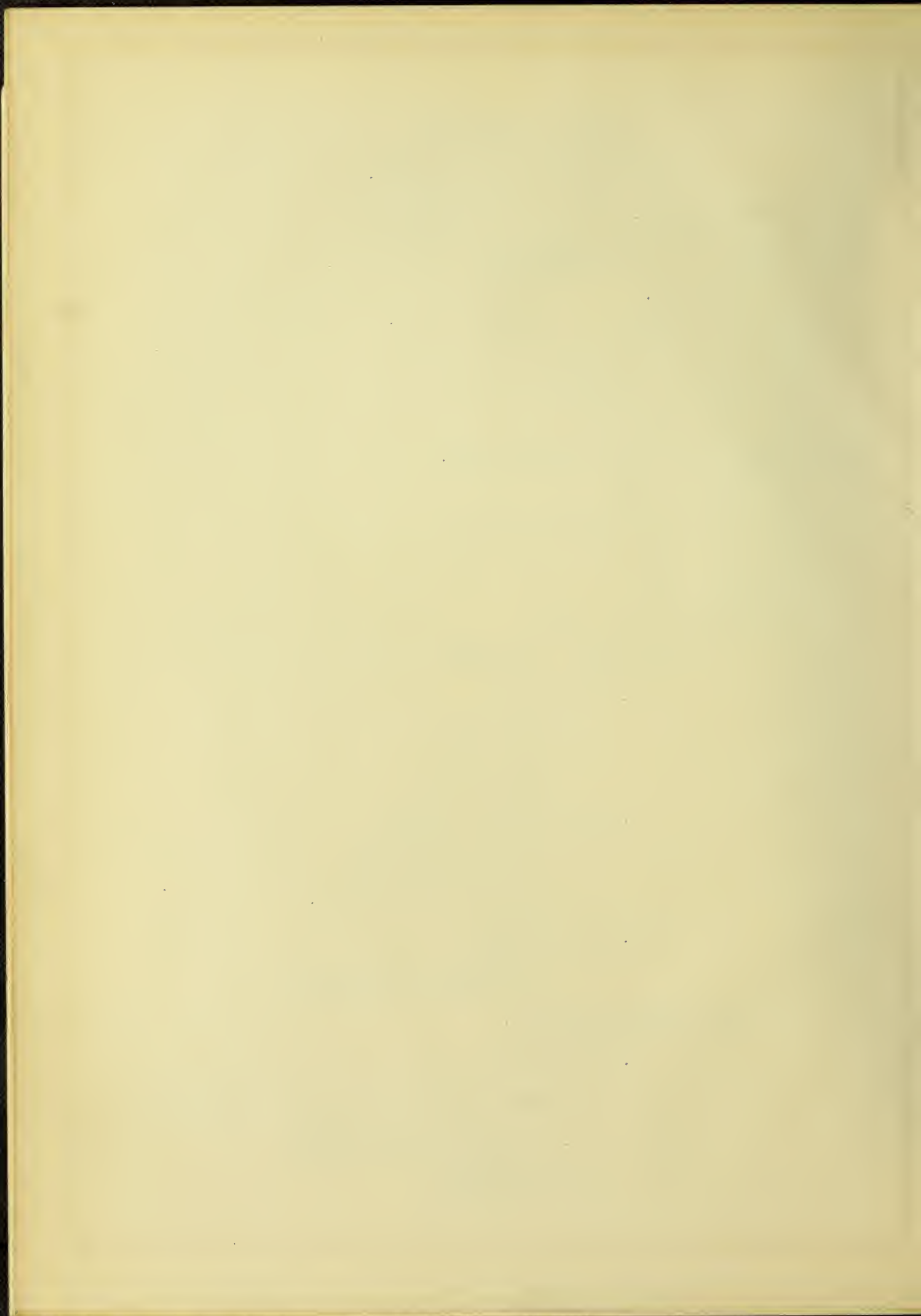
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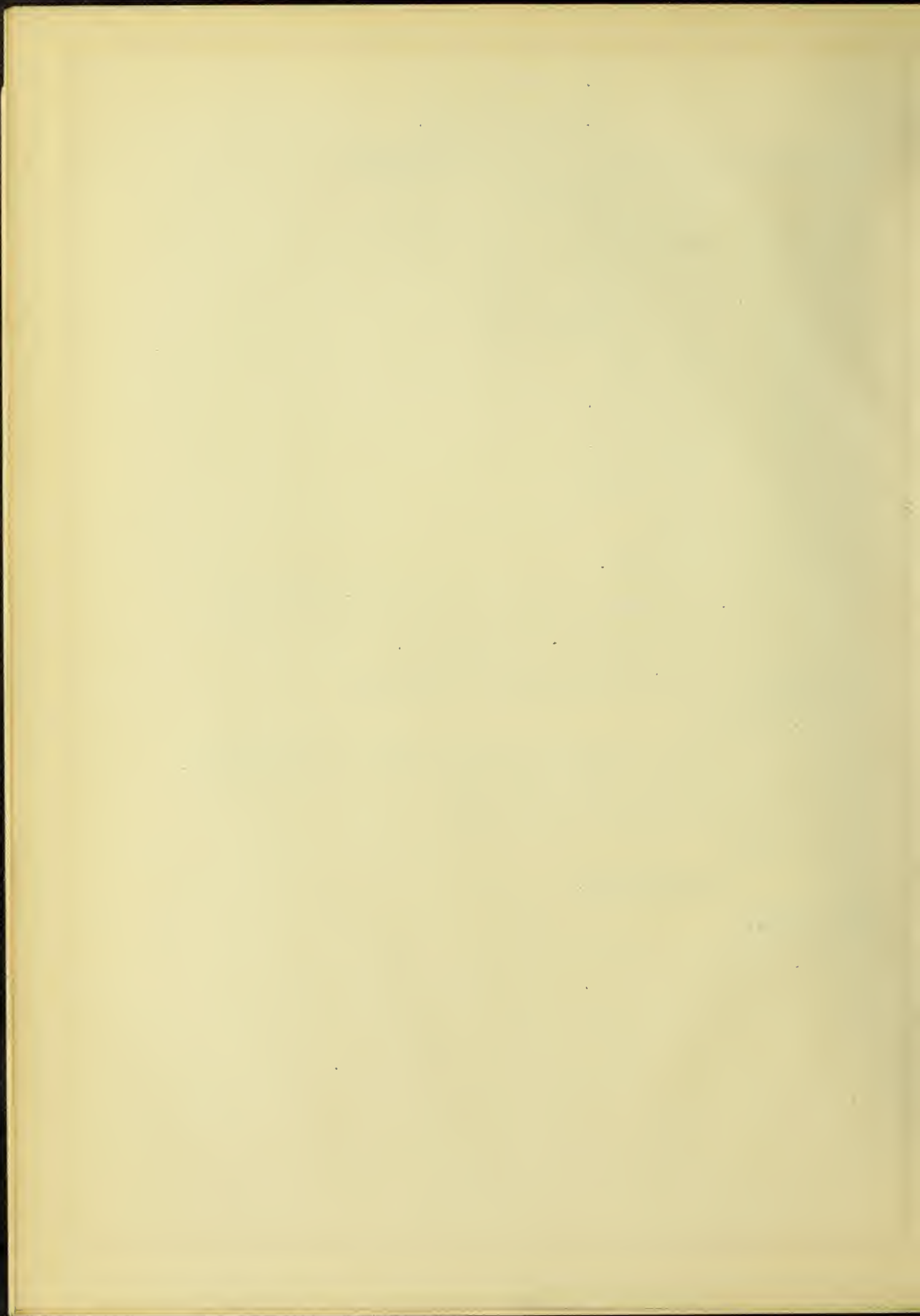
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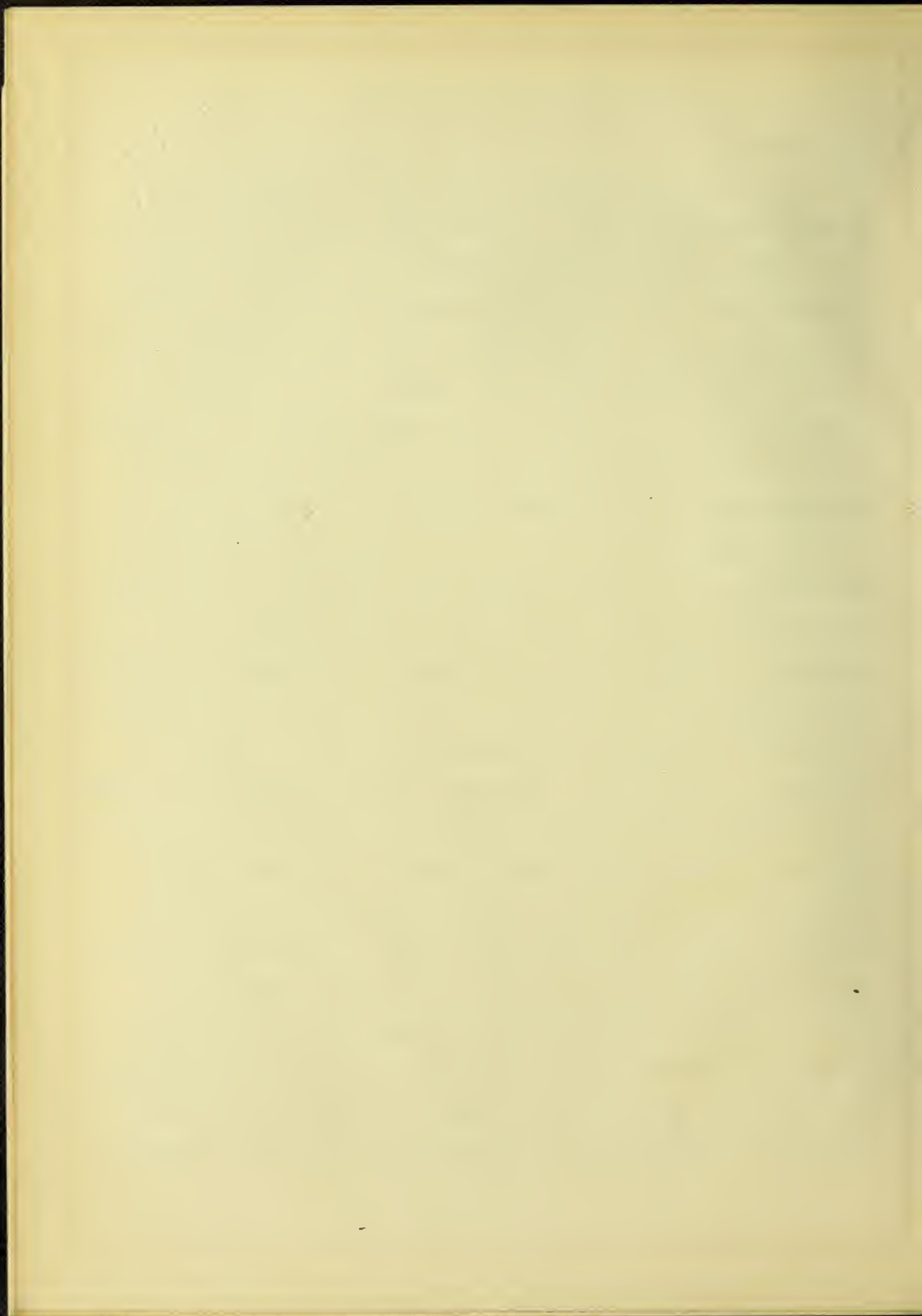


The Valuation of Railroads.

I. INTRODUCTION.

A railroad is a monopoly created by the law-making power primarily for public use. To prevent discrimination against the public these monopolies must of necessity be regulated by some authority. The only means of determining whether the monopolies are receiving more earnings than is their due, or whether the public is being benefitted at the expense of the railroad, is to ascertain the net income on their capitalized value. In order that this public authority may have a just basis upon which to work, they must first determine the value of the monopoly.

The value of an article as understood by an economist is its desirability. The mere translation of the tangible part of a railroad into another kind of wealth does not sufficiently determine its actual value to the public. The value of a commodity is dependent upon certain intangible factors often entirely overlooked. For example, the earning capacity of a concern is an element of real value. The Circuit Court of Appeals in the case of the National Water Works vs. Kansas City decided that the fair value of a "going concern" was in excess of the cost of reproduction when the corporation has the capacity to earn and is actually earning. This theory would apply in the valuation of old properties, but would not apply ^{to} a new railroad. Henry Fink, M. Am. Soc. C. E., asserts that the true value depends on the degree of efficiency with which the utility can serve its customers, and in return this efficiency is reflected in its earning capacity. Another of these factors is topographical location. For example,



it seems plausible that a road by reason of its situation in a mountain pass is of more benefit to the public than one crossing elsewhere. Again, the real value of a property depends also upon many other factors attendant upon the development of the railroad, as will be considered subsequently.

It is proposed in this thesis to present a brief history of valuations, and to explain the fundamental principles upon which such valuations should be made. From the collection of text books and magazine articles the writer has endeavored to collaborate a review of the opinions of various engineers and specialists in this line of work. Appraisal and rate engineering has already become one of the many branches of engineering. There has been much discussion as to whether railroad valuation should be under the direction of the engineer or the economist, and Mr. H. P. Gillette M. Am. Soc. C. E., seems to have hit upon a happy medium---a combination of the two. He says the engineer specialist should be thoroughly acquainted with the principles of economics, particularly those relating to engineering, and should be well informed as to the decisions of state and federal rate-regulating commissions as well as court decisions bearing on valuation and rates. He should be a student of the new phases of his speciality and of the cost of construction and operation. With these ideas in mind the writer will proceed with his subject as outlined on the preceding pages.



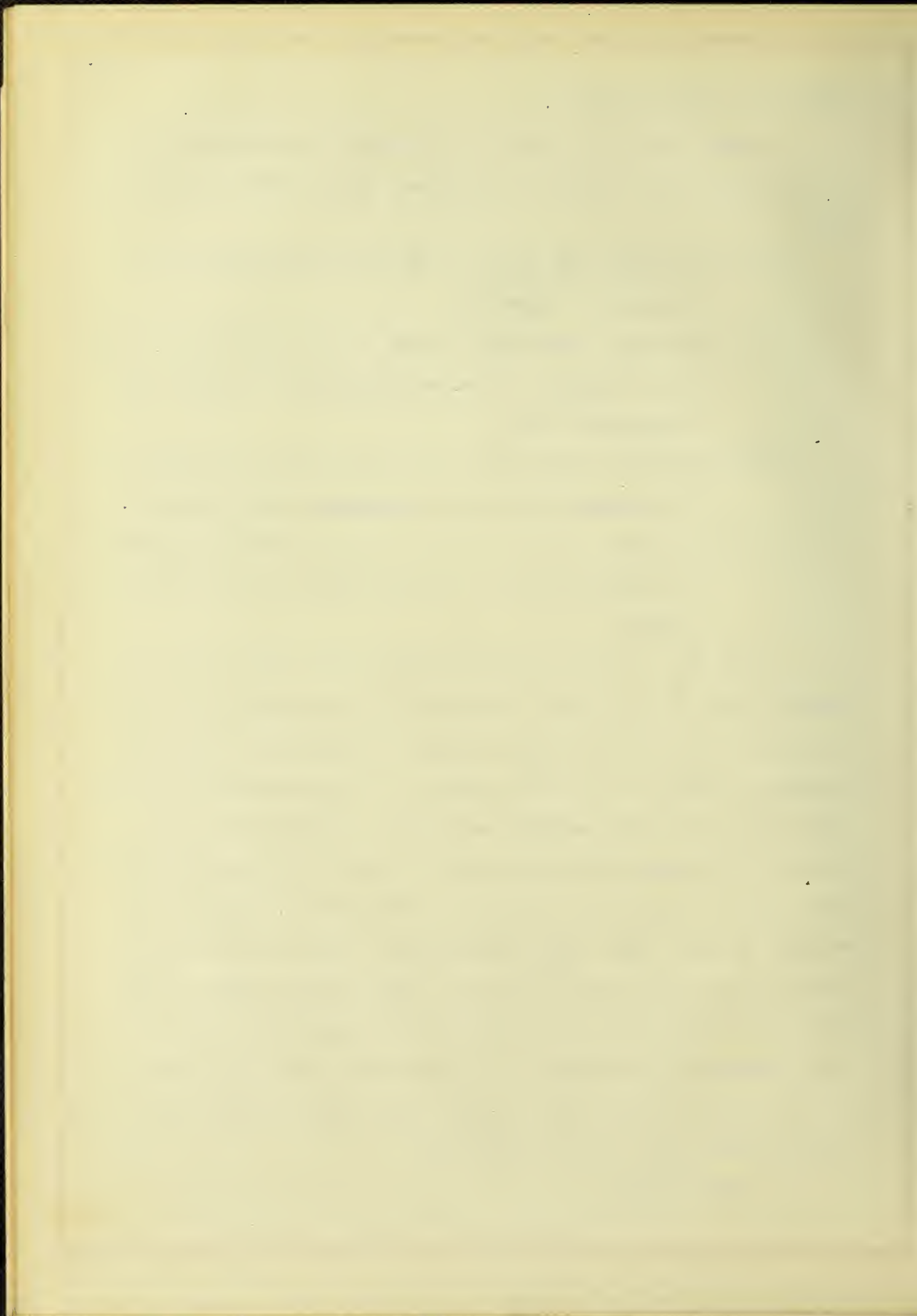
II. PURPOSES OF THE VALUATION.

An appraisal of the physical property of a railroad may be undertaken for a number of purposes, among which may be named:

- (1) To ascertain the value of the railroad property for purposes of taxation.
- (2) To ascertain the value or cost of the railroad property as an element in the determination of proper and reasonable rates.
- (3) To determine the value of the property preliminary to the prospective sale or purchase of the railroad.
- (4) To ascertain the cost of the railroad for the purpose of determining the reasonableness of its capitalization.

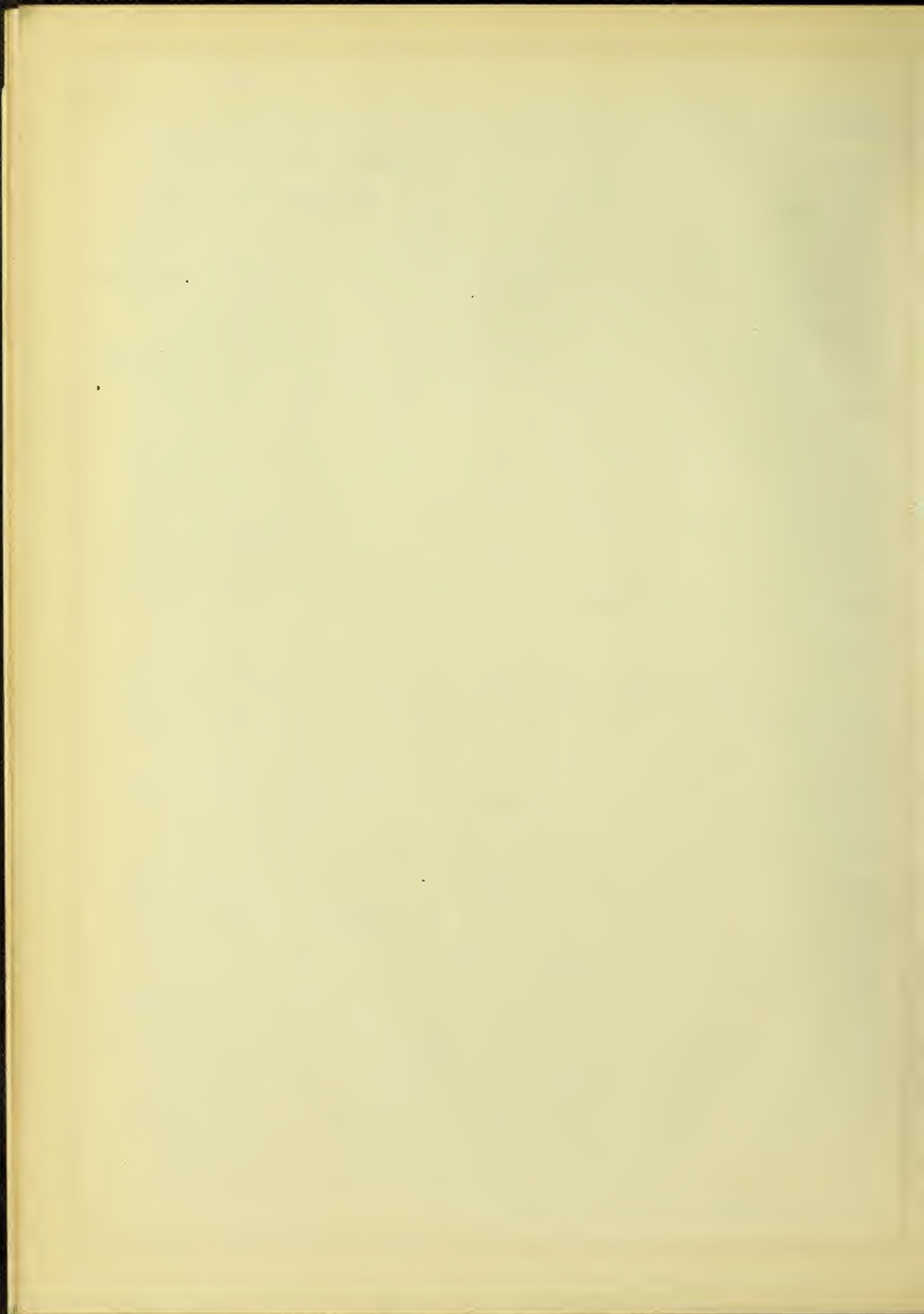
It is the opinion of some engineers that the value of a property will be different and should be determined in different manners for the different purposes stated above. The importance of the fact that the purpose for which an appraisal is made must control the methods and values used was early impressed on the commission appointed in 1909 to re-appraise the railroads and canals in the state of New Jersey. This was to be made in such a way that the valuation "shall be in a form available for the purpose ^{of} taxation under existing laws." Conditions are different and problems arise peculiar to each of these purposes, so that when it is definitely known for what the valuation is made, the engineer must use principles and methods applicable only to that end.

(A) Taxation.



Taxation is a purely local matter. This purpose for valuation has been the main one used by various states, and the views and methods have been slightly different. It is to avoid the complication of dividing all roads at the state line and to avoid the different regulations in different states that a method of federal or national regulation is strongly advocated. Mr. Wilgus M. Am. Soc. C. E., in a discussion before the American Society of Civil Engineers held that for taxation purposes, right-of-way and real estate should be taken at their assessed value, and other items at their depreciated or second-hand value without the inclusion of overhead and development costs. All the thousands of parts of the system should be considered separately and not as a whole creating a "going concern". It is this method that all tax assessors use in determining the proper taxation of other utilities.

Complications arise when considering real-estate. Unless otherwise provided by state statutes, railway land is subjected to the same rate of taxation as other lands, and the amount of taxes assessed depends on the valuation placed on the land by the assessors. This assessed value is usually not the same as the market value. An appraisal of the right-of-way land for taxation purposes, according to Mr. Whinery, M. Am. Soc. C. E., should be based on the assessed valuation of similar land adjoining it or in its vicinity, providing this land is not damaged. In determining the value for taxation the Courts have generally made it plain that neither the use made of, nor the amount of benefit or profit derived from, the land may be considered. It is found in practice that it is practicable to disregard each individual tract of right-



of-way in detail and formulate some general rule to be applied in the determination of the value of right-of-way land either as a whole or in large sections.

Our whole system of direct taxation is cumbersome, discriminating, and unjust, The burden of taxation has yearly been increasing. Mr. Crehore, M. Am. Soc. C. E., suggested a very good and simple idea which would wipe out an immense amount of inflation. He advocates that the government order each railroad to put its own value on all its property, and to have it understood that the same value would be used in assessment for taxation as well as for acquisition of the property, or for any other purpose. Thus a low valuation for taxation would be counteracted by the knowledge that the government would use that valuation for rate making or acquisition.

(B) Rate-making.

The question of making an appraisal for the purpose of establishing or regulating rates is an entirely different proposition. The lowest rates which a railroad may reasonably or legally be required to charge are such as will repay the total cost of the service rendered including interest charges and a fair return of the money invested, as any lower rates would be confiscatory. Interest and dividends are a part of that total cost, and as they are functions of the capital invested, the latter must be known in order to determine the legitimate cost and to frame proper rates.

It is claimed by the legislative and affirmed by the judicial authority that the government may intervene in the operation of a semi-public cooperation to the extent of requiring satisfactory service for reasonable charges; but the question,



what are reasonable charges, is still an open one. It will be conceded by nearly all fair-minded people that where the service is inadequate and rates are not only oppressive to the public but yield excessive profits to the owners, it is not only right but the duty of the government to intervene and to establish the relations between the two which will be fair and just.

Prof. H.E.Riggs, University of Michigan, differs materially with most engineers on this question. He says that there need not necessarily be any relation between rate regulation and rate making. Rate regulation can well be confined to rates in the aggregate, rate making applies to the individual rates and must necessarily be the work of men well versed in all the varied elements which control it and the particular conditions affecting the business of each particular road. He refuses to recognize that "intangible values" have any place in a physical valuation and does not consider that the purpose for which an appraisal is made should have any influence in determining the value of a property. His method of reasoning was proper but as the principles of the work have been studied again and again, what we call "intangible values" have become perfectly clear and appear as tangible matter. The Railway Age-Gazette, Sept. 12th, 1913, says that the valuation of a public utility to establish a basis for the regulation of its rates must be based on the present value of the property, not on what it has cost its possessor. That this is the correct legal view certainly seems to be a just inference from the language repeatedly used by the federal courts.

(C) Sale or Transfer.

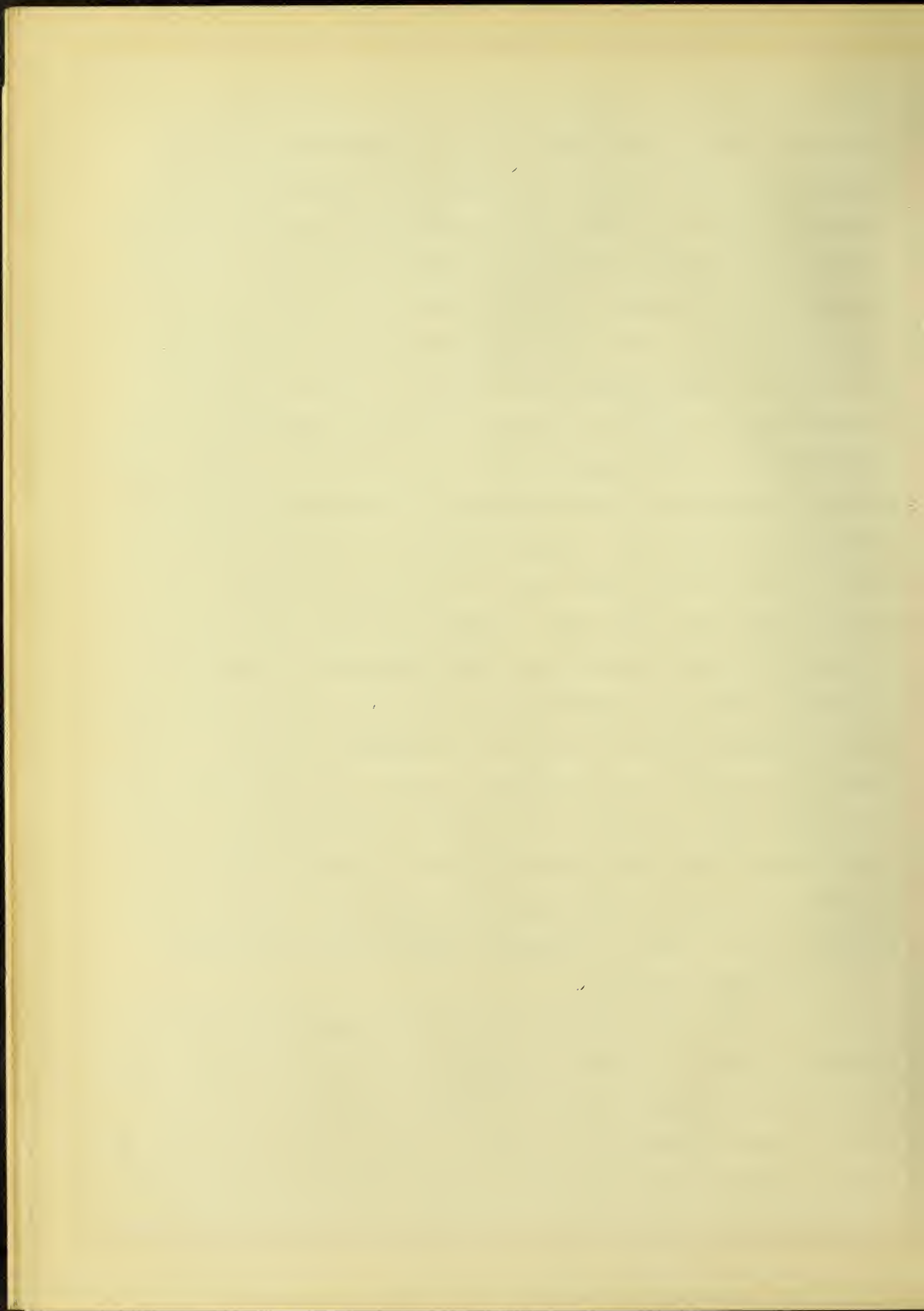
An appraisal made for the purpose of determ-



ining the value of a railroad property in a contemplated purchase or sale will necessarily differ in many respects from the other purposes, and will vary with the nature and circumstances of the proposed transaction. When a proposed sale is by mutual agreement between parties equally disposed and free to deal, the appraisal is essentially equivalent to the ordinary invoice of industrial or commercial concerns, and its purpose is chiefly to disclose market value. But when a government desires to acquire property by the exercises of its ^{power} or by coercive processes, regardless of the owner's desire or willingness to sell, the situation is wholly different. If the owner is to be deprived of his property he is entitled to full, and even liberal compensation therefor. This applies not only to the naked value of the physical property but to the franchise rights and other intangible values, and to any special physical conditions which may make the property especially remunerative. From any sound business standpoint, present and prospective earning capacity is a more true measure of value than the cost of the property or its physical value, and is as much an asset as physical value. Therefore the guiding principle in an appraisal of the property for the purpose of sale or transfer should be to ascertain its present and prospective productive value, of which original cost or cost of production would be only one element.

D. Capitalization.

The word capital is generally understood in railroad circles to mean the amount of outstanding evidence of cost or debt in the form of stocks and bonds. Strictly speaking, it is the amount of money permanently invested in the business, and this applied to railroads may be defined as the amount of money expended originally in its organization, financing, construction and equip-



ment plus the amounts since expended in additions and betterments, plus a reasonable amount of free money required for conducting the business, commonly called working capital. Suppose the amount of indebtedness as disclosed by the stocks and bonds should exceed the amount actually invested. It is such a possibility as this that demands an investigation into the capitalization of an enterprise.

The determinations of the amount of money invested in a property is the work of an accountant and not an appraiser. The actual cost of the property and not its present reproductive cost or marketable value should be ascertained. Appreciation or depreciation of the value of a property does not increase or decrease the amount of money invested, and does not affect the capital account. In the absence of complete and trust worthy accounts, and as the object of the valuation is to prevent over-capitalization or stock-watering, the only means of learning the approximate amount of the capital actually and legitimately invested in the railroad is to resort to an appraiser. An inventory of existing property, is of course, necessary; but the unit prices applied to determine aggregate value should be those of the original cost and the cost of betterments at the time they were made.

III. METHODS OF MAKING VALUATIONS.

A. Cost to Date.

In the case of a property recently created, with accounts kept properly, the best basis for valuation is the actual, reasonable cost as shown by the accounts. In the Act of Congress that prescribes the alternative methods under which the Inter-state Commerce Commission is to proceed, Original Cost-to-Date is named, in which the actual cost of the property as reflected on the books



and records of such companies of the United States are dependable. Only in recent years have cost accounts been kept in a uniform and complete manner, and even then the tendency ^{has been} to understate charges to construction, and to additions and betterments. Even these have been charged to operating expenses. On the older lines the accounts of many of the constituent roads have been lost or are incomplete. Were there such a set of books the ideal system of making a valuation would be found, and there would be no use of going further in the determination of the actual value of a property. But as the only surviving books of the older railroad systems show merely such a portion of the original cost to date as is there recorded, they therefore are not proper for use in physical valuation except in so far as they may be of aid in casting a side light on estimated cost of reproduction as of the present time.

B. Stock and Bond Valuation.

The method of stock and bond valuation has received very little attention and practically has been abandoned. Henry Fink, Pres. of a southern railway, is the only man who seems to defend it. So much high finance has been brought to light recently that economists shun the method. Mr. Fink says it is perfectly rational. The value of a going concern depends on its net earning capacity, and the market value of its securities reflect such earnings. In deciding the proper value to give to a property nobody could be a better judge of its real value than Wall St. It is a student of all conditions affecting railroads. Capital is alive to such dangers as the destruction of property, depreciation, damages, ill-considered legislation and so forth. The stocks of an old railroad are bought for an investment and not speculation; but



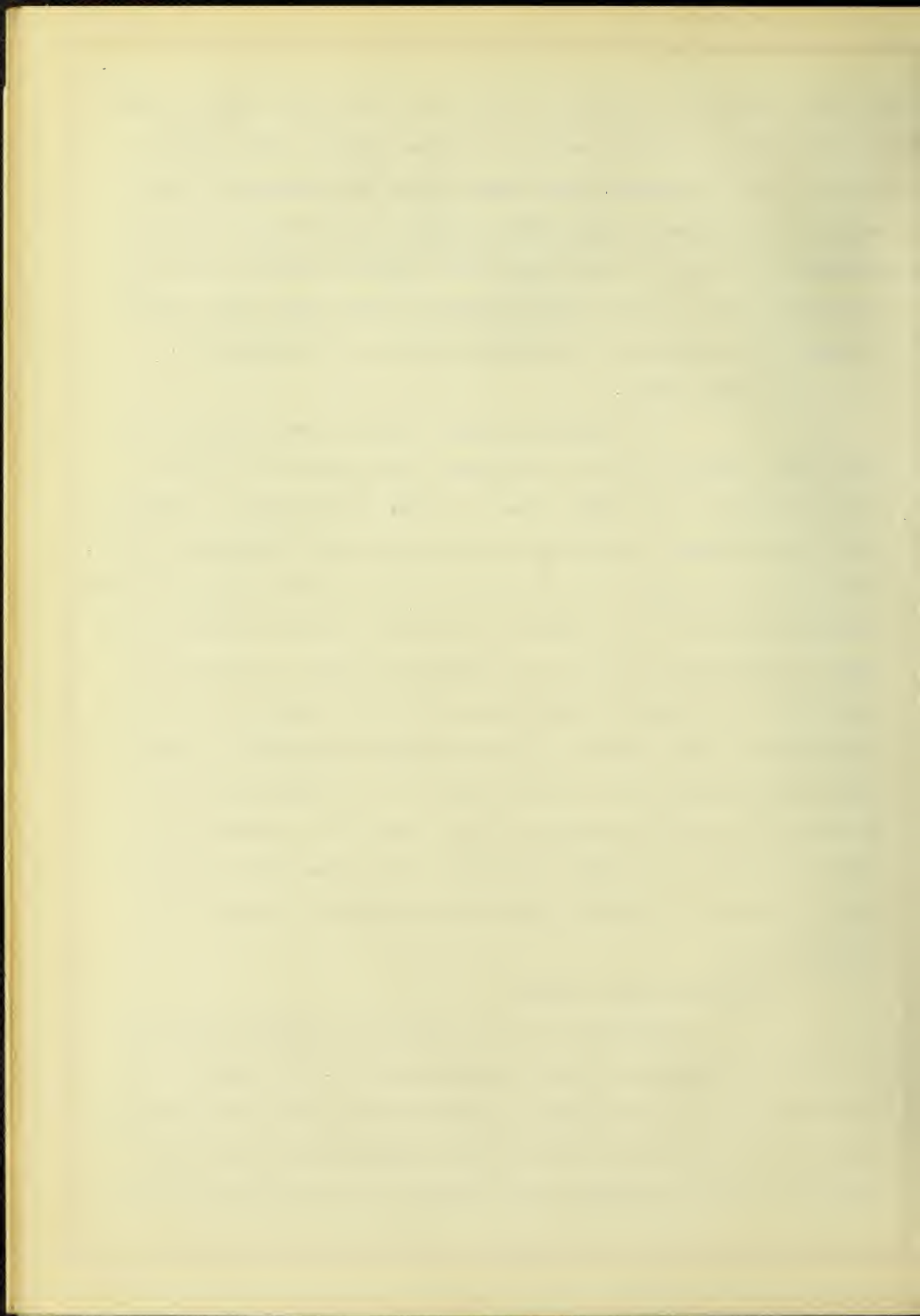
when such hazards as enumerated above must be taken, it is no more than right that a reward, such as interest greater than the legal rate, should be given. Were there not so many dishonest stock jugglers the stock-and-bond method would be applicable; but since dishonesty is bound to exist, and since Wall St. cannot determine at once the value of new roads and hence cannot apply this method to them, the valuation by the above means is not recommended.

C. Sale Value.

In taxation matters the sale value method has been used, right-of-way and real-estate being taken at their assessed valuation, and other items at their depreciated or second-hand value without the inclusion of overhead and development costs. This method is proper in so far as the value of the component parts may be desired, as in the case of taxation, but for any other purposes treating these parts as uncorrelated items at prices they would bring if thrown on the market is not applicable to the ascertainment to the full value of the tangible property of railroads as going concerns. The sale value of this property could be set by the railroad itself but this would be a reliable and justifiable price only when the corporation knows that the property is liable to taxation and rate regulation on such a determined value.

D. Reproduction Values.

The second of the alternative methods prescribed in the Act of Congress is Cost of Reproduction. This seems to be the resource of all engineers in the valuation for nearly all purposes. Under this theory, the natural topographical conditions along the line are assumed to be restored, but in all other re-

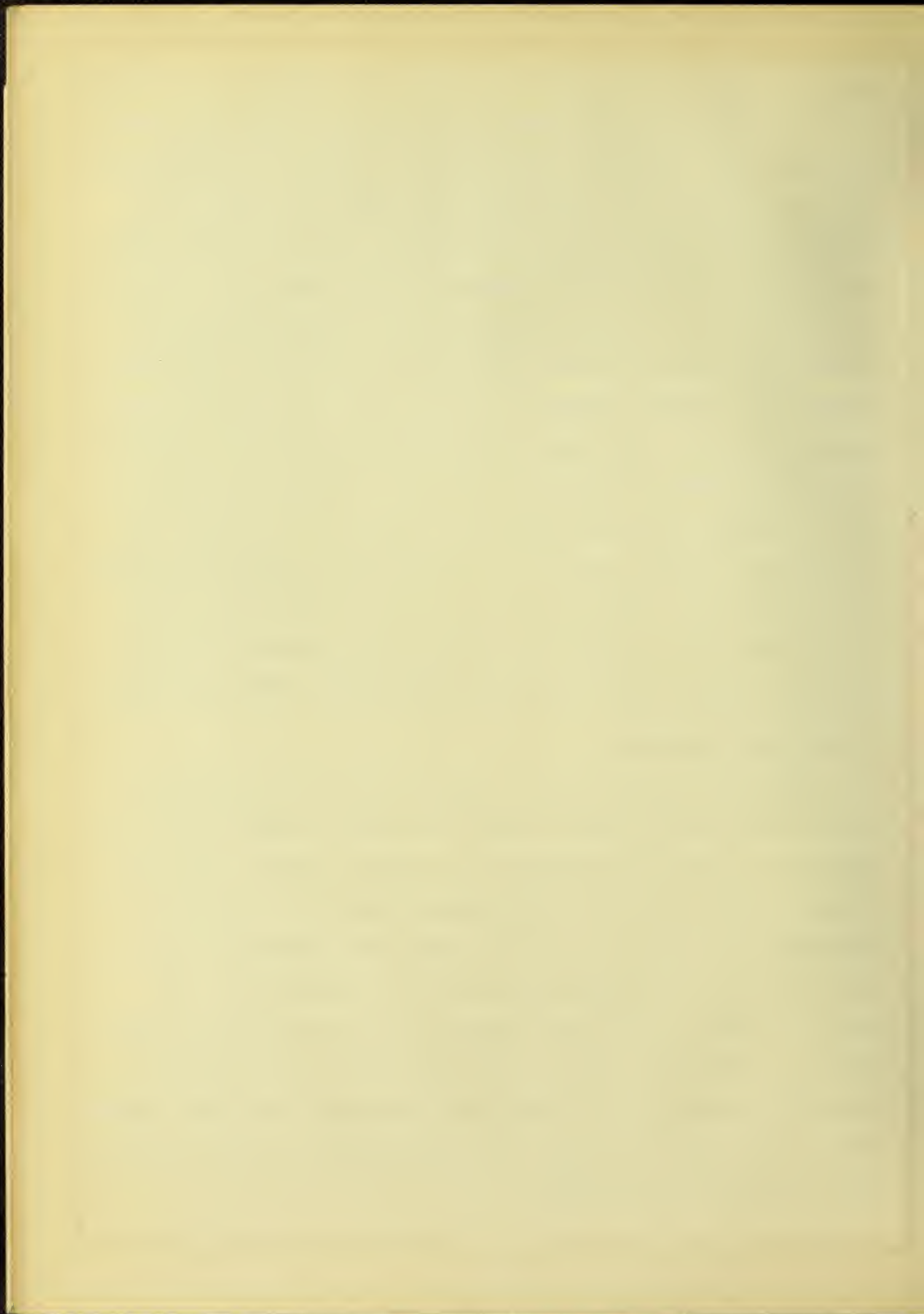


spects the existing environment is taken as of today.

In determining quantities and values under this method it would seem essential that, as far as possible, the procedure should be duplicated that experience has shown would have to be followed, step by step, in the creation of a going railroad. Mere inventorying of the numberless items and the placing of a price on each will not give the cost of reproduction because the intimate relation that the parts bear each other and the Cost of their Assemblage into a whole are thereby ignored. Not only should supervision, accidents, taxes, and administration expenses be included, but provision should be made for the cost of capital that must be held in suspense during the period of construction, and also for the necessary working capital. As the Reproduction-New-Less-Depreciation method has already been adopted by the Commercial World; it is probable that of all the various methods advised this will be the one finally used by the United States and state governments.

1. DEVELOPMENT EXPENSES.

Before a road may become a going concern it is necessary that it pass through certain stages. Its present "going value" is determined by the cost of making it a valuable concern. These development stages involve certain expenses which may be defined as the investment necessary to put the plant into successful operation, and create revenues that justify its construction. The method of treating development expense is in accord with the discussion of some public service commissions which have carefully studied the question and is upheld by many decisions of the courts. This principle will not apply to a losing venture, as the concern's value is based on its earnings.



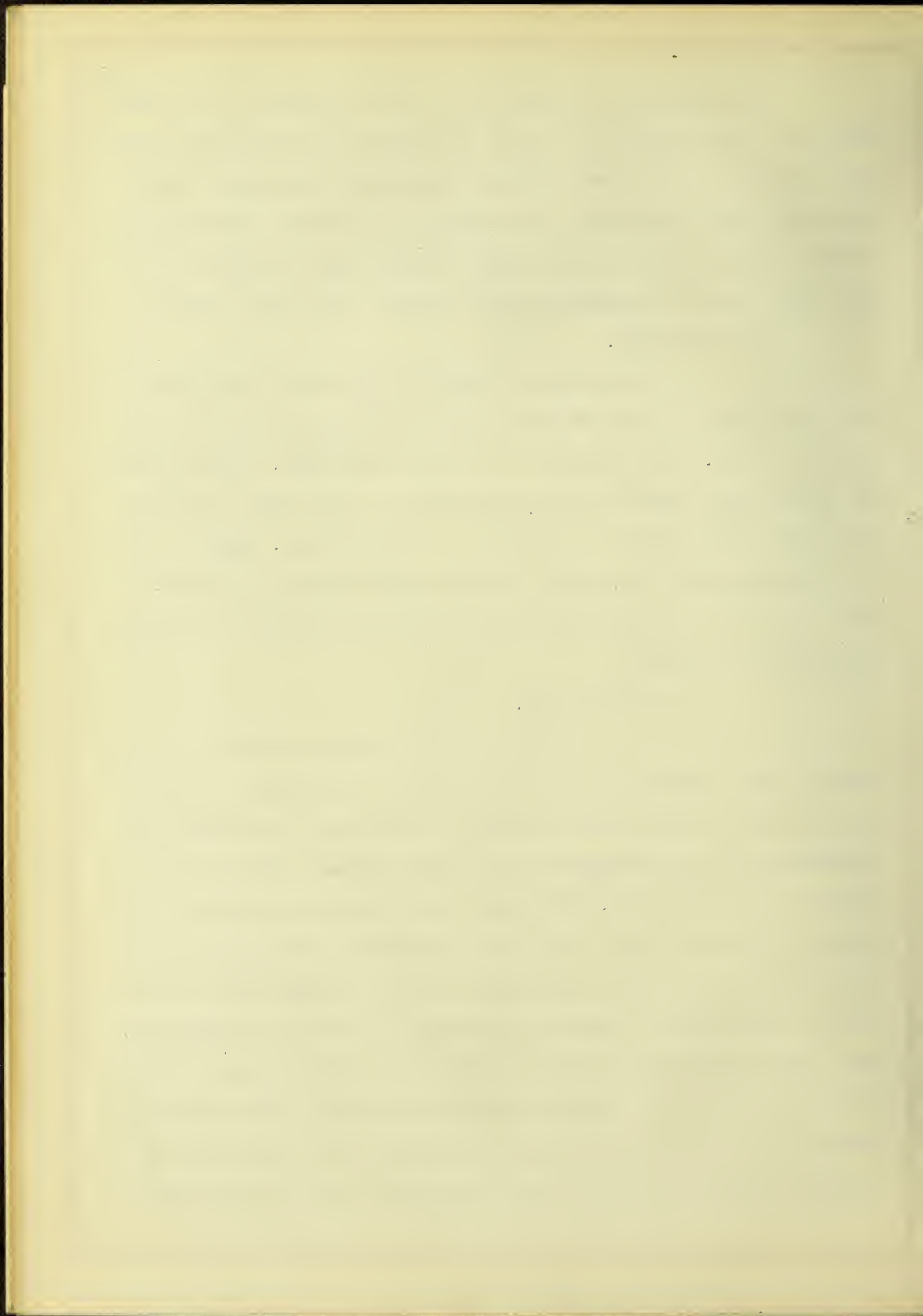
The impression prevails that the building of a railroad begins with the breaking of ground and ends with driving the last spike. There are three well-defined and equally important stages that precede the successful completion of a solvent enterprise, two of which are given but little weight in the usual estimation of cost. These are the initiatory, constructive, and final stages.

(A) Initiation.

The first of these is initiation. The plan is born in the minds of men who are fitted by experience and courage to give it life, and stay with it to its completion. Reconnoissances, preliminary surveys, and estimations of cost and of revenue and profits are needed to determine its feasibility. Capable men must be secured for the administrative and engineering staffs. Above all, these things require much time and capital, and should be seriously considered.

(1) Promotion.

Before a public service property can be brought into existence or even its construction begun, a considerable amount of money is expended for promotion, investigation, organization and financeering; and these expenses should be included in the valuation. With most railway projects several steps are usually taken. First there is a preliminary study which must be carried to the extent necessary to warrant expenditures for a further investigation, and for obtaining a charter or franchise. Next, the proposition is put in shape for presentation to those who may be willing to finance such an undertaking. The issuing and marketing of bonds involves the payment of a commission to brokers, as well as various other expenses, all of which should



be included in the valuation. The amount of the preliminary expenses for different projects varies both with the character of the concern to be built, and with the degree of care used in the preparatory work.

(3) Engineering.

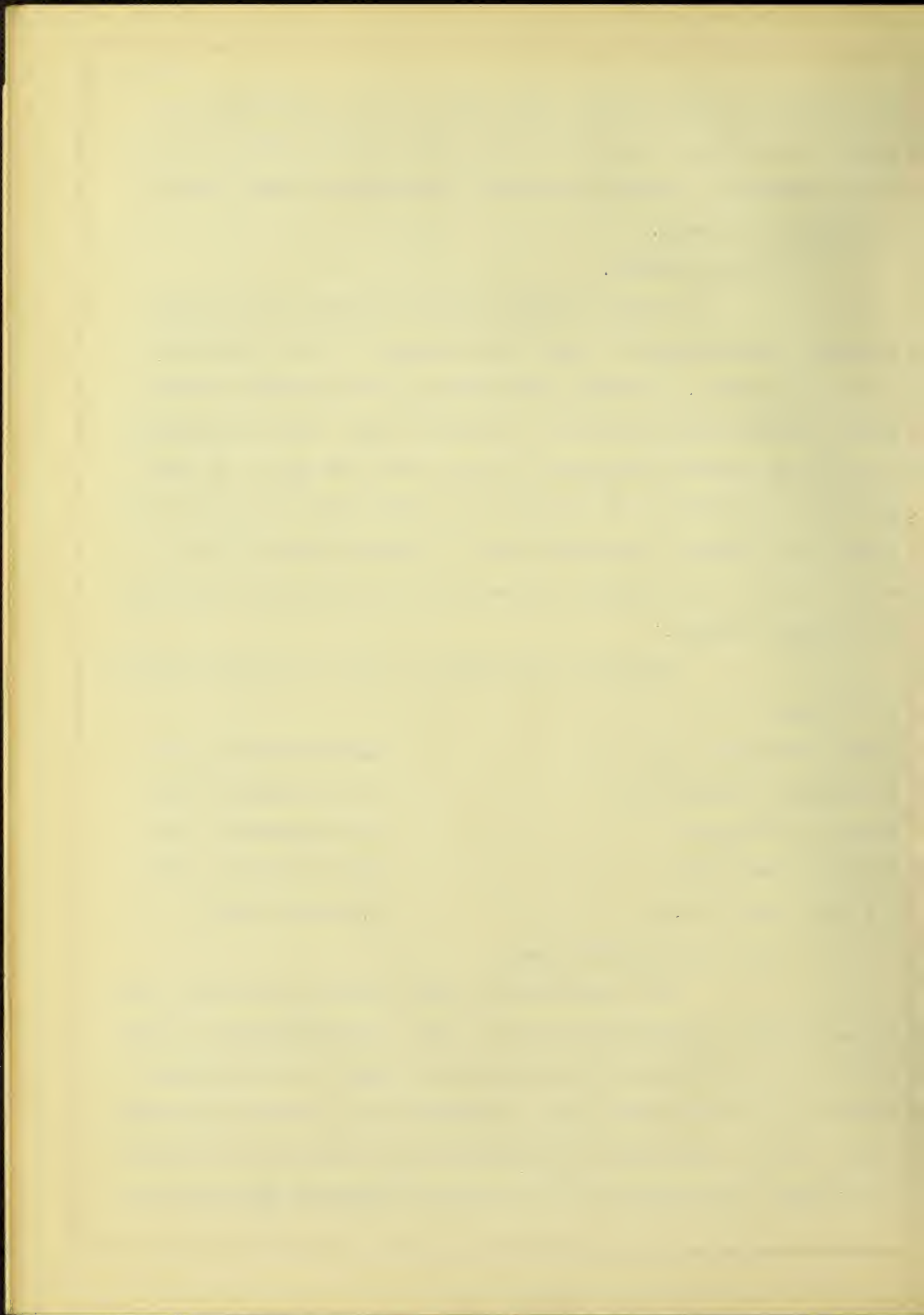
As stated before, reconnoissances, preliminary surveys, and estimates of cost are essential to the development of the enterprise. To obtain these the use of engineers is necessary through construction to the final stage. The percentage of the cost of the work represented varies with the amount of care and skill exercised in the design and construction. On most railroads it is commonly estimated that the engineering cost will amount to 5% of the physical valuation of the property, exclusive of overhead charges.

Available statistics on cost of engineering are as follows:

Lincoln Nebraska Light Co.	2.4% inventory cost
Des Moines Iowa Water Co.	4.5% inventory cost
Michigan Railroads	3.2% inventory cost
Minnesota Railroads	3.5% inventory cost
N.Y. N.H. and H. R.R	5.0% total cost

(B) Constructive Stage.

The constructive stage embraces the final location, surveys, preparation of maps, plans, specification, and estimates; the purchase and condemnation of right of way and real estate; negotiations with other railroads for trackage and crossings, and with towns and municipalities for franchises and other priveleges; the requesting of bids and the awarding of contracts;



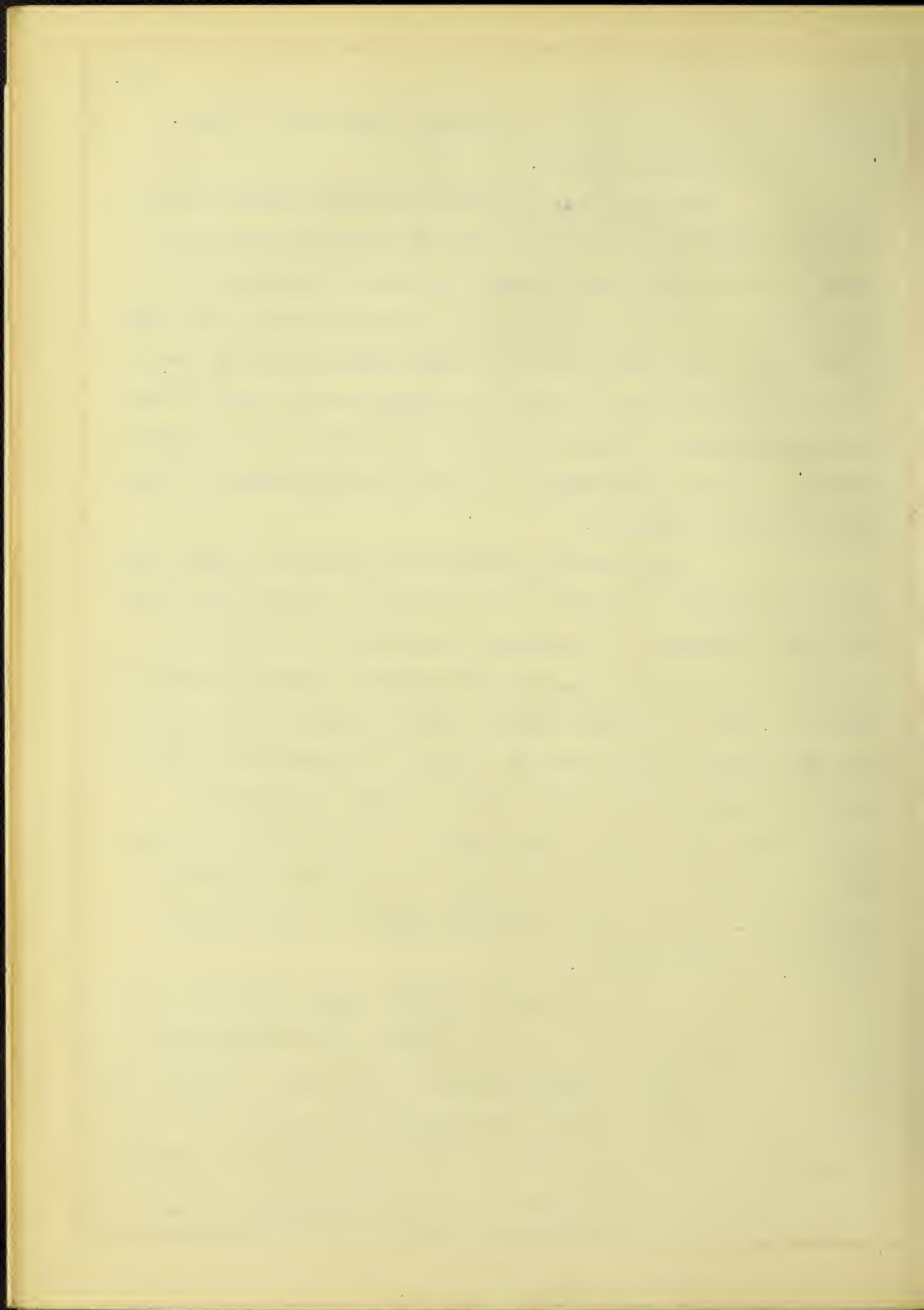
and the active construction by contract and company forces.

(1) Overhead Charges.

The principal incidental expenses during construction may be classified under the heads of salaries, general expenses, contingencies, and interest and taxes. The salaries include those of all concerned, from the executive body to the lowest paid man in the administration. These expenditures may be obtained from the records by taking the current annual cost of salaries and expenses of general officers and clerks for the period extending from the commencement of right-of-way purchases to the commencement of operation.

The general expenses are composed of legal fees (often disregarded), stationery and printing, insurance, and various other incidentals. In making an estimate of the cost of a projected undertaking the experienced engineer adopts a policy of liberality. This is for protection, and prepares for any contingency which might arise, such as failure of contractors, injunctions, stringency in the money market, strikes, rock-slips, floods, wash-outs, errors of employees, difficulties in securing labor and materials, and the necessity for providing for "force account work." These various items may add 15 to 20 % to the total cost of construction.

It is generally conceded that interest on money during construction is as much an element to be considered in arriving at the cost of reproduction of a railroad as expenditures for any other purpose. During the process of construction of a new enterprise there is no fund on which the company can draw for interest payments except interest-bearing borrowings supplemented



by such earnings as may result from operation during that time. Hence the capital raised must be large enough to cover all items of cost including interest upon itself, and interest on the interest up to the point of final completion of the road. As to the method of calculating this interest the rate is usually taken at the legal rate at the time of construction (the average being about 4%), and assuming it to be paid uniformly over one half of the period of construction.

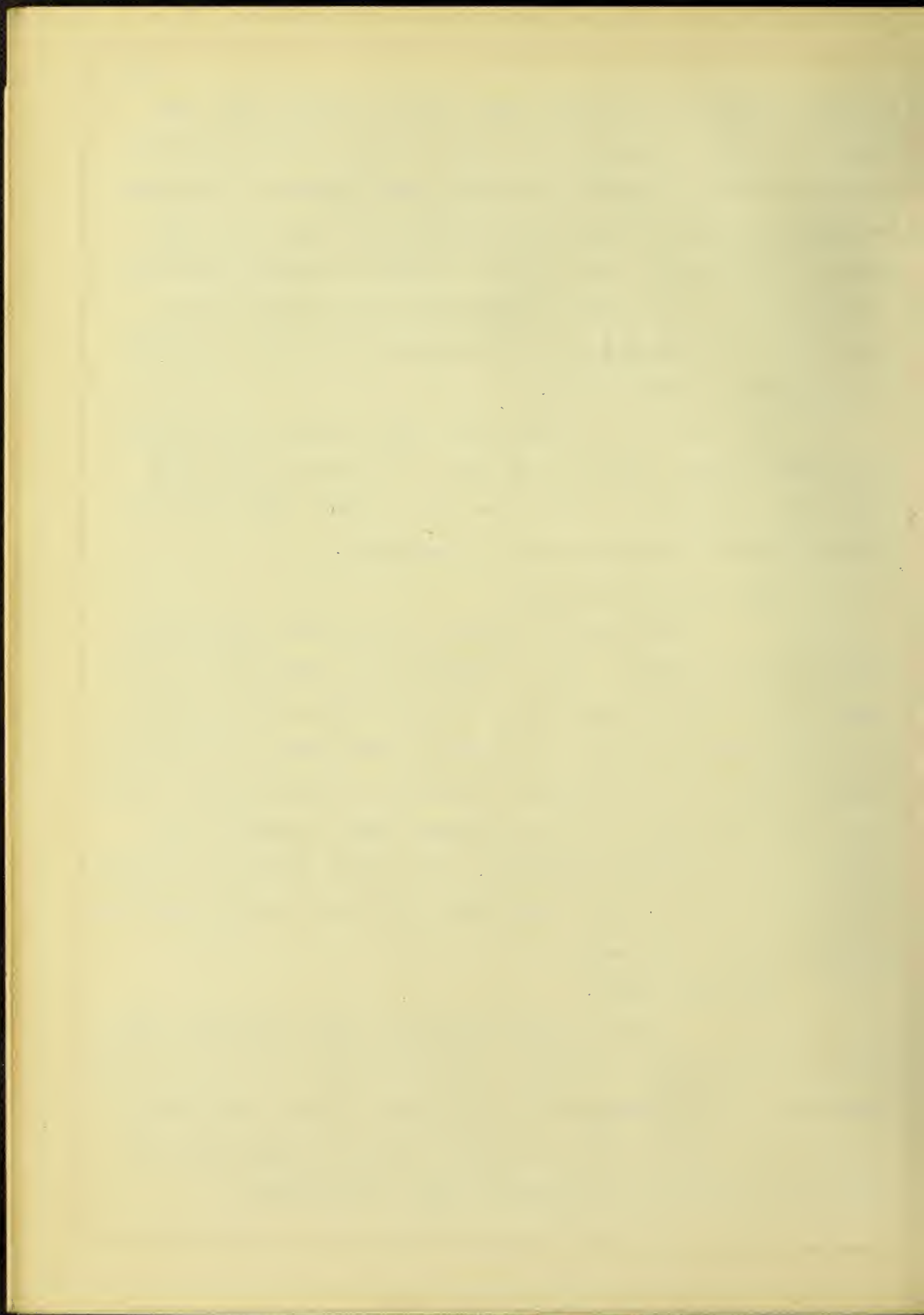
The amount to be allowed for taxes during construction must be determined largely on the basis of local tax rates and other local conditions. In this case the original plant and subsequent additions should be treated separately.

(2) Actual Construction.

The expense attached to the actual construction would include the amounts paid contractors for excavations, etc., wages for all laborers employed by the railroad, cost of temporary structures, and the use of locomotives and other rolling stock actually employed in construction. In fact it should include everything involving labor in the construction, and of course would exclude cost of permanent material. This expense would be determined by assuming the original conditions and going through operations as they probable were made.

(C) Final Stage.

Lastly is the educational and development stage when the line is open to traffic. Competent forces must be selected, organized, and trained to maintain and operate tracks, structures, rolling stock, and floating equipment. Errors of design and construction, as developed by operation must be rectified.



(1) Inducement of Traffic.

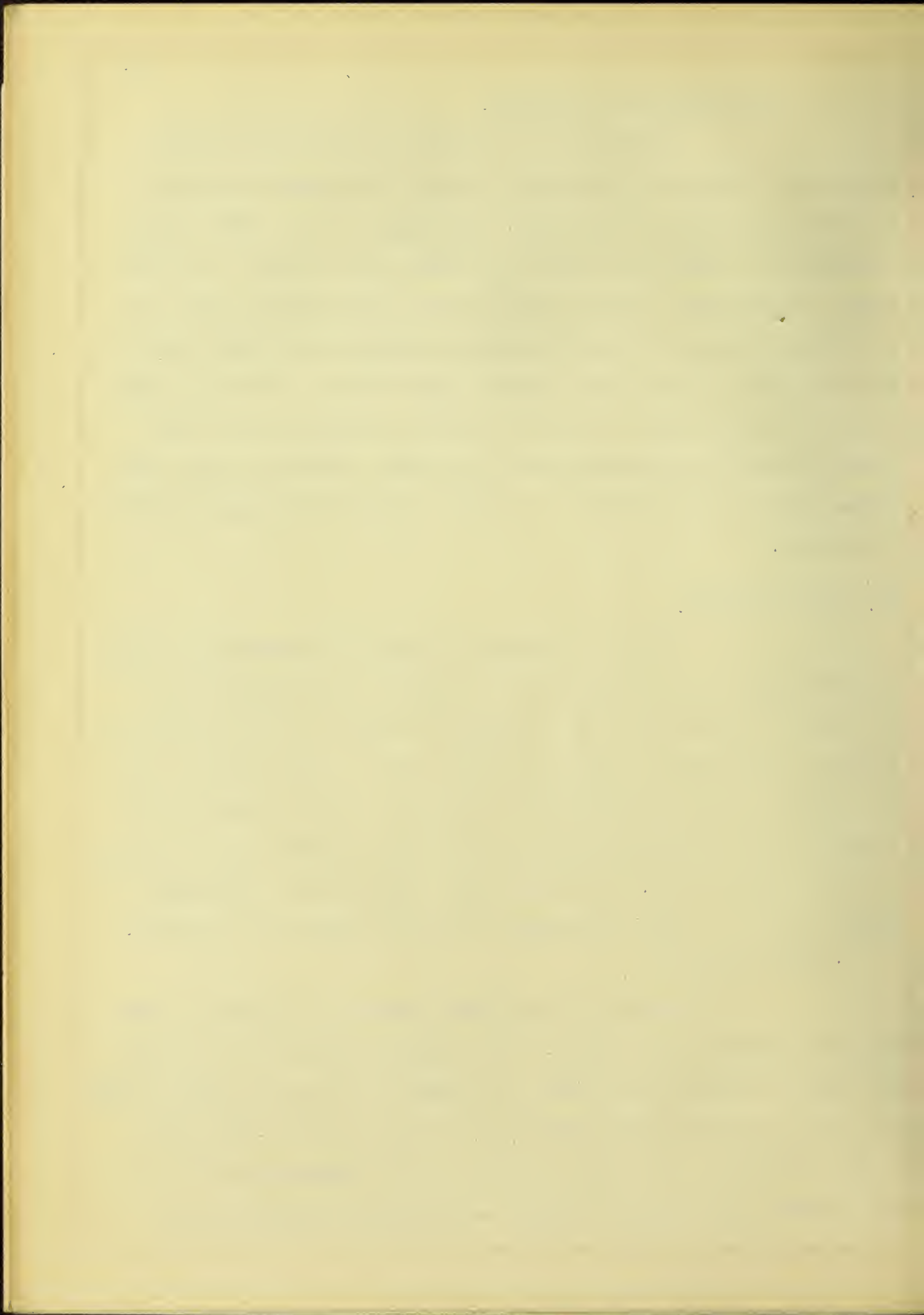
Traffic must be induced, economies studied, experiments tried, and the public brought to an appreciation of the new facilities at their hand. The attempt of the advertising department to induce more and more travel, both freight and passenger, to patronize a given road is also a never ending work. If a railroad is properly run and properly managed, the educational and development stage never ceases. Under the most favorable auspices it usually lasts for several years. All parts of the new creation must be co-ordinated and thoroughly trained in their new duties before it is possible to handle successfully a great volume of traffic.

II. PHYSICAL VALUE.

After determining the cost of developing a road, from the time it was conceived in the minds of the promoters to the time of its operation as a "going concern", it is necessary to determine the tangible values connected with it. The question, of its present values as individual or separate units is settled by deducting from the present value of the same article new, the amount it has depreciated. The sum of these tangible and intangible values of units, gives the present value for almost all purposes.

(A) Inventory.

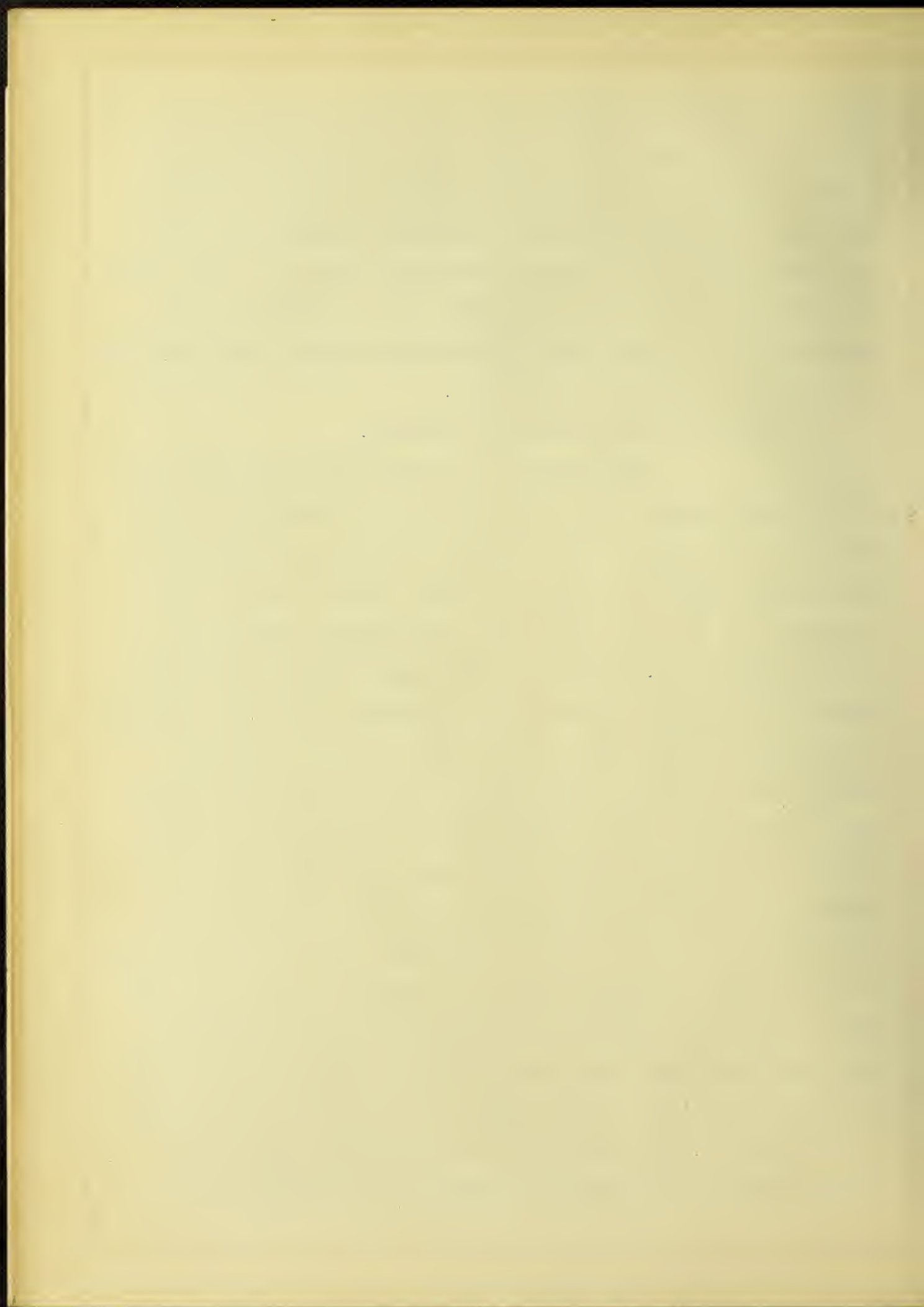
To ascertain the present value an inventory of the tangible factors must be made. This inventory should be in detail, and should include an allowance for omissions varying in amount with the care and completeness with which it has been made. The unit prices prevailing at or near the date of the valuation should be used rather than original prices; but to make a valuation more



stable, the normal or average prices prevailing during a period of from five to ten years prior to the date of the valuation should be used, except where the prices are steadily rising or falling, when prices nearer the date should be used. The parts of a connected whole should be so listed that their relation to each other will be apparent, and this can be done best by adhering to the classification of expenditures for road and equipment as prescribed by the Interstate Commerce Commission.

(1) Land, Right-of-way and Terminal.

Even though the reproductive principle is accepted, there are many who contend that land values should be entered in the estimate at their original cost, or at the current normal market price of neighboring lands, without any increase for damages, or for the excess that railroads are compelled to pay for right-of-way. Whitten, in "Whittens Valuation of Public Service Corporations," asserts that the weight of authority points to the present value of surrounding lands, for if the land in question were not used by the public it could be sold for such a price. He says that this is important for the value of a road's land will soon exceed its structure value and cites the case of the Northern Pacific Railway whose land values in a few years have increased from 500 to 600 %. The method used in the valuation by the Wisconsin Commission was on the assumption that its reproduction cost is the same as the present estimated condemnation cost. Mr. Wilgus claims this value should be multiplied by a factor ranging from $1\frac{1}{5}$ to 3, for these are the prices usually paid by a corporation. He is seconded by the committee appointed by the American Society of Civil Engineers to investigate the mat-



ter. This method guarantees equal consideration to the older lines, and to those more recently built, and gives due consideration to the facts that are known to enter into the purchasing and condemnation of lands for railway purposes.

Terminal land should be treated in the same way. Various methods of determining land values have been used in previous valuations, some of which are as follows:

Washington-----Experts on present value.

Michigan-----Special appraisers.

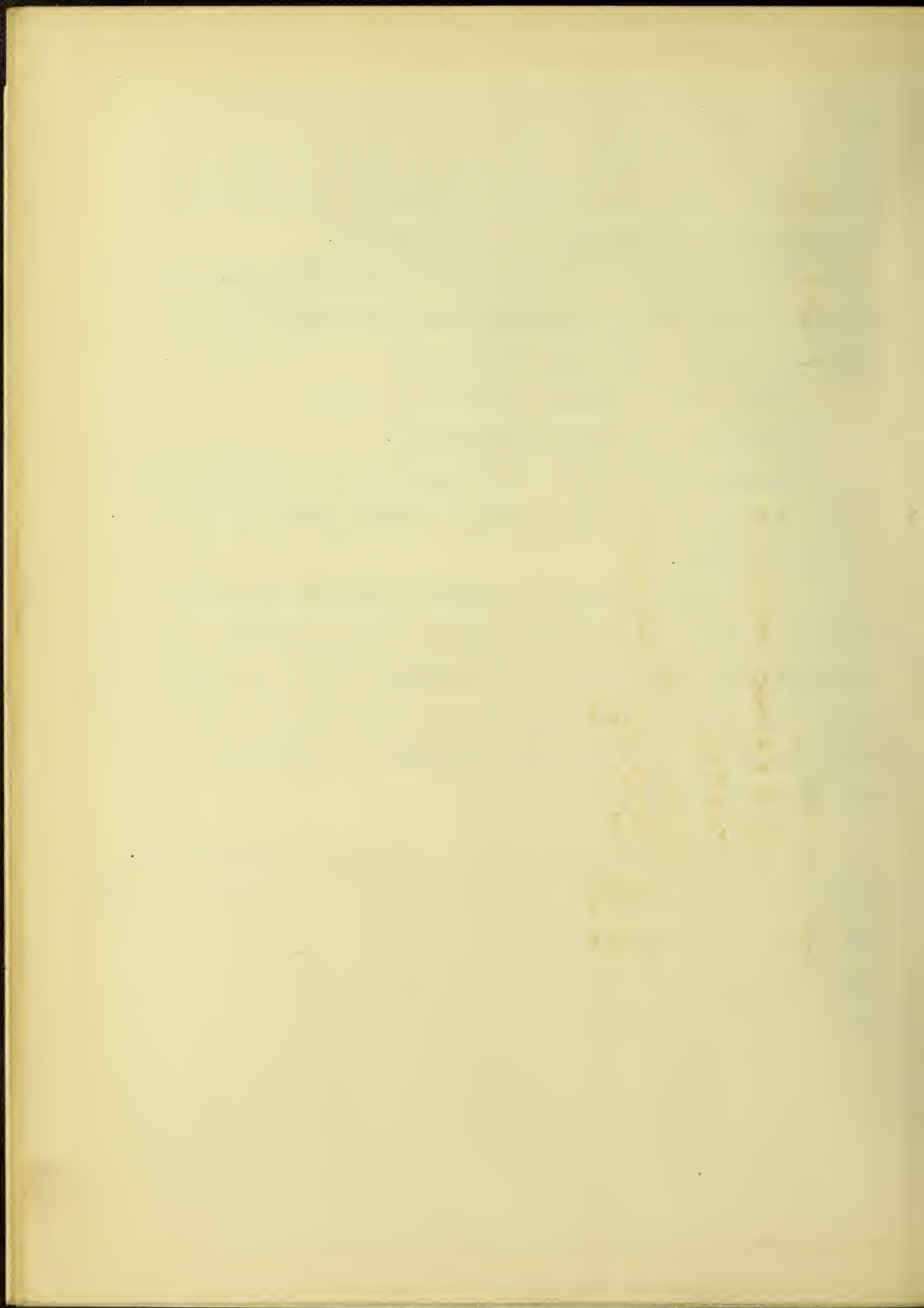
Wisconsin-----110% of the market value of adjoining land.

Minnesota-----Topographical location enhanced the value.

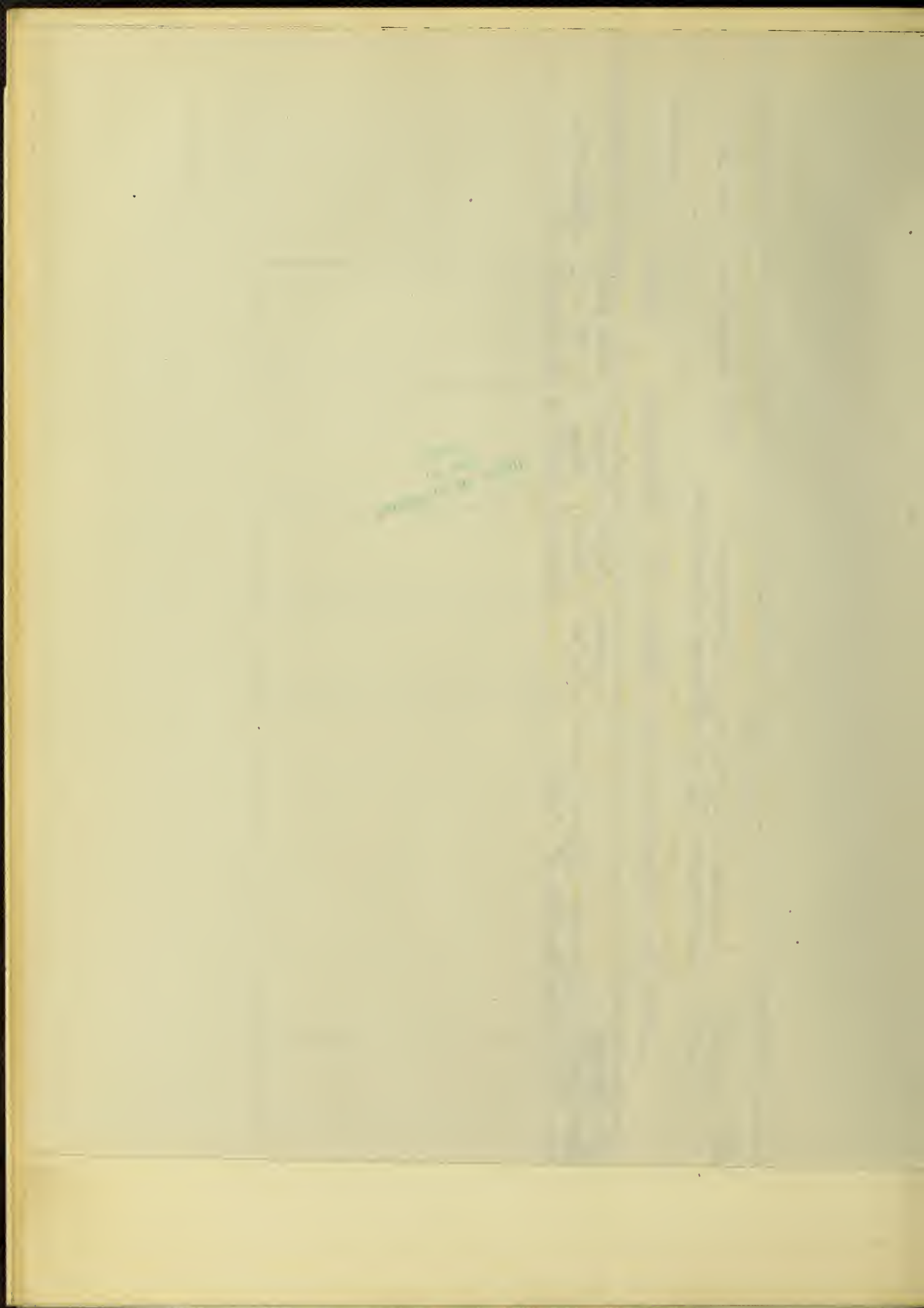
(2) Equipment.

Rolling stock and floating equipment as defined by the Interstate Commerce Commission should each be placed in charge of an engineer of standing in his speciality. Each locomotive, car, and boat need not be viewed personally by the appraiser, but a sufficient number of each class or type may be inspected to fix their value and condition.

Following are some forms used by the state of Wisconsin in its valuation of railroads within that state. They show the general idea to be carried out in the valuation of land, roadway, and equipment, and also the method of compiling these data into final form.



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PHYSICAL VALUATION OF RAILROADS JUNE 30th.....

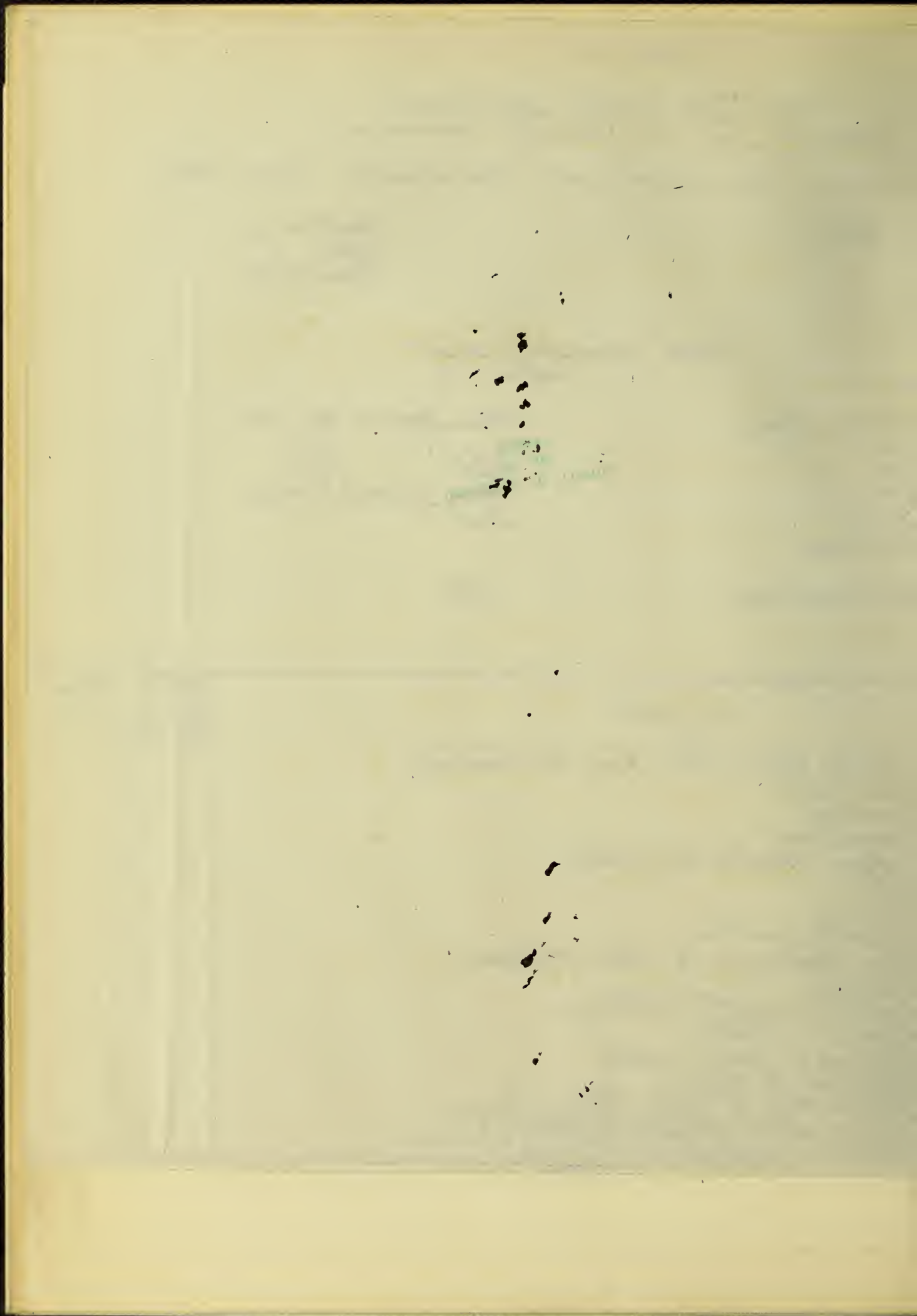
Name of Road.....
Mileage.....

Compiled by.....
Date.....
Checked by.....

Final Summary Sheet
Section No.....

Miles 1 st Main Track.....	Miles Branch Main Track.....
" 2 nd " ".....	" " Joint ".....
" 3 rd " ".....	Total " Main ".....
" 4 th " ".....	Miles Spurs & Sidings.....
Joint " ".....	Joint " " ".....
Total Main Track.....	" " " ".....
Total Miles Crossovers.....	Total " " ".....

Subject	Cost of Reprod. Proy New	Present Value
1. Land for Right-of-Way, Yards & Terminals		
2. Real Estate		
3. Grading		
4. Tunneling		
5. Bridges, Trestles & Culverts		
6. Ties		
7. Rails		
8. Frogs & Switches		
9. Track Fastenings & Other Materials		
10. Ballast		
11. Track Laying & Surfacing		
12. Roadway Tools		
13. Fencing & Cattle Guards		
14. Crossings & Signs		
15. Interlocking & Signal Apparatus		
16. Telegraph & Telephone Lines		
17. Stations, Buildings & Fixtures		
18. General Office Buildings & Fixtures		
19. Shops, Engine Houses & Turntables		
20. Shop Machinery & Tools		
21. Water Stations		
22. Fuel		
23. Grain Elevators		
24. Storage Warehouses		



- 25. Dock & Wharf Property
- 26. Light & Power Plants
- 27. Power Transmission
- 28. Miscellaneous Structures
- 29.
- 30.

Totals 1-29 Inclusive

31. Engineering, Supervising & Legal Expenses... % 1-29	Cost of Reprod. New	Present Value
32. Locomotives		
33. Passenger Train Cars		
34. Freight " "		
35. Miscellaneous Equipment		
Totals 31-34 inc.		

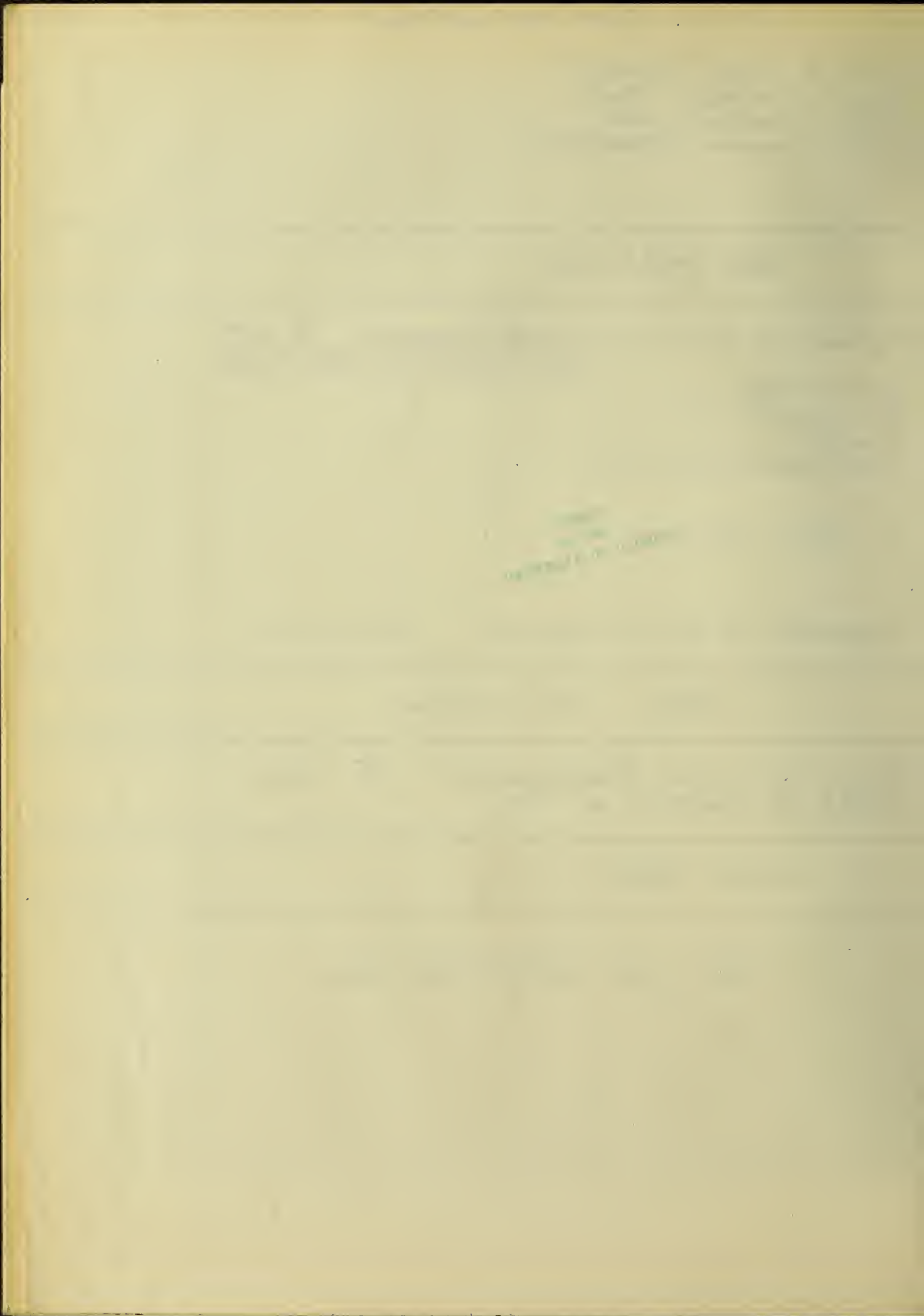
36. Inspection & General Expenses..... % 32-35 inc...

Totals 1-36 inclusive.

- 37. Internal organization & Contingencies... % 1-36 inc...
- 38. Stores & Supplies on Hand

Grand Totals

Total per mile of main line.



B. Depreciation.

Depreciation, modified by the appreciation of those parts that improve with time, should be based on actual conditions and on suitability for continued use. There are several types of depreciable and appreciable property, and these must be considered in the various methods of determining depreciation. The same method should not be used for bridges and buildings as for ties and timber trestles. All forms have a lessening worth. Some depreciate due to age, wear, and tear; some due to the development of a new art or to obsolescence. The straight-line method in the case of long lived property distributes the burden very unequally among the rate payers of different years. The actual-inspection method does not determine the amount of the annual depreciation allowance which the corporation is entitled to earn. The replacement method does not provide for paying for items of property during their life, and is especially unfair in the case of long-lived items of property.

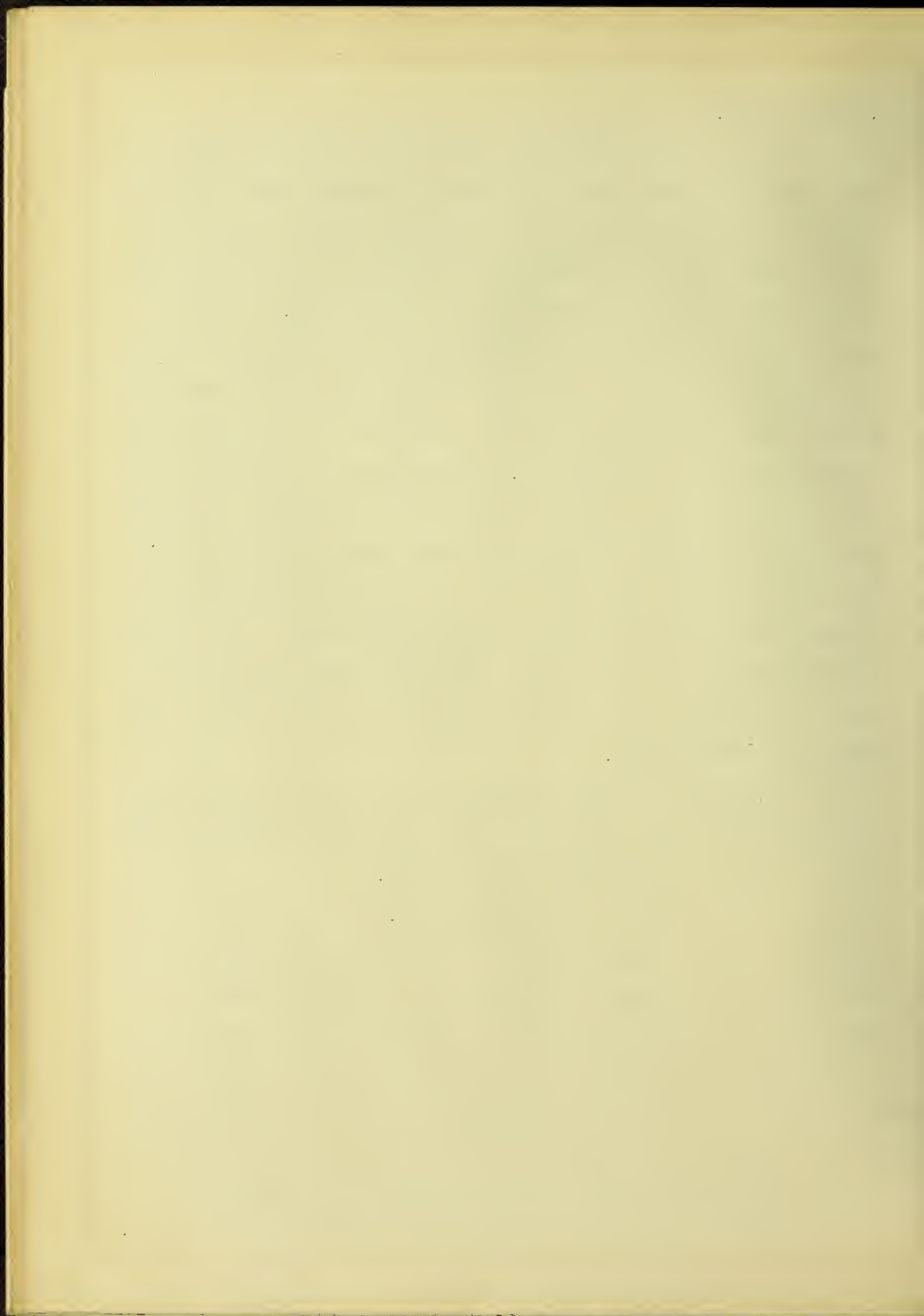
An example of figuring depreciation is the one used by a state in its recent valuation. The object was to determine the average depreciation on their cars in 1909.

1890 to 1909 = 19 years.

100 cars	bought in 1890	100x 19 =	1900
200 cars	bought in 1896	200x 13 =	2600
100 cars	bought in 1900	100x 9 =	900
50 cars	bought in 1906	50x 3 =	150
<hr/>			<hr/>
450		16 yrs.	5550

5550

450 = 11.44 years = average age of all in 1909.



Estimated life = 40 years.

$$\frac{11.44}{40} = 28.6\% \text{ depreciation.}$$

The Chicago Board of Supervising Engineers has deemed that their properties must always be maintained at 85% of their original cost to construct. The method of determining the proper amount of depreciation because of the innumerable conditions is left to the judgment of the engineer. That it must be considered is shown by the recent decision of the U.S. Supreme Court in the Minnesota Rate Case, which ruled that depreciation in the determination of present value, must be taken.

C. Appreciation.

Land and water rights generally appreciate in value from year to year. This should be treated in the same way as depreciation. Mr. F. A. Delano, Pres. Wabash Railroad, says that appreciation counterbalances depreciation, but he is not supported by any authority. Since a different method is used in determining land values, and since land values are practically the only appreciative factors, it is useless to consider appreciation in the method of Reproduction-New-Less-Depreciation.

IV. PREVIOUS VALUATIONS AND COURT DECISIONS.

(1) Early Valuations.

As early as the Civil War the United States Government ordered a valuation made of the first Pacific railway in order that they might determine whether the money they had loaned this railway was used judiciously. However, the first real valuation was attempted years after. In 1904 the Bureau of the Census made a commercial valuation of railway operating property in the

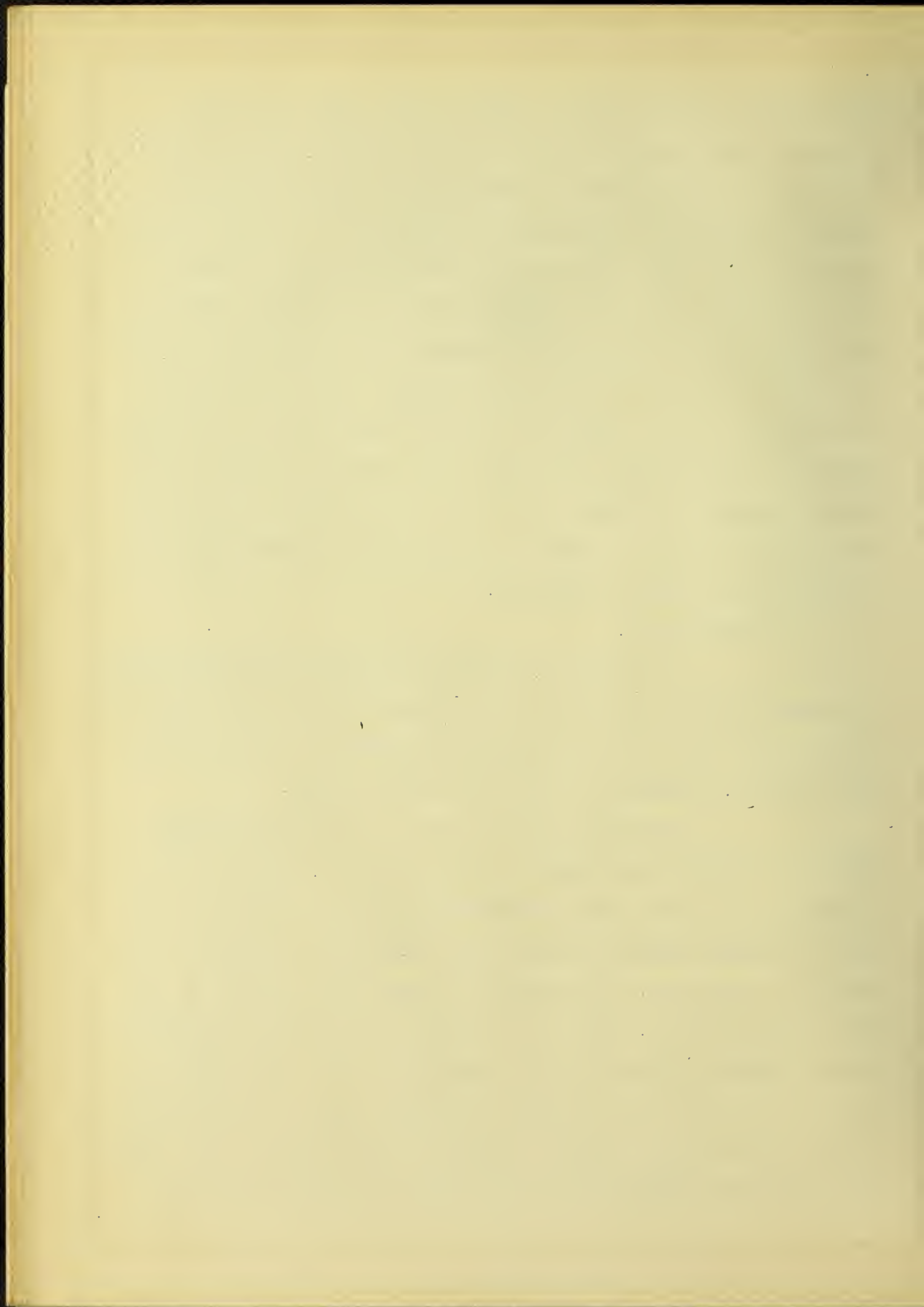


United States. In this the net earnings were used as a basis of capitalization, and the rate of capitalization was obtained by dividing the corporate net income by the aggregate value of corporate securities. The commercial valuation is a market estimate which takes into consideration the expectation of income arising from the use of the property and its strategic significance, the growth of the country, restrictive legislation, competition by rail and waterways, and investment demand. Since net earnings are directly dependent on rates, and since the valuation depends on net earnings, obviously such a valuation could not be used as a means of deciding upon the rates charged; and hence it was necessary finally to revert to a physical valuation based on an inventory of tangible property.

(2) Washington.

The methods employed by the Washington Commission in determining the valuation of the railways within that state, in 1905-08, were outlined in the Railway Age-Gazette of Feb. 18th-, 1910, by Mr. J. C. Lawrence, one of the Commissioners.

He stated that the cost of reproducing right-of-way and terminal was estimated on the basis of market value of adjacent property, plus the additional amount experience has shown a railway company must pay for consequential damages in securing such property. The unearned increment was allowed in the cost of reproduction. This may be either in the cost of construction of roadbed, structures, and equipment, or in the right-of-way and terminals. The commission concluded that on an established road, maintained to proper standard of efficiency, there would be no continuing depreciation; and that on a newly constructed



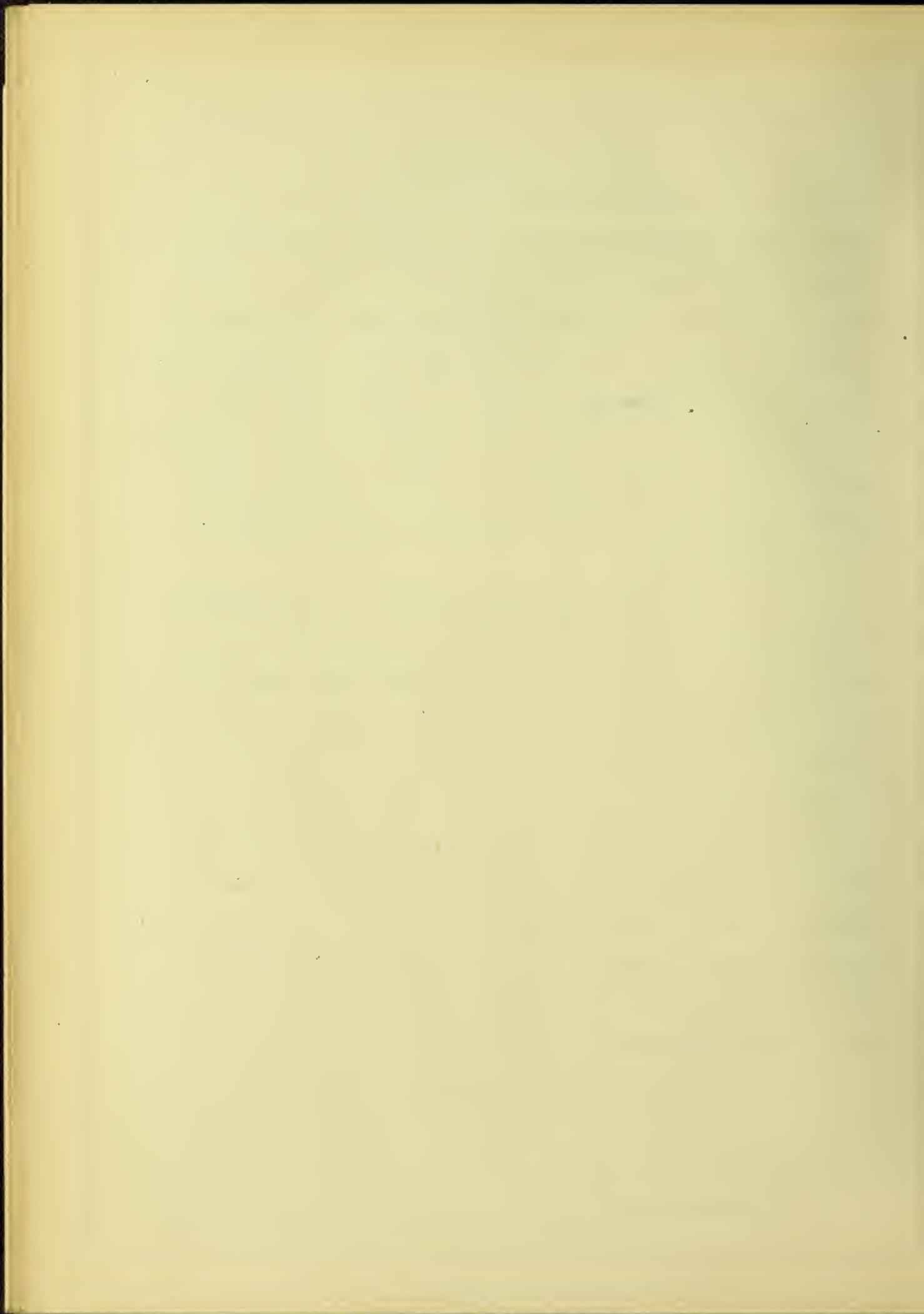
line there would be a rapid depreciation of certain elements during the first few years. The appreciated value of the roadbed was added to the estimated cost of the reproduction new, and from this sum deductions were made to cover the depreciation on all other items. However this value does not equal its market value. To this must be added a sufficient amount to cover such influences as prices of outstanding securities, density of population, amount, permanency and class of traffic, and value of facilities for doing business. From records the cost of reproduction new per mile was found to be \$64,300, present value \$58,000, market value \$64,800, and capitalization \$53,000.

(3) California.

The state railroad commission of California on Feb. 3rd, 1913, started a physical valuation of all railroads operating within that state. One year before that date the commission ordered all state carriers to approximate the physical valuation of their properties; and practically the entire number, save several of the larger roads, filed their reports with the Commission. A few of the first reports received are said to have shown a tendency to over-valuation, because of which the Commission decided that it would be unsafe to use the railroad's reports on which to determine the merits of applications for permission to issue bonds. For that reason the Commission will make its own estimates on rail valuations. The hearings are to be given opportunity to present argument in the fixing of the values.

(4) South Dakota.

The physical valuation of the railroad property in

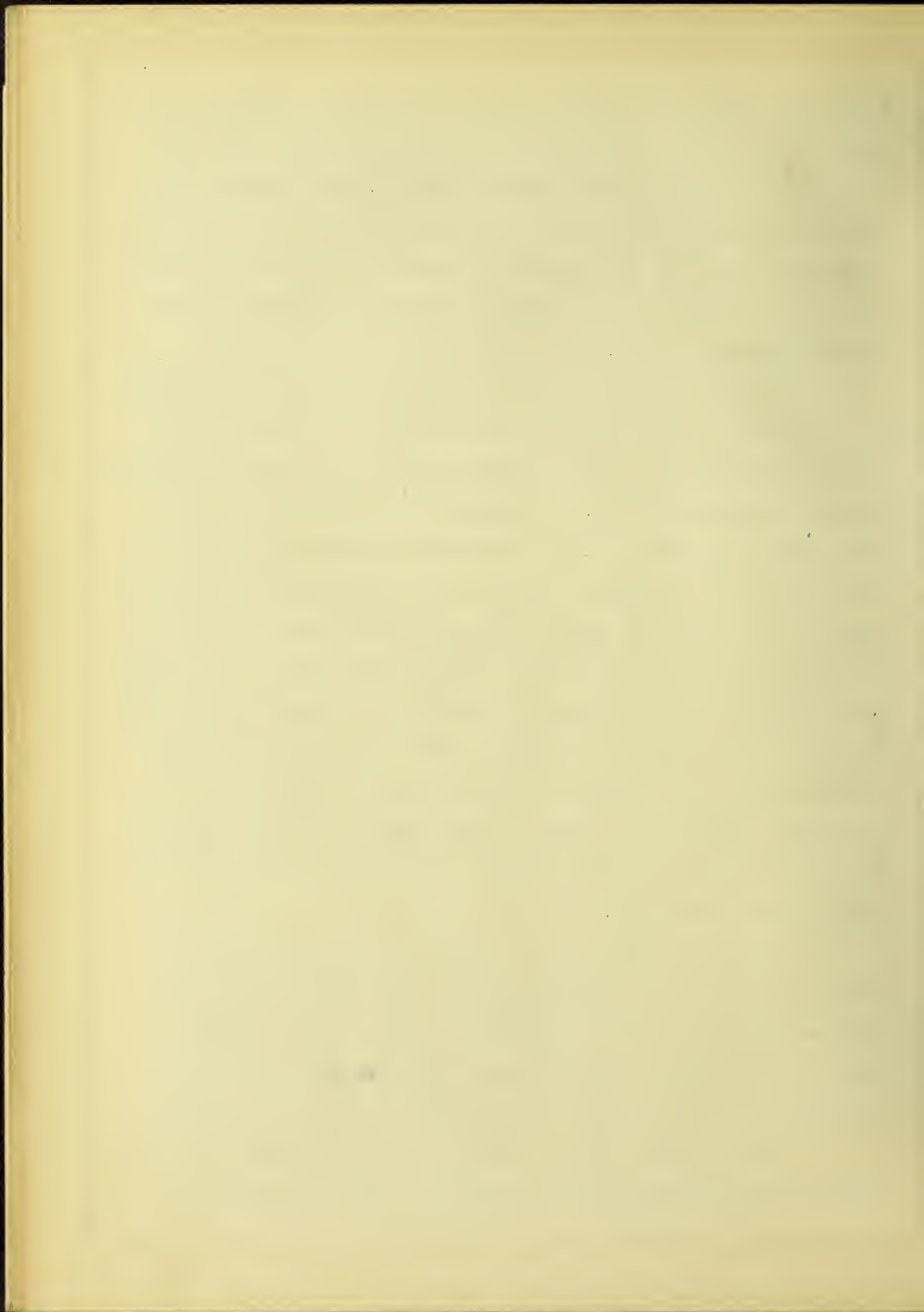


South Dakota made for the State Board of Railroad Commissioners was conducted under the direction of Mr. Carl C. Witt, its engineer, by the "Reproduction Value-New" method. The appraisal was made in accordance with an act passed in 1907, and was intended to furnish a part of the information called for in the decision of the United States Supreme Court in Smythe vs. Ames, on the reasonableness of rates.

In order to make the appraisal, the Commission prepared and distributed to the railway companies a set of blank forms covering in detail all the data required to enable anyone familiar with railway construction to determine the cost of reproducing the physical property new. The roads were requested to divide their lines into convenient sections not exceeding 100 miles in length, and to begin at one end and note the items in detail in sequence to the other end of the section. They were also requested to furnish the Commission with profiles and right-of-way maps of their entire lines in the State. After these data had been received from the companies, a field inspection was made by the engineers, accompanied by one or more members of the Commission, on a special train. In this manner every mile of railway within the state was inspected.

After the inspection a cost to reproduce each item new at current prices was determined, and by applying the condition-percentage to the reproduction-new cost the present value was determined. Locomotives, and passenger and freight equipment were apportioned to South Dakota on a mileage basis.

The request for an inventory met with prompt and willing response from the railway companies, and a complete report



was made June 30th, 1909. The cost of making this appraisal was 24.
\$5.00 per mile, a surprisingly small figure.

(5) Michigan.

The original appraisal of the physical properties of Michigan railways was conducted in 1900-01 under the direction of the Board of State Tax Commissioners. Since that time the Board has annually presented a table of assessed value of railway property, which by law must be what the Board considers the actual value of the property.

The method of valuing right-of-way and terminal lands is described as follows by Prof. Coolley in his report to the Michigan Board of State Tax Commissioners. "The question whether the increased cost of right-of-way over and above the value as determined by contiguous property may properly be included in the present value of a railroad, is a matter about which there may be a difference of opinion. The true cash value of a thing has been defined as the price upon which a purchaser and a seller mutually agree, and at which an actual transfer takes place. If an attempt were made to purchase an existing right-of-way as, for example, an entrance into a city, if the owner were willing to sell at all he surely would take into consideration what it would cost the purchaser to get into the city by another route, and the prospective purchaser would surely consider what it would cost him by another route. The conclusion finally reached by the Commission was to add to the value of the right-of-way, as determined by contiguous property, an amount fairly representing the additional cost to the railroad."

The results obtained from this valuation were that



the per mile cost of reproduction new was \$25,900, present value \$34,000, and capitalization \$42,000.

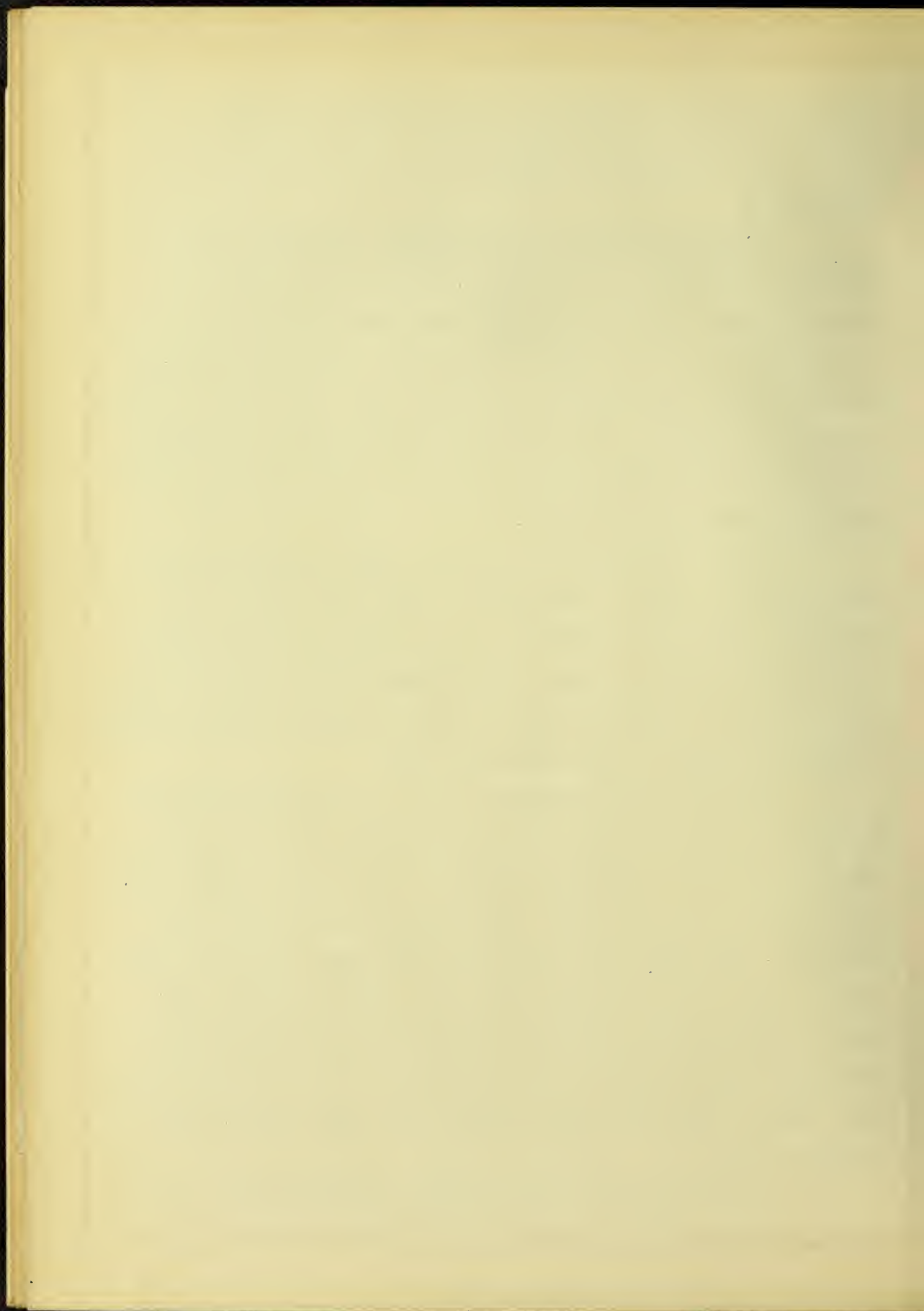
(6) Minnesota.

The State of Minnesota has recently completed a most exhaustive valuation of its railways. There were two bases of valuation; one in which an allowance was made for the sum which the railways would have to pay for the land for railway purposes, including damages and monopoly prices for land; the other in which the land was valued on the same basis as land lying in contiguous territory. The railways contended the first to be the fairer, the commissioners the second method.

In the latter part of 1906 the state of Minnesota ordered one of the roads of the State to report the value of its properties, requiring a statement in one column, of the "market value", and in another column, of the "value for the railway purposes". This was for the purpose of determining the reasonableness of the rates charged by the defendant road.

The United States Supreme Court on June 9th, 1913 handed down its long-expected decision on the Minnesota rate cases, wherein the primary issue was the right of the state to make rates which affect interstate rates. The Court's opinion is that the states have this right so long as the intra-state rates are reasonable, i.e., not confiscatory. The court added, however, that Congress has authority to direct the regulation of even these intra-state rates because of their influence on inter-state rates. Until Congress exercises this authority the state legislatures are free to act.

Going beyond the question of interference with inter-



state rates and reaching the question through an effort to determine whether the rates were confiscatory, the court discussed at some length the questions of depreciation and proper methods of evaluating railroad lands.

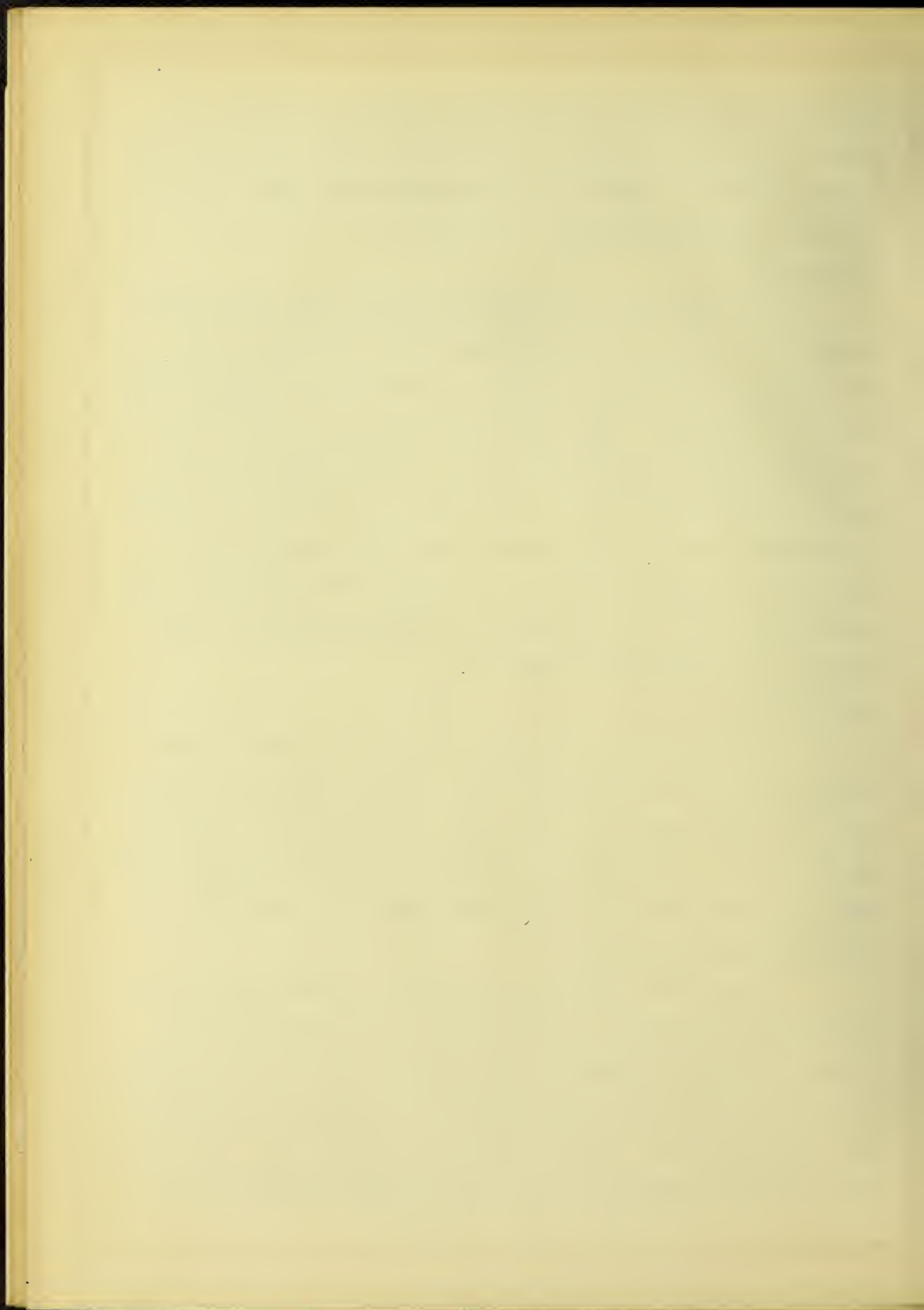
(7) Wisconsin.

The appraisal of the physical properties of Wisconsin railways is in charge of the Wisconsin Tax Commission, and is made primarily for taxation purposes. The original appraisal was made as of June 30th, 1903, and annual revisions thereof have been made through the medium of reports by the railways to the Engineer of the Commission. To determine the right-of-way value, to the market price of the land was added the depreciation in the salable marketable value of the residue. The results in 1909 were per mile cost of reproduction new \$41,800, present value \$33,900, and capitalization \$44,000.

(8) New Jersey.

In the state of New Jersey a feeling existed on the part of many of the citizens that the assessed valuation was too high, and that it was on a much higher scale than that for other corporations or individuals. Accordingly a valuation of all railroad properties within the state was made in 1911 using the reproduction-value-new method.

One of the interesting problems in determining the value of railroad property in New Jersey is the question of the floating or marine equipment used in connection with the various railroad terminals. The decisions of the federal courts determine that the domicile of the owner is the location of the vessel for the purpose of taxation, and all the floating equipment used by



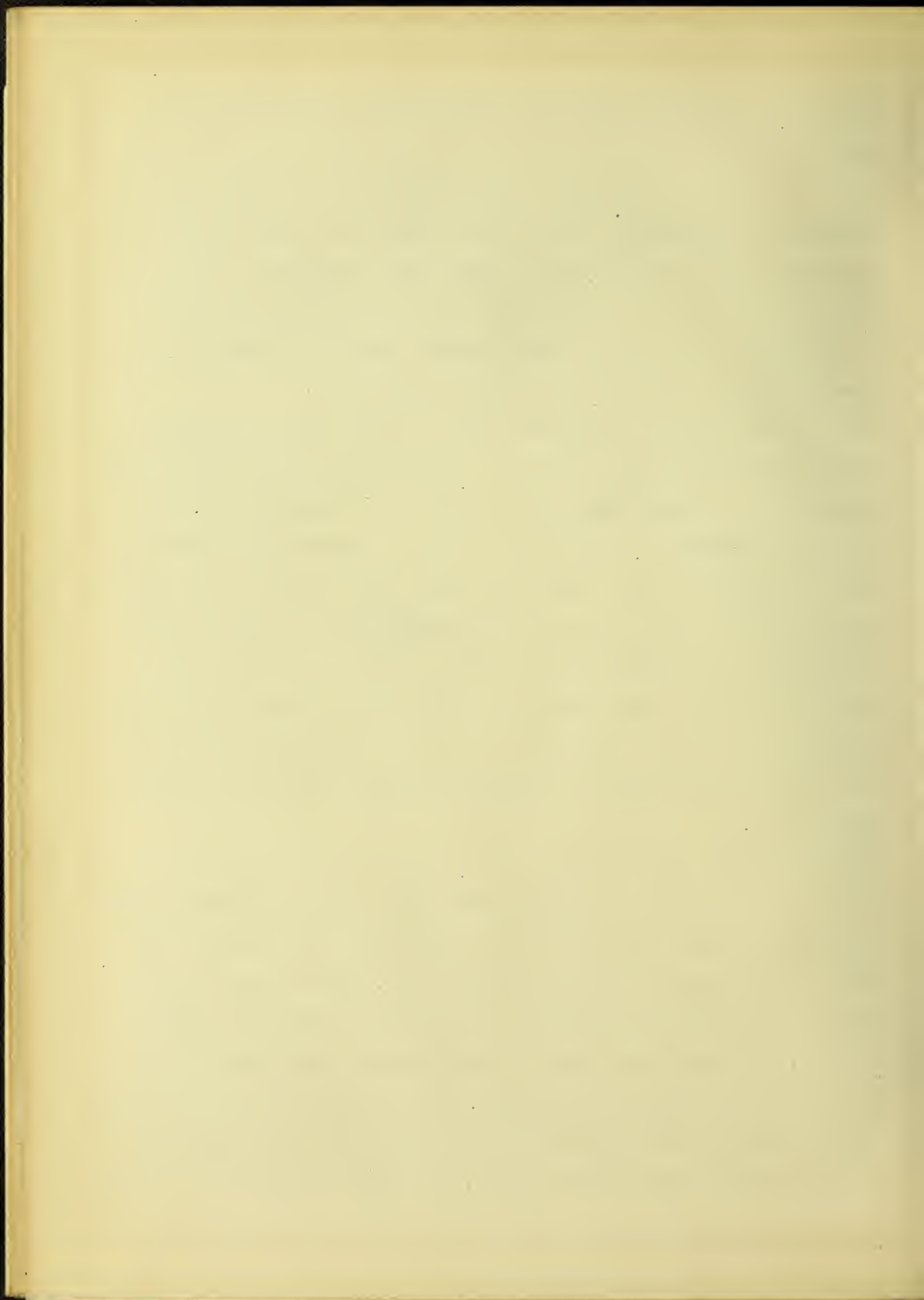
New Jersey railroads were made assessable in the state of New Jersey,

The cost of making the valuation in this state was estimated at \$150,000, but due to the excellent organization, the cost did not exceed \$90,000. The field engineers were required to compute the quantities measured each day and report to the main office daily, thus allowing the chief engineer to keep in close touch with every part of the work.

(9) In 1909 the Railroad Commission of Texas made a valuation of all the roads within the state using the cost-of-reproduction-new method. Unfortunately the reports of the Commission do not contain a summary of the detailed cost of reproduction, and little can be gained from them except the final results. The total mileage in 1909 was 12,373 miles of roadbed and the cost of reproduction new was \$17,000 per mile. It will be noticed that this is very low. Even the value of the rolling stock is abnormally low, probably below half its cost of reproduction new, if the criteria furnished by valuations in other states are at all applicable.

(10) Nebraska.

In 1910 the state of Nebraska appointed Commissioners to determine the valuation of all railroads in the state to assist in affixing the proper freight rates. The work was divided into three distinct parts with different men working in each division. The first party was to ascertain the value of all the right-of-way, land, and terminals. They co-operated with 500 real estate dealers within the state, and from this fixed the values on the railroad property the same as on surrounding land. A spec-



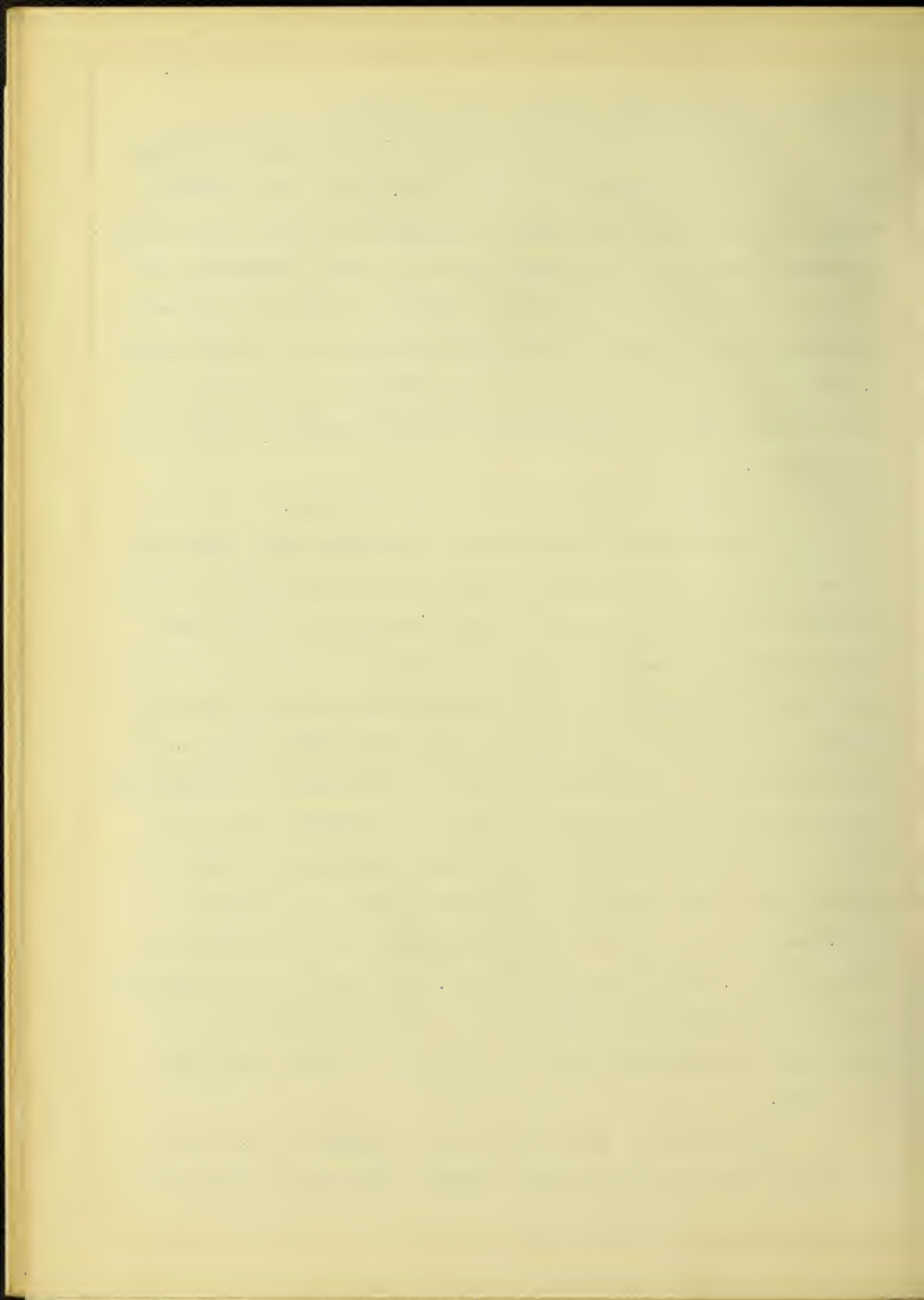
ial invoice of the Omaha terminal was necessary.

The second and third divisions were "Roadway" and "Equipment." As in other states the road was subdivided into sections varying from four miles in length to two-hundred-thirty-seven miles. An estimate was made of the earth and rock moved, grubbing, cost of laying, buildings, etc., and the commission with the engineers then devised unit values for all that the physical inventory showed. The total cost of the valuation was \$75,000, and the results showed 16,000 acres of right-of-way and 6,000 miles of track within the state.

(11) The New York, New Haven and Hartford Railroad.

In 1909 the Attorney-General of Massachusetts demanded the New York, New Haven and Hartford Railroad to give up her charter for two counts which were in direct violation of the State laws. The road maintained that it was solvent, and this led to an investigation or appraisal by the Massachusetts Board of Railroad Commissioners, the Tax Commission and the Bank Commissioners. This was a unique state undertaking because it involved an investigation of properties outside as well as within the limits of the state; and this interstate character of the work introduced a number of unusual conditions. The physical valuation was done by Prof. Geo.F.Swain, with Messrs. Stone and Webster as investigators of the companies investments and accounts. The report of the appraisal is a volume of 581 pages, and from Prof. Swain's special report, which forms a considerable part of the whole, the following has been taken.

"The physical valuation is not a scientific basis for an estimate of the public wealth, because that wealth depends up-



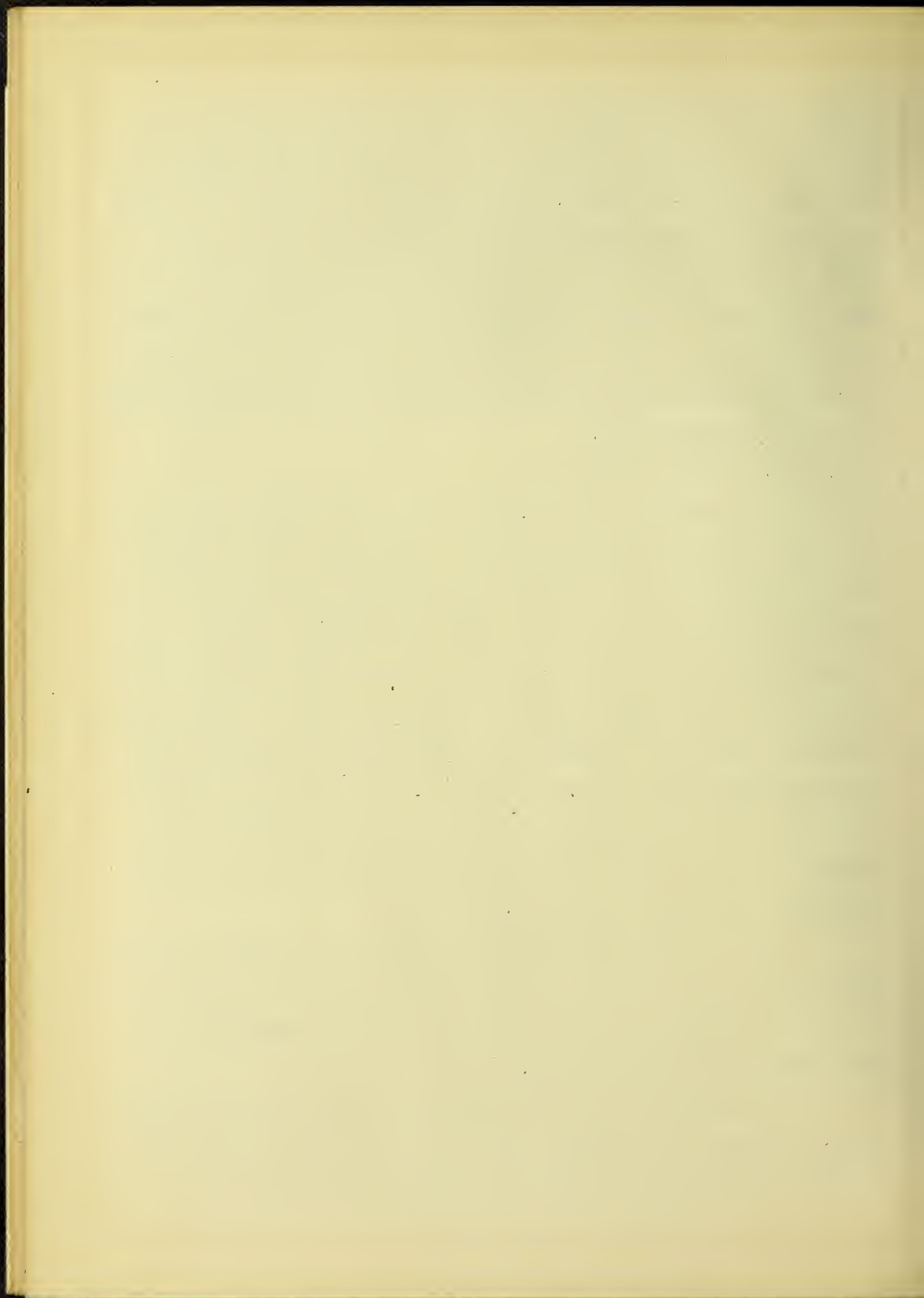
on the value of the property as a "going concern", and this depends upon its earning capacity, not its physical valuation. For this reason the U.S. census reports estimate the value of a railroad property by capitalizing the net earnings. The road was found to have a surplus of \$100,000,000, and for every \$100 invested in stock it has an equivalent actual value of \$180." However this valuation did not restore the confidence of the public as was expected, for even in May, 1914, the road's stock was listed on the Exchange at 70.

(12). Northern Pacific Railroad.

In 1909 Mr. Halbert P. Gillette, for the Railroad Commission of the State of Washington made a valuation of the Northern Pacific railroad in that state. He determined the original cost from the accounting records, fully 80% of which were intact, and the rest he found by field inspection. It has been said that the original cost plus improvements can be ascertained for very few railways in America. Doubtless this assertion has deterred other railroad commissions from even attempting to secure the original cost. The facts are, however, that of the entire railway values in Washington, not much more than 5% were such that the original cost plus improvements could not be found.

The cost of reproduction was determined by adding 15% to the original cost to provide for increased prices. The present value was obtained by deducting from the cost of reproduction a depreciation of 3.6% per annum.

In drawing conclusions relative to the probable average cost of railway lines through-out the country, Mr. Gillette says serious errors have been made by considering only the costs in one



or two states. It was noticed that the cost of terminal lands in Washington was enormous when charged entirely to the road mileage within that state. In the findings of the Washington Railroad Commission it was determined that 55.8% of the entire value of lands used by the whole Northern Pacific railway system exists in the state of Washington. The total original cost of the 1,645 miles within the state was found to be \$75,457,000, or \$46,000 per mile.

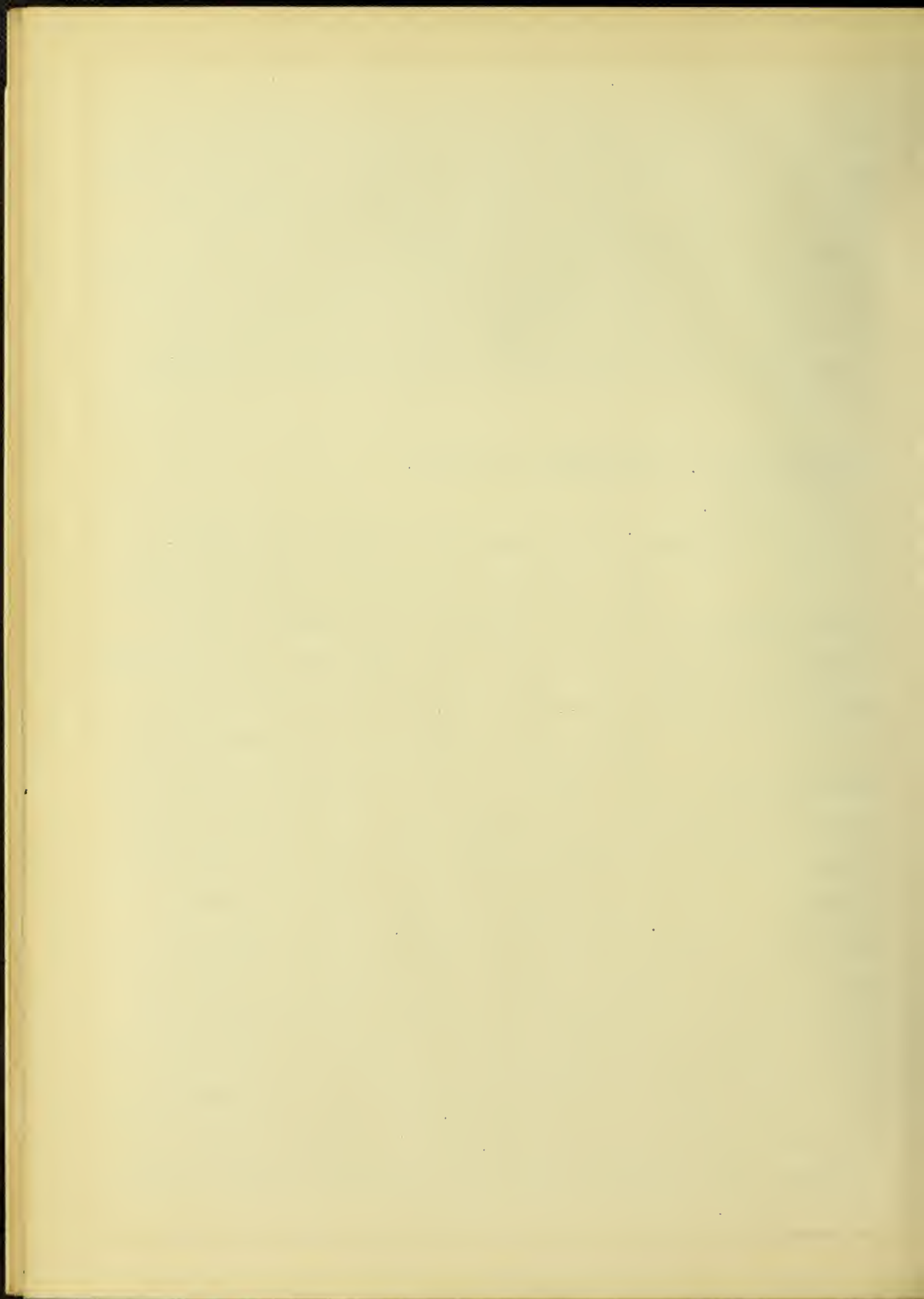
V. PROSPECTIVE U.S. GOVERNMENT VALUATION.

A. History.

1. Powers of the Inter-state Commerce Commission.

Over twenty-five years ago Congress authorized the President to appoint a Commission to regulate certain phases of railroading. It was not until 1906 that this Commission really did any thing significant concerning rate regulation.

The Inter-state Commerce Act as amended has been in effect 8 years (1914), and this Act gives the Commission a restricted authority to fix rates. Section 15 of the Law authorizes the Commission whenever after full hearing and complaint, it shall be of the opinion that any of the rates, or charges whatsoever, demanded, charged or collected by any common carrier or common carriers, subject to the provisions of this act xxx are unjust or unreasonable, or unjustly discriminatory, or unduly preferential or prejudicial, or otherwise in violation of any of the provisions of this Act, to determine and prescribe what will be the just and reasonable rate or rates, charge or charges, to be thereafter observed in such case as the maximum



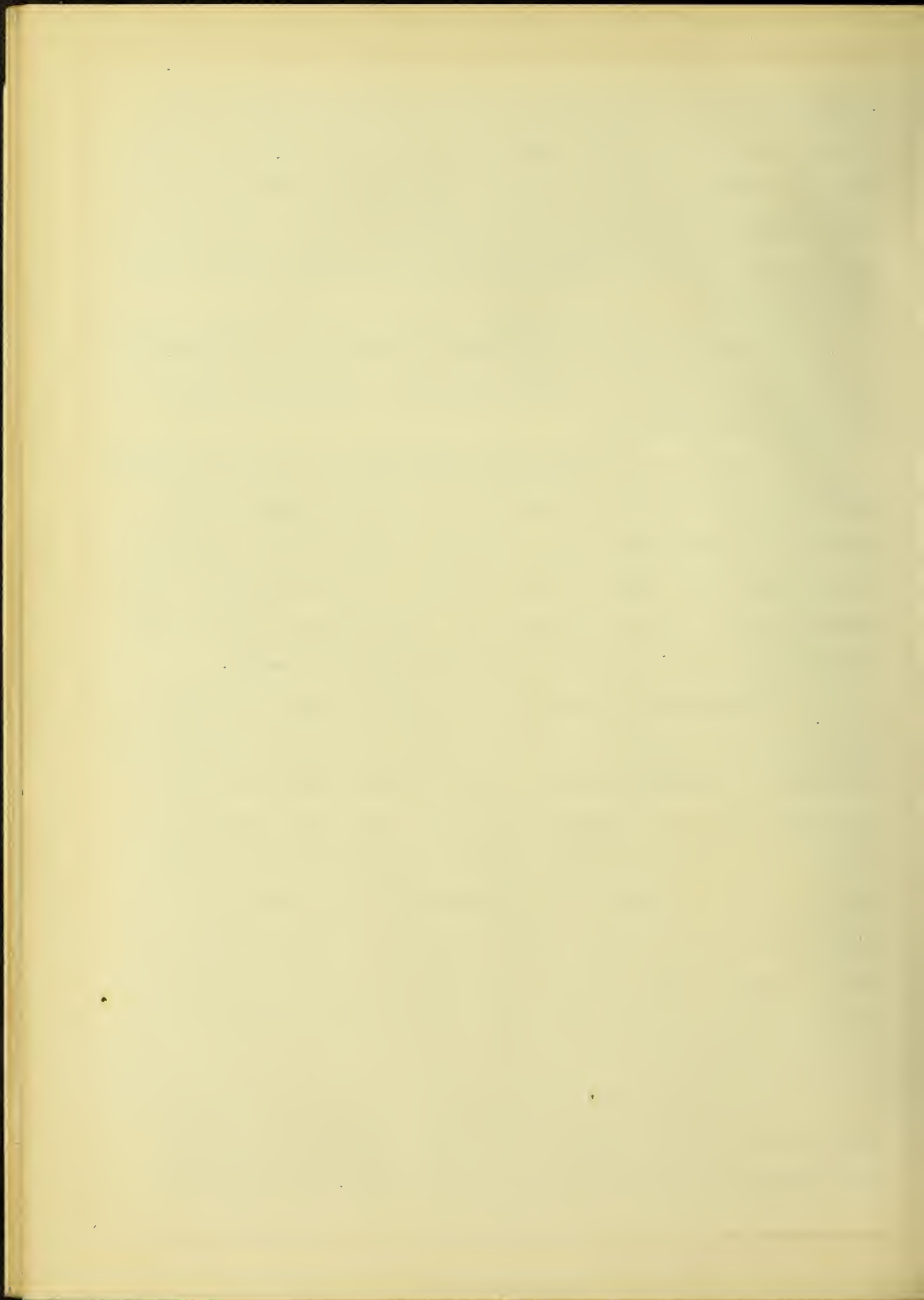
to be charged; xxx and to make an order that the carrier shall xxx not hereafter publish, demand or collect any rate or charge for such transportation in excess of the maximum rate or charge as prescribed." This gives the Commission authority to reduce a rate either because it is discriminating or because it is unjust or unreasonable.

The language in which the law confers on the Commission power to condemn excessive, and substitute reasonable rates is given two interpretations.

One is that it makes the Commission, as to rates about which complaint is made, virtually the traffic manager of the railways. The Commission may and should substitute its judgment of what such rates ought to be, for that of the managers of the railways, and so long as it does not cross the dead line of confiscation it may readjust and reduce them as it pleases.

The other interpretation of the Act grants it power only to fix the highest limit up to which the traffic manager may exercise the discretion which the law leaves them. When a complaint is filed, the Commissioner's first duty is to ascertain if the rate complained of exceeds this highest limit, in other words is extortionate. If the Commission finds this rate excessive its duty is to fix, not the rate which it may think the traffic manager ought to make for the greatest good for both the railway and the shipper, but merely the highest rate which will not be extortionate.

It was proposed in Congress to give the Commission power to fix absolute rates. It was also proposed to give it power to fix minimum as well as maximum rates. Both these pro-



positions were rejected. The Commission was given power only to fix maximum rates. So in view of the discussion of the Hepburn Bill in Congress, and decisions of the Supreme Court, it seems probable that the second interpretation, as outlined above, is the correct one.

2. Adamson La Follette Law, 1913.

Although the Inter-State Commerce Commission was given a little power there was nothing definite attached to these powers, and attempts have been made in Congress to secure the enactment of legislation for the purpose of securing a complete physical valuation of all the roads, and thus obtain a basis upon which the Commission may work. Nothing of importance came out of this agitation until 1913, when the Adamson Bill was presented to the House and passed by a large majority. The Adamson Bill was radically amended while before the Senate and was known on its passage as the La Follette-Adamson Bill.

The act as finally passed provided that the Inter-state Commerce Commission should investigate, ascertain, and report on the value of all the property used by every common carrier subject to the provisions of the Inter-state Commerce Act; that the Commission should have the authority to employ such experts and other assistants as might be necessary; that it would have the power to summon witnesses and to take testimony, and that it should make an inventory of all the property of every common carrier and classify the physical property in accordance with the general classification of expenditures as used by the Commerce Commission.

In making this investigation the Commission was re-



quired to ascertain and report in detail as to each piece of property owned and used by the common carriers, and to report upon the original cost to date, the cost of reproduction new, the cost of reproduction-less-depreciation, and to propose and publish an analysis of the methods by which these several costs were obtained, and the reasons for the differences if any should occur.

The Commission was required in addition to report separately the original cost of all lands, rights of way and terminals used for the purposes of a common carrier, and to ascertain as of the time of dedication to public use the value and the present value of the same. It was also required to ascertain and report as to the amount of property that had been given by individuals and public authorities to the railroads for the purpose of aiding in the establishment of the same. After the completion of the valuation the Commission was required to keep the same up to date so that for the United States there would be a perpetual inventory of all the property devoted to the work of transportation by common carriers.

B. Plan.

1. Organization.

The Interstate Commerce Commission in pursuance of the authority granted by this act has already appointed a board of engineers, among them being the Hon. Chas. A. Prouty and Prof. W. D. Pence. The Commission divided the United States into a number of districts, and has commenced the valuation, beginning on the San Pedro, Los Angeles and Salt Lake Railroad, extending from San Pedro, California, to Salt Lake City. This road



was taken because it was thought that the problems involved in its valuation were simpler than those generally prevailing, and that as a result of experience in this particular instance the work of valuation in other districts might be carried on more efficiently and economically. (Extracts from Technograph, May, 1914 Prof. M.H. Robinson Ph.D.)

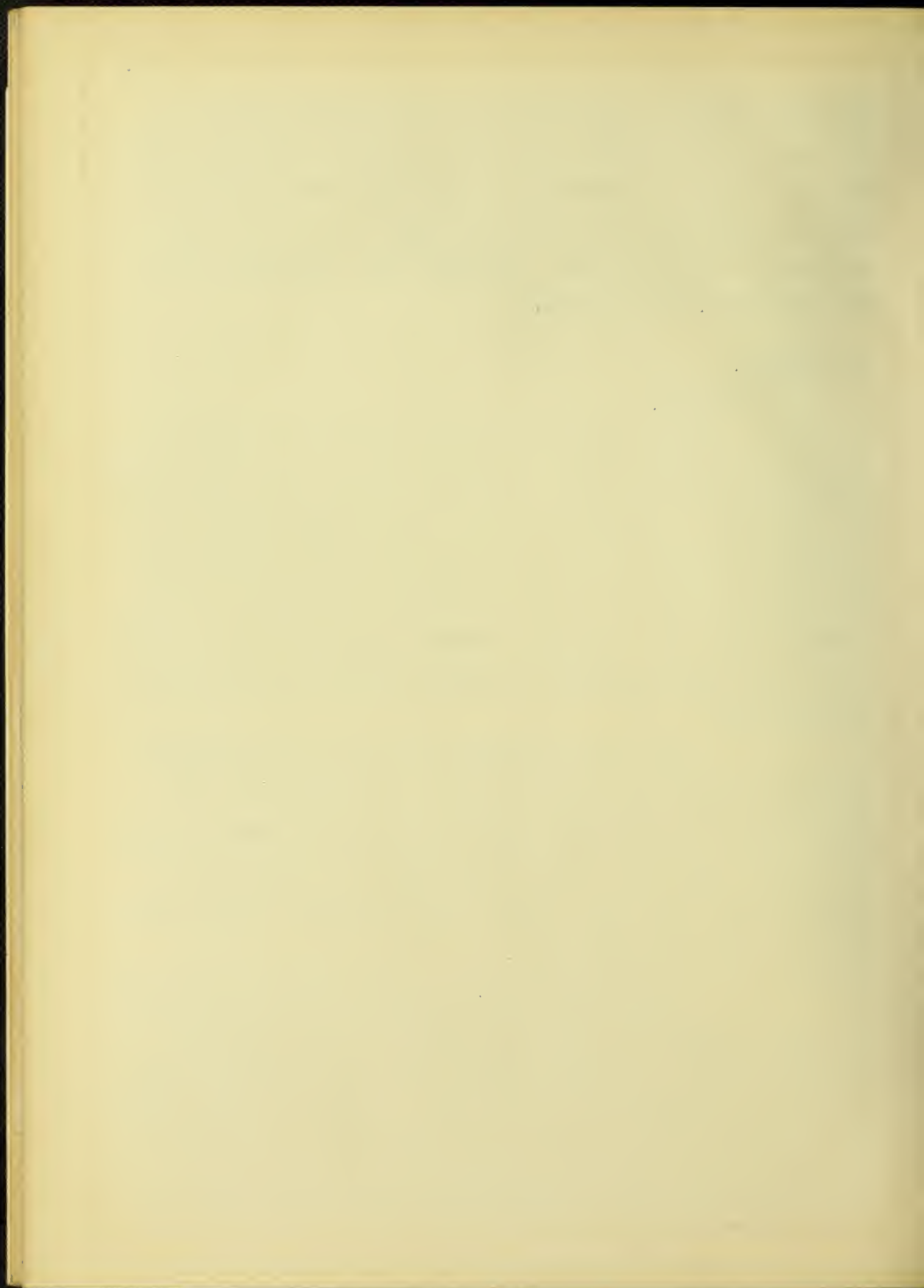
VI. SUMMARY.

A. Results.

From previous valuations there have arisen controversies resulting in court decisions the main ones being first, that the cost of reproduction is not controlling; second, that a company is entitled to a valuation based upon the present standard of prices, that is, it is entitled to the benefit of an increase; third, that a railroad company is not entitled to a valuation based upon mistakes in judgment either in purchasing or construction.

It is the consensus of opinion that the reproduction-new-less-depreciation method is the best of any and should apply to all cases whether for determining taxation, rates, or solvency. There are few who will dispute the importance of the "franchise," or "going value", and no authority forgets overhead expenses in the valuation.

It is true that the present valuation of American railways by the United States Government will cost probably \$15,000,000, but it is worth while. The yellow newspapers will be silenced and public confidence will be restored in the roads. The investors in railway stocks and bonds will know to what extent their securities are protected by actual assets, and the



roads will be able to secure more capital. To some companies it will mean a reduction of rates, and hence a benefit to the public, while to others it will mean better service and an increase in rates. On the whole this valuation is the only fair and honest way of determining the proper relations between the corporations and the public.

END



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